

Mapping and Assessing Sustainability Opportunities in the Logistics Function of a Telco Operator

David António Dias Costa Castro

Master Dissertation

FEUP Supervisor: Prof. Pedro Amorim



Master in Production Engineering and Management

2023-06-26

Abstract

Sustainability represents a growing concern for companies today, in addition to social and environmental responsibility, it has become a crucial competitive advantage. In the logistics sector of companies, the implementation of measures such as reducing resource consumption, minimising carbon emissions and optimising logistics processes may achieve several benefits by reducing operating costs, improving efficiency and strengthening the image and commitment of the company to the environment.

The objective of this dissertation was to analyse and map sustainability opportunities in the logistics sector of NOS, a telecommunications company. To address these challenges, three areas of analysis were conducted that ran in parallel throughout the study period.

In the first area of analysis, the implementation of a circular shipping box was evaluated in the logistics circuit between the shops and the warehouse. This process consumes a large amount of cardboard and plastic, resulting in a significant environmental impact. Thus, the circularity scope of this process was studied through a pilot project, using circular plastic boxes in six shops in Portugal, in the supply and return circuit. Finally, a balance between the costs and environmental benefits of the obtained solution was made, and the need to evaluate the carbon price metric was addressed to make the sustainability projects feasible.

In the second area of analysis, sustainability opportunities were identified in the shops and technical support centres (CAT), related to reduced paper consumption, waste, costs, and increased operational efficiency resulting from the visits and monitoring of processes. In this sense, opportunities were identified to digitise documents, improve operational efficiency, reduce waste and reformulate the process of purchasing stationery materials for the shops. Following these opportunities, corrective measures were implemented, and suggestions were proposed to reduce materials and minimise the environmental impact of these operations, addressing costs and benefits.

In the last area of analysis, a study was carried out to understand the environmental benefits of shop collection/pick-up point, according to the company's business model, to promote the reduction of the environmental impact of home delivery and transport costs. The proposal designed involved the implementation of an awareness-raising strategy for consumers who shop online with direct effects on the reduction of carbon emissions and economic benefits.

In conclusion, this project allowed the initiatives developed to integrate the NOS value chain through the implementation of sustainability and awareness opportunities, resulting in a significant reduction of the environmental impact of the operations. With the proposed measures, it is estimated that there will be an annual reduction of 26 tonnes of materials (paper/cardboard, plastic), 69 tonnes of CO_2 and a change of 12 tonnes of paper to its sustainable version.

Keywords: Sustainability, logistics, environmental impact.

Resumo

A sustentabilidade representa uma preocupação crescente para as empresas, para além da responsabilidade social e ambiental, tornou-se uma vantagem competitiva crucial. No setor logístico das empresas, a implementação de medidas como a redução do consumo de recursos, minimização das emissões de carbono e otimização dos processos logísticos, poderá permitir a obtenção de uma série de vantagens tais como, a redução de custos operacionais, a melhoria da eficiência, fortalecimento da imagem e do compromisso da empresa com o meio ambiente.

O objetivo desta dissertação foi analisar e mapear oportunidades sustentáveis no setor logístico da NOS, uma empresa de telecomunicações. Para abordar estes desafios, foram conduzidos três âmbitos de análise que decorreram em paralelo, ao longo do período de estudo.

Na primeira área de análise, avaliou-se a implementação de uma caixa de expedição circular no circuito logístico entre as lojas e o armazém. Atualmente, este processo consome uma grande quantidade de cartão e plástico, resultando num impacto ambiental significativo. Assim, foi estudado o âmbito de circularidade deste processo por meio de um projeto piloto, utilizando caixas de plástico circular em seis lojas de Portugal, no circuito de abastecimento e devolução. Por fim, foi feito um balanço entre custos e benefícios ambientais da solução obtida e endereçada a necessidade de avaliar a métrica do "preço carbónico" de modo a viabilizar os projetos do âmbito da sustentabilidade.

Na segunda área de análise, identificaram-se oportunidades de sustentabilidade nas lojas e nos centros de apoio técnico (CAT), relacionadas à redução do consumo de papel, desperdícios, custos, e ao aumento da eficiência operacional resultantes das visitas e acompanhamento dos processos. Neste sentido, foram identificadas oportunidades de digitalização de documentos, melhoria da eficiência operacional, redução de desperdícios e reformulação do processo de aquisição de materiais de economato para as lojas. No seguimento destas oportunidades, foram instauradas medidas corretivas e propostas sugestões para a redução das matérias e minimização do impacto ambiental destas operações, apresentando os custos e benefícios.

No último âmbito de análise, realizou-se um estudo para compreender os benefícios ambientais da recolha em loja/pick-up point, de acordo com o modelo de negócio da empresa, de modo a promover a redução do impacto ambiental da entrega ao domicílio e os custos de transporte. A proposta delineada passou pela implementação de uma estratégia de sensibilização dos consumidores que efetuam compras no site online, que objetiva contribuir diretamente para a redução das emissões de carbono e obtenção de benefícios económicos.

Concluindo, este projeto permitiu que as iniciativas desenvolvidas integrassem a cadeia de valor da NOS por meio da implementação de oportunidades de sustentabilidade e sensibilização, resultando numa redução significativa do impacto ambiental das operações. Com as medidas propostas é estimada uma redução anual de 26 toneladas de materiais (papel/cartão, plástico), 69 toneladas de CO_2 e uma alteração de 12 toneladas de papel para a sua versão sustentável.

Palavras-chave: Sustentabilidade, logística, impacto ambiental.

Agradecimentos

À minha orientadora da NOS, Mafalda Alves, por todo o apoio e conhecimento transmitido ao longo do estágio.

A todos os elementos da NOS, pelo apoio que me prestaram durante o estágio na partilha de conhecimento e que contribuíram para o sucesso do projeto.

Ao meu orientador da FEUP, Professor Pedro Amorim, por todos os conselhos e esclarecimentos prestados.

Um agradecimento especial ao meu Pai e Avô, a quem dedico esta tese, que tanto contribuíram para a minha formação e desenvolvimento pessoal.

À minha família e namorada que sempre me apoiaram ao longo desta jornada.

A todos os meus amigos que me acompanharam ao longo do percurso académico.

"The only limit to our realization of tomorrow will be our doubts of today."

Franklin D. Roosevelt

Contents

1	Introduction	1
1.1	Project framework	1
1.2	Company presentation	2
1.3	Aim of the project	3
1.4	Method followed in the project	3
1.5	Dissertation structure	4
2	Background literature	5
2.1	Sustainability	5
2.1.1	Globalisation and e-commerce	7
2.1.2	Circular economy	9
2.2	Logistics	10
2.2.1	Sustainability in logistics	11
2.2.2	Global impact	12
2.3	Environmental impact of pick-up in store	14
3	Problem description and context	17
3.1	Evaluation of a circular shipping box	18
3.1.1	Background	18
3.1.2	Problem	19
3.1.3	Approach	22
3.2	Sustainability opportunities in shops and CATs	26
3.2.1	Background	26
3.2.2	Challenge 1: Digitisation of processes	27
3.2.3	Challenge 2: Process of purchasing stationery	29
3.2.4	Challenge 3: After-sales label printing	30
3.3	Environmental impact of pick-up in store vs delivery to address	31
3.3.1	Background	32
3.3.2	Approach	33
4	Proposed Solutions: Analysis of results and implementations	37
4.1	Analysis of the circularity of the shipping model	37
4.2	Impact of sustainability opportunities identified in shops and CAT	41
4.2.1	Digitisation of processes	41
4.2.2	Process of purchasing stationery	43
4.2.3	After-sales label printing	45
4.3	Analysis of environmental and economic savings with delivery in store/pick-up point	46
5	Conclusions	51

A	Appendix	57
A	Representation of the supply chain and allocation of projects	57
B	Historical analysis of shipments and shop returns	58
C	Pilot questionnaires	63
D	Questionnaire "Consumer Choice - Shipping Method"	64
E	Analysis of pilot project results	67
F	Evaluation of project experience and characteristics of the future box	69
G	Emissions plastic box vs cardboard	72
H	Plastic boxes - Business case	73
I	Sample of orders by carrier platform	73
J	Analysis of the different routes from the distribution platform	74
K	Savings in transport costs with the delivery of orders with the supply of the shops	76

Acronyms and Symbols

KPI	Key Performance Indicator
ESG	Environmental Social and Governance
CAT	Technical Service Centre
SP	Service Provider
BO	Back Office
YTD	Year to Date
SD	Staff Day
ROI	Return of Investment
B2C	Business to Consumer
B2B2C	Business to Business to Consumer

List of Figures

1.1	Constitution of the NOS Group	2
2.1	Dimensions of sustainability. Source: Arena et al. (2009)	6
2.2	Top concerns among millennials and Gen Z. Source: Deloitte (2020)	8
2.3	Circular Economy Model. Source: European Parliament (2015)	9
2.4	Consumer Supply Chain. Source: Lummus et al. (2001)	11
2.5	Greenhouse gas emissions by the economy and GDP, EU, Q3 2019 - Q3 2022 (million tonnes of CO_2 equivalents). Source: Eurostat (February 15, 2023)	13
2.6	Results of delivery to address versus collection in lockers. Source: Saad and Bahadori (2018)	16
2.7	Comparisons of results of the delivery methods. Source: Saad and Bahadori (2018)	16
3.1	Representation of the flow of direct logistics	19
3.2	Representation of the reverse logistics flow of fixed equipment	19
3.3	Volume of consumables used in shipping in the year 2022, in tonnes.	20
3.4	Main consumables category EXP in 2022	20
3.5	Main consumables category OREXP in 2022	21
3.6	Filling used in shipping	21
3.7	Box used in the pilot	24
3.8	Monitoring of the dispatch process.	26
3.9	Distribution of NOS shops in Portugal	27
3.10	Stores with technical support service. Source: NOS SGPS	27
3.11	Current description of the procurement process for stationery	29
3.12	Top 5 most requested materials by shops this year 2023 to date	30
3.13	Area wasted by the label	31
3.14	Analysis of orders sent by the NOS online shop in the last half of 2022	32
3.15	Ranking of factors when choosing the shipping method	34
4.1	Annual emission savings in tonnes and CO_2 for the cardboard and plastic boxes model	40
4.2	Example of the design of the digital document process	42
4.3	Awareness-raising communication made to shops in connection with the purchase of stationery	44
4.4	Problem solving process for printers	45
4.5	Normal collection: Pick-up from shop / Pick-up point	50
4.6	Pick-up from the shop at the NOS DAY option	50
5.1	Analysis of the eliminated/reduced savings in materials and the change of waste source in tonnes	52

A.1 Allocation of projects in the supply chain	57
A.2 Analysis returns and dispatches fixed equipment S2 2022- Part 1	58
A.3 Analysis returns and dispatches fixed equipment S2 2022- Part 2	58
A.4 Analysis returns and dispatches fixed equipment S2 2022- Part 3	59
A.5 Analysis returns and dispatches fixed equipment S2 2022- Part 4	59
A.6 Analysis returns and dispatches fixed equipment S2 2022- Part 5	60
A.7 Shop clusters	61
A.8 Selection of shops for pilot project - Part 1	61
A.9 Selection of shops for pilot project - Part 2	62
A.10 Questionnaire of reception and return of pilot boxes	63
A.11 Dispersion of respondents' ages	64
A.12 Questionnaire "Consumer choice - shipping method	67
A.13 Circularity analysis	67
A.14 Volumetry analysis	67
A.15 Transport costs analysis	68
A.16 Collection of the characteristics of the future box	69
A.17 Feedback questionnaires experiences plastic boxes(retailers)	70
A.18 Feedback questionnaires experiences plastic boxes (warehouse operators)	71
A.19 Calculation of the annual consumption of cardboard boxes and estimate of plastic boxes	72
A.20 Emissions plastic box vs cardboard	72
A.21 Business case	73
A.22 Analysis of the different routes from the distribution platform	75
A.23 Savings in transport costs with the delivery of orders with the supply of the shops	76

List of Tables

3.1	Categories of analysis of dispatches and returns, by shop, for fixed equipment . .	22
3.2	Number of shipments/Number of returns ratio for own shops	22
3.3	N° of boxes shipped / N° of boxes returned ratio for own shops	23
3.4	Matrix analysis of the number of shops based on the frequency of dispatch/return and the number of boxes dispatched/returned	24
3.5	Shops chosen to cover the pilot	24
3.6	List of documents printed in shops	28
3.7	List of documents printed in CATs	29
3.8	Matrix of decision factors in the choice of shipping method	34
4.1	Analysis of circularity pilot project	38
4.2	Optimum volumetry proposed for the future box developed	39
4.3	Cash flow analysis of the two scopes analysed and the balance between them . .	41
4.4	Annual savings in tonnes of printed paper and annual monetary savings	42
4.5	Project payback analysis	43
4.6	Total orders placed in shop and online with delivery to address in Q1 2023	46
4.7	Evaluation of the number of daily shipments per platform	47
4.8	Emissions savings from delivery to address vs. delivery to store/pick-up point . .	48
4.9	Estimated annual emissions saved from in-store/pick-up point delivery	48
4.10	Estimated annual savings with aggregation of orders with shop supply (Total and converted group)	49
A.1	Percentage of orders with delivery to address by platform	73

Chapter 1

Introduction

This introductory chapter attempts to establish the framework and structure of this dissertation by providing a thorough review of the project context and introducing the company in which it was developed. The project's main objective will be explored, along with a comprehensive description of how it was developed. Finally, the thesis' overall structure is presented to provide an overview of the sections and chapters that comprise it.

1.1 Project framework

This document is the result of the dissertation course, which is part of the 2nd semester of the 2nd year of the Master in Production Engineering and Management of the Mechanical Engineering course of the Engineering Faculty of the University of Porto. The project was carried out in the company NOS SGPS, in the department of R&M, technical support, logistics, and terminals management.

Within the scope of sustainability, the operator is committed to contributing to the development of society through innovative products and services. Together with employees, customers, shareholders, suppliers, partners, and government entities, the company wants to explore new opportunities and thus contribute to building a better future for the global community.

The company presents a great wish with the sustainability of our planet that has as its mission the reduction of carbon emissions by -90% compared to 2019. With this, several initiatives have been implemented to contribute to this goal, especially in NOS logistics, a sector that materially impacts sustainability indicators.

Considering into account the factors mentioned above, this project is conceived to boost the company in the field of sustainability, with particular attention to the logistics sector, mainly targeting the activities of the stores and technical service centers (CAT), as well as all the parties involved in these processes. In this sense, the company presents specific challenges related to these areas and stimulates the critical spirit and proactivity of those involved in order to identify new opportunities and solutions in this sector.

1.2 Company presentation

NOS is a portuguese telecommunications company that emerged in 2013 due to the merger of the two largest telecommunications companies in Portugal: ZON and Optimus. In addition to the benefits arising from any merger, including increased competitive capacity and cost reduction, this operation had as its primary foundation the creation of a new group in the sector that allowed it to generate more value for its customers through a consistent focus on the convergence of services and products (Mesquita, 2015). Actually, Miguel Almeida is the CEO of the company.

Currently, NOS has a diversified set of businesses in the telecommunications sector, where it offers Internet, television, voice solutions, and intelligent alarm solutions, both to private customers and companies that want to use these services. In addition, the company is committed to the audiovisual sector and movie theaters, with the distribution of numerous contents and channels as well as cinema exhibitions through the NOS Lusomundo Cinemas (Ferreira, 2013). The most recent developments are related to 5G technology, where the operator presents pioneering projects in Portugal, providing a profound transformation of technology's role in society. The company is a leader in pay television distribution, next-generation broadband, and cinema distribution and exhibition. There are more than 4 million clients in mobile service, 1,5 million in television service, 1,6 in fixed telephone service and 1,2 million in fixed internet service. The constitution of the group is shown in the figure 1.1.

In the field of sustainability, the company is transversally implementing a set of practices to reduce its environmental impact and maximize the benefits it generates for society. To this end, according to the assessment conducted by Moody's ESG Solutions, NOS improved its performance in the dimensions of environment, social, and governance (ESG) compared to 2021 and positioned itself as the fourth company with the best rating in the European telecommunications sector. The operator obtained values higher than the sector average in this assessment, with 70 points in the environment dimension, 70 in social, and 56 in governance (João Santos Pereira, 2023).



Figure 1.1: Constitution of the NOS Group

1.3 Aim of the project

This section presents the project's objective, highlighting the company's commitment to the sustainability of our planet and its mission to reduce carbon gas emissions. As mentioned in the project context, NOS main goal is to achieve a 90% reduction in emissions associated with its operation compared to 2019 levels. In this regard, the company has implemented various initiatives to contribute to this goal and has even been rewarded for this achievement.

NOS recognizes that logistics plays a significant role in sustainability indicators. Therefore, given the size and importance of this sector within the company, adopting the best sustainable practices in this area is essential. Although the company has already carried out some sustainable initiatives in different aspects, more progress has yet to be made so far in the logistics sector. That is why these projects arise, with the purpose of boosting the company in the field of sustainability, especially in the logistics area. Particularly, not much has been done in terms of shops or the CAT (Technical Support Center). In that context, the purpose will be to evaluate the logistical sustainability opportunities in these two universes.

In this sense, the main challenge of this project is to implement sustainability opportunities of a logistical nature in the NOS shops and CAT. Upstream, there will be an analysis of the shipping process to the shop with the evaluation of a circular solution. Downstream, a study of the environmental impact of the sustainability benefit of the "pick-up in store" mode, with the study of customers' behaviour concerning their travel.

1.4 Method followed in the project

The present project, essentially, follows an action research methodology, as this is a real project rather than experimental and artificial studies and focuses on solving real problems. The choice of this methodology proved indispensable for identifying sustainability opportunities in the shops and CAT and for the scope of analysis of the shipping boxes since the project in question required continuous monitoring and a deep understanding of the reality in which the problems occurred. Also, the project has a high level of participation from all stakeholders that have the know-how on the process and is likewise defined by the iterative cycles of data that were gathered in order to analyze, plan, take action, and evaluate the achieved results.

Therefore, the steps followed for the identification of opportunities in shops and CAT were:

1. **Diagnosis:** where the main challenges and their root causes were determined;
2. **Action Planning:** which defines corrective actions and an implementation plan;
3. **Implementation:** to implement the defined measures;
4. **Evaluate:** in order to analyse the action results;
5. **Monitoring:** so that it would be possible to identify general conclusions.

In the scope of the analysis of the topic concerning the evaluation of the benefits of in-store collection, a methodology distinct from action research was chosen, directing the focus towards understanding consumer habits and behaviours and identifying effective strategies to influence them and promote positive changes. Thus, an approach based on behavioural research and consumer psychology was adopted. The main objective was to obtain an in-depth understanding of the factors that influence consumer choice. By analyzing behavioural patterns, individual preferences, and other relevant elements, it was possible to build a detailed picture of consumers' profiles and thus develop tailored strategies to influence their behaviour positively.

1.5 Dissertation structure

This dissertation is structured into five chapters. In the first introductory chapter, a brief presentation of the project and its context is conducted, as is a description of the company at which the project will be developed. Furthermore, the proposed objectives are established, and the methodology adopted to conduct the project is presented.

In the second chapter, a theoretical framework of the most relevant themes made available in the literature that is directly related to the project and the analysis of this dissertation is carried out. This background literature provides a solid theoretical basis for understanding the study's key concepts and theoretical foundations.

In the third chapter, the challenges that will be the subject of analysis in this dissertation project are presented. It starts with a brief overview of the problem context, followed by the presentation of the approach adopted to solve each of the identified challenges. This section is crucial to highlighting the scope and relevance of the issues addressed in this research.

The fourth chapter is dedicated to presenting the main results obtained and proposing solutions or actions that should be taken to address each of the challenges identified at present and in the future.

Finally, the fifth chapter deals with the project's main conclusions.

Chapter 2

Background literature

The background literature presented here aims to analyse the various approaches adopted by companies and researchers regarding sustainability, logistics, globalisation, e-commerce, circular economy and the associated global and environmental impacts.

Due to increased environmental awareness and the need to reduce the impact of human activity on the environment, many companies are adopting increasingly sustainable and environmentally responsible practices. This factor is nowadays key to business development and is seen as an important differentiating factor. This issue is especially important in the logistics sector, given its amplitude and because it is responsible for a large part of the impact on global emissions. Globalisation and e-commerce have made the logistics sector even more complex, requiring innovative and efficient solutions to meet consumer demand while reducing environmental impact. In this perspective, it makes more and more sense to address circular economy themes that emerge as an alternative to maximise the value of resources, minimising waste production and pollution. In particular, this section will also address the environmental impact of pick-up in store delivery and possible solutions to minimise this impact.

2.1 Sustainability

In 1987, according to the World Commission on Environment and Development (WCED), "sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" was formulated as the first concept of sustainability (Imperatives, 1987).

In a broader context, this concept was defined by UCLA Sustainability Committee as "the integration of environmental health, social equity and economic vitality in order to create thriving, healthy, diverse and resilient communities for this generation and generations to come. The practice of sustainability recognizes how these issues are interconnected and requires a systems approach and an acknowledgement of complexity" (Sustainability, 2021).

According to Van Marrewijk and Werre (2003) hundreds more definitions have since been suggested in academic discussions and corporate arenas, alluding to a more humanitarian, ethical, and transparent way of doing business.

The literature often refers to three aspects of sustainability: environmental, social, and economic.

Since this categorisation is so wide, Arena et al. (2009) states that it may not be adequate to operationally assist companies in adopting a specific approach. As a result, this point of view might be expanded with a more extensive examination of the relevant dimensions of environmental, social, and economic sustainability (see Figure 2.1). This would allow companies to concentrate on more particular challenges.

Dimensions of Sustainability		
Environmental	Social	Economic
1. Materials 2. Energy 3. Water 4. Biodiversity 5. Emissions 6. Waste 7. Product and Services 8. Compliance 9. Transport	1. Work Practices 2. Diversity and equal opportunities 3. Relations with community 4. Social policy compliance 5. Consumer health and safety 6. Human rights	1. Economic performance 2. Market presence 3. Indirect economic impacts

Figure 2.1: Dimensions of sustainability. Source: Arena et al. (2009)

At industrial level, sustainability is of great importance because it is a key point for the competitiveness of companies in terms of their strategies, not only because it ends up being a demand from stakeholders, but also because it contributes to issues such as operating efficiency or differentiation from competitors. Pinheiro (2022) states that corporate sustainability refers to the voluntary activities of the company, where social and environmental concerns are included, and these are taken into account in business operations and interactions with stakeholders.

According to Edwards (2003), it is critical that the company assumes a written commitment, as well as the implementation of a continuous improvement policy, pollution prevention, compliance with environmental regulations, implementation and maintenance of an environmental management system, customer commitment and policy publication.

Porter and Van der Linde (1995) warn in their paper "Green and Competitive, Ending the Stalemate" that the deployment of "well-designed environmental initiatives can inspire innovation and decrease the total cost of the product or increase its value". The authors understand that several organizations that have implemented environmental programs have found methods to boost productivity by innovating on production elements and optimizing resource consumption (raw materials and human resources), making investment in environmental concerns a critical component

of their competitiveness. Furthermore, the requirement to comply with environmental rules, particularly those related to pollution, has prompted many companies to measure and monitor their waste, so helping to the discovery and removal of inefficiencies.

It is of utmost importance to conclude with the presentation of the 2030 agenda for sustainable development with the 17 goals defined by the United Nations. The organization confirms that these sustainable development goals "are an urgent call for action by all countries - developed and developing - in a global partnership". They recognize that "ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests" (United Nations, 2016).

2.1.1 Globalisation and e-commerce

The significant economic expansion of recent decades has allowed for considerable improvement in people's quality of life. According to Peterson Institute for International Economics (October, 2022) the term globalisation can be defined as "the growing interdependence of the world's economies, cultures, and populations, brought about by cross-border trade in goods and services, technology, and flows of investment, people, and information".

Tang et al. (2020) notes that globalisation is not just purely an economical phenomenon, it is exhibiting itself on a worldwide level.

Fernandes (2008) argues that this irreversible and inexorable process resulted in a growing unification of markets and aggregation of supply, forcing corporations to reconsider their strategy for acquiring raw materials, manufacturing, and distributing their goods. Unfortunately, this economic boom has resulted in irreversible environmental damage, ecological disasters, global warming, and a loss in accessible natural resources. Concerned by this situation and aware of the planet's difficulties, consumers and non-governmental organizations have intensified the pressure exerted on economic organizations and governments to take significant actions to avert environmental problems and reduce/sustain natural resource usage.

The evolution of generations, technological and financial development, have allowed great advances on a global level but all acts have consequences and one of them is the environmental state to which our world is heading.

However, according to the Deloitte research "Millennial and Gen Z Survey 2021", "Millennials" and "Gen Z" are channeling their energies in order to make a difference on the world, in terms of environmental concerns and political activity (see Figure 2.2). Climate change and environmental preservation are the primary concerns of millennials, according to the report. According to the sample of respondents, 37% of millennials and 40% feel that in the post-pandemic period, more people will want to act in defense of the environment and climate. These improvements will be linked to initiatives for using public transportation and changing eating and shopping habits (Deloitte, 2020)

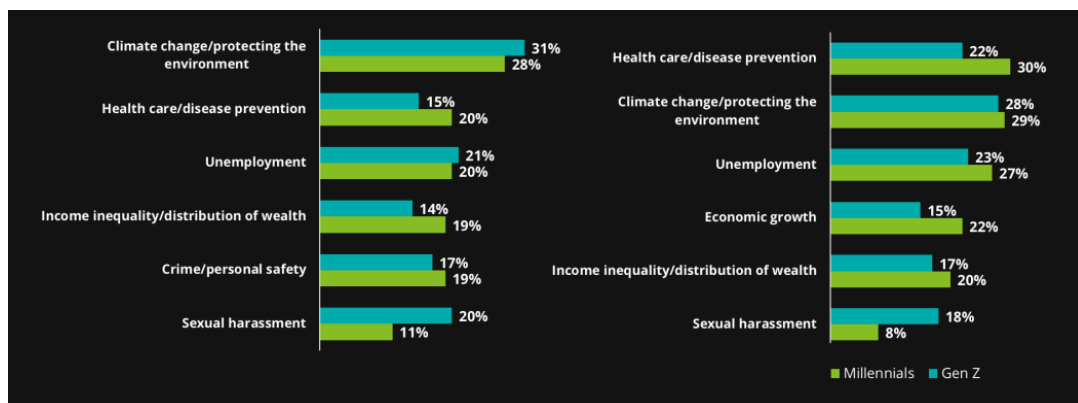


Figure 2.2: Top concerns among millennials and Gen Z. Source: Deloitte (2020)

One of the most significant findings of this survey is that more than a quarter of respondents admit that the environmental effect of companies has a direct influence on their purchase decisions. In addition, 60% of Millennials and Generation Z fear that corporations' commitment to combating climate change may not be a priority (Deloitte, 2020).

The internet had a great influence on society, bringing an easier, faster and more efficient way efficient way for people to communicate and enabled the emergence of e-commerce bringing a challenge in the way of buying and selling over the internet.

Al-Qirim (2006) defines e-commerce as "the use of electronic networks and technologies to conduct commercial transactions, including the exchange of goods and services, the transfer of funds, and the exchange of data". The author highlights that e-commerce entails more than simply online purchasing and selling, but also a variety of activities such as online marketing, customer relationship management, and supply chain management.

E-commerce and globalisation have become intertwined, as advances in technology and transportation have enabled businesses to reach customers beyond their local shops. However, the increasing demand for e-commerce has also raised concerns about its impact on the environment and society.

According to DPD's (Dynamic Parcel Distribution) e-shopper Barometer 2021, approximately 82% of regular online consumers believe that brands must be environmentally responsible, but only half ensure that they buy environmentally friendly products, and only 43% are willing to pay more for environmentally friendly products and services. Based on this report, e-shoppers are becoming more conscious of the importance of sustainability in e-commerce. Around 65% of online customers believe that choosing eco-friendly delivery options is important when purchasing online (DPD, 2021).

According to the document "e-commerce report 2022", made available by the portuguese carrier CTT, "the adoption of concrete sustainability initiatives is already a reality for 75% of respondents". In this study, it is stated that the initiatives with the highest adherence are the use of recyclable packaging and the marketing of sustainable products (65% and 60% of respondents, respectively). Even so, it was possible to conclude that with "the end of the pandemic and the

consequent return of many e-buyers to their usual place of work led to a decrease in the receipt of orders at home (95%, 1.5pp less than the previous year) (CTT Correios de Portugal, 2022).

2.1.2 Circular economy

The circular economy notion has conceptual origins in industrial ecology, which proposes a type of symbiotic relationship between materials and a totally different form of manufacturing processes in companies. Industrial Ecology emphasizes the advantages of recycling waste materials and by-products, such as the formation of intricate inter-linkages (Jacobsen, 2006; Leal, 2015).

Leal (2015) argues that, circular economy is a paradigm of economic growth focused at environmental conservation, pollution prevention, and long-term development. In this approach, resources are used more effectively, reused and recycled where possible, and waste is eliminated to the greatest extent possible.

According to the European Parliament's committee "the circular economy will boost the EU's competitiveness by protecting businesses from resource scarcity and price volatility, helping to create new business opportunities and innovative and more efficient ways of producing and consuming". It is also stated that this strategy allows "keeping added value in products for as long as possible and eliminates waste" (Europeia, 2015).

IAPMEI (Institute of Support to Small and Medium Enterprises and Innovation) believes that this paradigm change will contribute to a more balanced and innovative dynamic between businesses, consumers, and natural resources, decoupling economic growth from nonrenewable resource usage. The Portuguese institution confirms that making the transition to a circular economy necessitates a complete rethink of the manufacturing chain, from design through the conclusion of the product's life cycle (IAPMEI - Agência para a Competitividade e Inovação, 2023).

According to the European Parliament's circular economy model, we can constitute your cycle in 5 stages.



Figure 2.3: Circular Economy Model. Source: European Parliament (2015)

- **1. Design-** with the development of products and services for different life cycles that are both financially viable and environmentally efficient. Product design or redesign which is more durable and uses less resources.
- **2. Production, remanufacturing-** with the implementation of cleaner industrial production processes, limiting the use of toxic substances, promoting efficiency efficiency and identifying new uses for by-products.
- **3. Distribution-** organization of logistics services to share distribution networks, more environmentally friendly forms of transportation, and concerns about using recyclable materials and reducing over-packaging.
- **4. Consumption-** it include extending the life of current materials and goods by sharing, leasing, reusing, repairing, refurbishing, and recycling.
- **5. Re-entry into the cycle-** stimulation of networks for take-back, reuse, remanufacturing, or recycling. Start concentrating on upcycling or downcycling.

2.2 Logistics

Logistics has been increasingly significant in the industrial environment in recent decades. Globalisation, sustainability, market competitiveness, and customer demand for quality products and services are some of the elements driving the study of logistics as a strategic function of the companies.

Council of Logistics Management, in 1991, defined logistics "as the process of efficient and effective planning, implementation and control of the flow and storage of goods services and information, from point of origin to consumption, in order to meet the consumer demands".

However, in 2007, the Council of Supply Chain Management Professional Vitasek (2013) defined logistics management as the part of the supply chain that plans, implements and controls the effective disposal and stock, reverses flow of goods, services and information related to the point of origin and the point of consumption in order to meet service constraints. This definition adds to the preceding by incorporating the reverse movement of products, services, and information.

Although the concepts of supply chain and logistics often appear related, these are different. According to Frazelle (2002) the supply chain consists of the set of facilities, vehicles and information systems information systems that are distributed between the supplier and the client, while logistics encompasses what happens within the chain. Following this differentiation, the author defined the concepts as:

- **Logistics-** the network of entities involved in processes and activities linked together, both upstream and downstream, and which produce value for the the user in the form of products or services;
- **Supply chain** - the system that encompasses the logistics processes, activities and resources required for the supply chain, and is often referred to as the logistics pipeline.

The figure 2.4 shows an example of the flow of information between the different nodes of the supply chain, as well as the flow of direct and reverse logistics between the different entities involved in the logistics process.

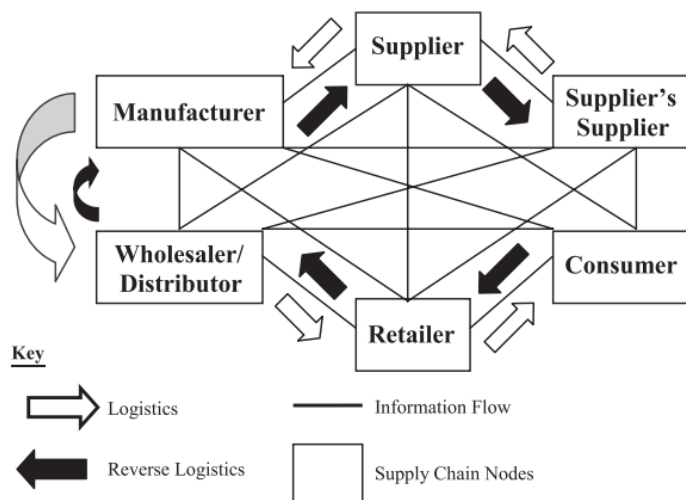


Figure 2.4: Consumer Supply Chain. Source: Lummus et al. (2001)

2.2.1 Sustainability in logistics

When addressing the sustainability in logistics, the concept of "green logistics" emerges inherently. Although traditional logistics and green logistics differ in some points, the latter is considered a crucial factor in the economic and social competitiveness of companies.

Green logistics, according to Wu and Dunn (1995), is an environmentally responsible system that includes the implementation of "forward" logistics procedures such as raw material acquisition, production, packaging and distribution of goods, as well as reverse logistics procedures such as receiving and packaging waste for reuse.

Often associated, sustainable supply chain management (green supply chain management) is a concept that is gaining popularity among researchers, managers, and companies. It demonstrates the need of a strong commitment to addressing economic, social, and environmental challenges.

In the past, companies coordinated their logistics activities, which included freight transport, warehousing, packaging, materials handling, data collection and management, in order to meet customer requirements at the lowest possible cost (Nowakowska-Grunt et al., 2008). Actually, the environment is become a serious worry.

According to Van Hoek (1999) investments in greening may save resources, eliminate waste, and increase production. As a result, green efforts can reduce a company's environmental footprint while increasing efficiency, creating potentially competitive advantages in innovation and operations.

Nowadays, environmentally friendly and more sustainable logistics practices may benefit organizations. Green supply chain management help companies in minimizing the legal, financial,

and reputational concerns that most supply networks face. Customers expect companies to make their best effort to properly source and manufacture their products.

In the present, it is important to have an industry aligned and sensitised with the permissives and principles of sustainability (Geng et al., 2017; Rajeev et al., 2017; Gonçalves, 2018). The authors consider that it is an exceptional indicator that can confer a competitive advantage in the business world, not only because it creates a good image before potential customers (given the demand for this approach by some), but also because the non-adoption of green practices has a great impact on the environment and society, which cannot be neglected by the organisation with the reverse of losing opportunities for improvement and efficiency.

In general, the implementation of green logistics aims to minimise the impact on the environment and consequently reduce the organisation's expenses, such as reducing waste in the production process (Gonçalves, 2018). In a transversal way to the logistic chain, "there are five strategies that allow the reduction of the logistical impact on the environment and greater efficiency in its execution: minimization and transport scheduling; use of efficient packaging; modal shift, modal transfer and careful selection of suppliers. However, for these strategies to generate benefits, companies must insert sustainable activities in their environment" (McKinnon et al., 2015; Fahimnia et al., 2015).

Gonçalves (2018) alerts that the investment to reach such a goal could be high. The author reinforces that "from implementation to practice goes a colossal step, since this logistics has to be very well structured and planned, so that the organisation does not incur in more costs that reduce margin to the organisation. It is important, from the beginning, to define paths and strategies to adopt in line with the principles of Green Logistics". According to Zaman and Shamsuddin (2017), for the implementation of green logistics it is also important to introduce the famous 3 R's: reduce, reuse and recycle.

In a first instance, it seems easy to implement sustainable strategies, where the environment and the company would benefit. Nevertheless, Gonçalves (2018) encourages to look at this process in more detail to conclude that to be sustainable often implies expanding revenues. So, the author considers green logistics to be paradoxical because to be fully sustainable could be necessary to increase the costs. A practical example of this idea is the transport strategy. If the load to be transported is reduced, gas emissions are also reduced. However, this quantity reduction may involve more journeys, which will consequently increase transport costs.

2.2.2 Global impact

The global economy depends heavily on the logistics industry, which contributes significantly to carbon emissions. This sector substantially influences the environment and climate change. Therefore, it is extremely important to give due importance to the emissions generated by the different operations inherent to this sector.

The statistical office of the European Union (Eurostat) presents the most recent data for the last quarter of 2022 of global carbon emissions represented in figure 2.5.

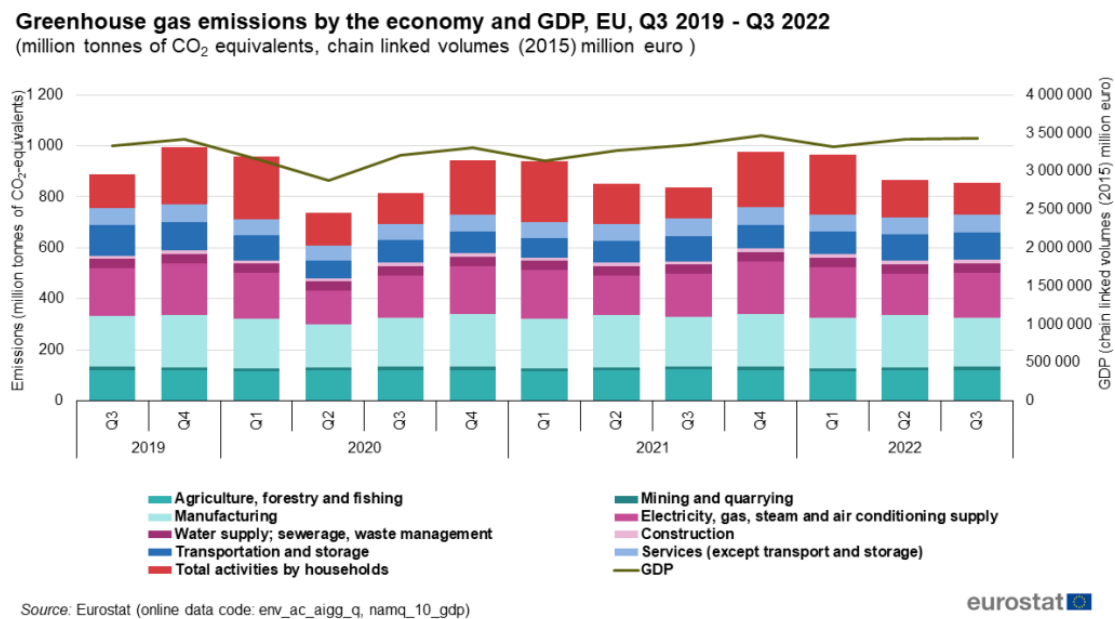


Figure 2.5: Greenhouse gas emissions by the economy and GDP, EU, Q3 2019 - Q3 2022 (million tonnes of CO₂ equivalents). Source: Eurostat (February 15, 2023)

The organisation confirms that the "greenhouse gas emissions in the third quarter of 2022 increased by 2% compared with the same quarter in the previous year. This increase is largely related to the effect of the economic rebound, which can be drawn from the gross domestic product (GDP) development, after the sharp decrease in activity due to the COVID-19 crisis. In fact, compared with the pre-pandemic third quarter of 2019, EU economy greenhouse gas emissions decreased by 4 % (from 889 to 854 million tonnes of CO₂)" (Eurostat, February 15, 2023).

A study conducted by accenture states that 60% of global emissions are the result of supply chains (Accenture, January 6, 2022). This includes emissions from many operations, such as packing, warehousing, and transportation. As e-commerce and worldwide trade expand and the need for logistics and transportation services rises, it is projected that this industry's emissions would rise.

In line with this information, the study referred to above from accenture, reveals the importance of focusing on the scope 3 emissions that correspond to the "indirect upstream and downstream emissions that result from company operations. These are typically over 11 times larger than scope 1 and 2 combined"(Accenture, January 6, 2022).

According to the questionnaire carried out by Fernandes (2008) the companies on their logistics operations, the vast majority (63%) state "transport" as the activity with the greatest responsibility, while purchases and provisioning occupy 23%.

In this sense, it is imperative that companies take into consideration the impact of their operations on the environment and evaluate strategies to reduce them.

2.3 Environmental impact of pick-up in store

As the world becomes increasingly dependent on e-commerce, the importance of reliable and sustainable options has become paramount. Given the wide range of shipping methods available, from address delivery to in-store/pick-up point delivery, consumers have the power to choose how and when their orders are delivered.

The main shipping methods that companies offer when buying online are:

- **Delivery to address:** this method consists of delivering the order to the address indicated by the customer.
- **Pick-up in-store:** contrary to the previous method, with this method the customer chooses to collect his order in a shop. Generally, you are notified when your order arrives at the shop and is ready for collection.
- **Delivery in lockers:** some e-commerce companies offer this option, especially for customers who are unable to receive their order at home or pick-up in shop, allowing collection at the most opportune time.
- **Express delivery:** this method allows the order to be delivered in less than 24 hours. This method has a higher cost.

Although there are several shipping methods available for e-buyers, the options do not have the same environmental impact. However, the cause for concern can be placed in three places: the company that is selling the product, the carrier responsible for the transport or the consumer's conscience.

As mentioned in the chapter 2.1.1, the e-buyer is increasingly aware of the importance of sustainability. This awareness applies equally to the choice of shipping method.

A study conducted by Forbes revealed that "nearly 6 out of 10 consumers are willing to change their purchase behavior to minimize their carbon footprint". It is also reinforced that "when retailers address consumer sustainability concerns, Capgemini Research Institute found that there is a 77% increase in consumer loyalty and a 63% increase in total revenue" (Council, 2022).

In compliance with Lake and Cherrett (2002), although online shopping can reduce trips to the shop by up to 10%, we need to take a close look at the negative environmental impact this can have. The main reasons identified for this concern are:

- The fragmentation of the fulfillment process as a result of consumers making increasingly frequent purchases of relatively modest quantities of items, sometimes from many web-based companies;
- Additional car-based out-of-home activities performed in the time saved by online shopping;
- More transportation is required as a result of missed deliveries, when no one is home, and the return of undesirable products.

Following the need to study the environmental impact of these practices, Edwards et al. (2010) states that "a trip to a brick-and-mortar store via individual transport emits over twenty times more carbon than an average home delivery".

All the findings in the literature up to this point relate to purposeful shopping and the type of means of transport they use. A purposeful trip is understood to be when the only purpose of the trip is to pick-up the order. It is in the use of environmentally friendly modes of transport and the combination of trips (joining several tasks in a single trip, meeting the same route), or on the way to work, that the reduction of the environmental impact can be found. This theme is addressed by author Buijs and Niemeijer (2022), where he states that "the use of a passenger car to visit a pick-up point becomes particularly problematic when this visit is the sole purpose of a customer's trip". In this sense, the author reinforces that in case the customer has a trip and can combine this trip, without additional deviations, to pick-up his order this will mitigate the impact of using the car for collecting.

The majority of early research indicate home delivery to be the worst sustainable option, but collection points and C&C (click and collect at store) can be more environmentally friendly (Visser et al., 2014). Nevertheless, there are additional factors to take into account, including situational considerations, distance to stores/collection points, product category, geographical characteristics (e.g., urban vs. rural region), and vehicle type, all of which influence the environmental effect of each delivery method (Song et al., 2009).

The author Goebel et al. (2012) reveals that the motivation for using order lockers lies in the ability to decide individually when to collect the order, and not primarily in time savings or faster delivery times. So, for pick-up in store, the consumer can choose an individual pick-up time within the opening and closing hours and thus increase the possibilities to plan efficiently his daily schedule and to be able to combine his journeys (Vyt et al., 2022).

The paper "Sustainability evaluation of last mile food delivery: pick-up point using lockers versus home delivery" was also designed to analyse the impact of home delivery vs pick-up point collection, but in the food retail sector in a UK city sector. In this study a city with high population density and where the demand for delivery services is high was used. It is important to mention that the locations, traffic and road conditions are factors that may influence the emissions of these means of transport (Saad and Bahadori, 2018). In this study the two transport models were considered: delivery from the warehouse to the customer's home and delivery at pick-up points.

Using the GURU logistics software, routes were simulated based on customers' homes, the location of the central warehouse and of the collection lockers (Saad and Bahadori, 2018).

Based on these locations, a simulation was carried out for both shipping methods (home delivery versus pick-up point delivery) in order to assess factors such as delivery time, emissions, distance travelled and cost (Saad and Bahadori, 2018). The results obtained are presented in the following Figure 2.6 .

Routes	<i>M</i> (km)	<i>CO</i> ₂ (kg)	<i>T</i> _c (£)	<i>T</i> _t (h)	<i>R</i> _u (%)
R 1	5.93	1.91	11.86	0.20	23
R 2	4.60	1.41	9.21	0.15	13
R 3	4.88	1.47	9.76	0.16	10
R 4	4.81	1.49	9.63	0.16	16
R 5	11.33	3.73	22.66	0.38	27
R 6	5.91	1.87	11.81	0.20	19
R 7	6.50	2.14	12.99	0.22	27
R 8	6.12	1.92	12.24	0.20	18
R 9	7.38	2.51	14.76	0.25	34
Total	57.46	18.45	114.92	1.92	-
Mean	6.38	2.05	12.77	0.21	21

Routes	<i>M</i> (km)	<i>CO</i> ₂ (kg)	<i>T</i> _c (£)	<i>T</i> _t (h)	<i>R</i> _u (%)
Route 1	6.25	2.16	12.51	0.21	37
Route 2	5.87	2.13	11.75	0.20	47
Route 3	5.67	1.92	11.34	0.19	33
Route 4	6.98	2.51	13.95	0.23	45
Route 5	4.33	1.48	8.66	0.14	34
Route 6	3.50	1.04	6.99	0.12	08
Total	32.60	11.24	65.21	1.09	-
Mean	5.43	1.87	10.87	0.18	34

Figure 2.6: Results of delivery to address versus collection in lockers. Source: Saad and Bahadori (2018)

In Figure 2.7, it can be seen that pick-up point delivery showed more satisfactory results in all the factors studied when compared with delivery to the address. It's important to highlight the fact that this study shows a 39% decrease in the carbon emissions of pick-up point delivery when compared to delivery to the address (Saad and Bahadori, 2018).

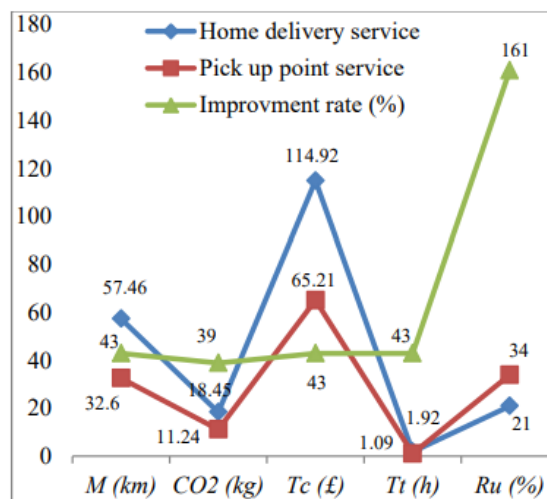


Figure 2.7: Comparisons of results of the delivery methods. Source: Saad and Bahadori (2018)

In general, the literature confirms that delivery to a shop/pick-up point can be more sustainable than home delivery. However, there are points to note when making this assessment. It is considered more sustainable when the trips are not intentional for collection (when the only purpose is not only the collection of the order and no extra routes are taken) or when an ecological means of transport is used (personal car without emissions, on foot, bicycle, ...). It is important to mention, that currently the carriers already present all their routes optimized with some electric vehicles, to minimize their costs but also in sustainable terms. So if it is not possible to combine the trips to pick-up the order or to go in an ecological means of transport, it is preferable that the delivery continues to be made at the customer's home.

Chapter 3

Problem description and context

The critical obstacles recognised and proposed by the company will be addressed in this chapter to provide a clear and detailed understanding of the problems identified.

These challenges are aligned with the strategic importance that it attributes to sustainability as an essential factor for the development of the organisation and the business. In this context, section 3.1 will evaluate the introduction of a circular dispatch box in the supply and returns logistics circuit of the stores, given the current process's impact on the supply chain due to the volume of consumables generated by this movement. In section 3.2, will be indicated the main opportunities in the area of sustainability, identified in the shops and in the CAT, which will contribute not only to waste reduction but also to operational efficiency, cost reduction and the business area as a whole. Additionally, given the theme of the shops, in section 3.3, the impact that in-store collection may have in reducing environmental impact will also be evaluated.

These initiatives have as their primary objective the reduction or elimination of waste generated, making all processes more sustainable and efficient. The integration of these challenges into the company's value chain is fundamental for the promotion of sustainable logistics and the reduction of environmental impact. This approach not only contributes to mitigating adverse environmental effects but can also generate competitive advantages, improve the corporate image and strengthen relationships with stakeholders. The figure A.1 in Appendix A illustrates the visual map of the supply chain and where the main projects fit in.

Each challenge will be fully explained, beginning with a brief study of the context surrounding the problem in question. Understanding the context of each difficulty is critical to comprehend the organisation's difficulties. Therefore, before describing the specific issues, it is crucial to understand the problem's context.

Based on this contextualisation, a description of each identified problem will be shown. The key elements that make up each challenge will be detailed, examining their characteristics, impact and implications in the business context.

Finally, it will outline the strategies used to solve each of these difficulties. A strategic and reasoned action plan will be provided to overcome the identified barriers and achieve positive outcomes for each of the challenges.

3.1 Evaluation of a circular shipping box

This section addresses one of the main challenges posed by the company's logistics process related to the dispatch of material from the warehouse to the shops in the direct and reverse circuits.

The supply of the shops is carried out using cardboard boxes, which require glue tape for their closure and filling to accommodate the equipment. Currently, this process presents a low circularity due to the very short life cycle of the cardboard boxes, which are used only once in the direct and reverse circuits before being discarded. The closing of the boxes requires a significant amount of glue tape, and to ensure that all the equipment arrives in good condition at the shops, it is sometimes necessary to use filling. This practice results in a high volume of consumables generated in the whole process, which implies costs for the company and a high environmental impact.

In order to make this whole process more circular, the possibility of introducing a circular shipping box was studied, with the implementation of a pilot project, to promote circularity in this logistics process and reduce the environmental impact of this movement. The primary data to collect from this analysis were the circularity rate of the model, optimal volumetry to promote price synergies and physical characteristics that the future box should contemplate.

During the implementation of this project, continuous contact was maintained with all the areas involved, from the warehouse to the shops, in order to collect feedback, monitor the process efficiently and keep all the parties coordinated and aligned.

3.1.1 Background

Direct and Reverse Logistics

There are three main macro-flows within the operation: one for the new product, direct logistics, and two for the reception of products coming from reverse logistics.

As mentioned in Chapter 1, NOS has different types of businesses, such as fixed, mobile and, more recently, alarms. Currently, the main volume is concentrated on fixed and mobile. Fixed equipment is defined as equipment that is permanently installed at a location, such as routers, TV boxes and landline telephones. Mobile equipment, as the name suggests, can be carried, such as mobile phones, tablets and headphones. So, depending on the type of business we are dealing with, the logistics process differs in some aspects.

In the case of direct logistics, the business of fixed and mobile is aggregated. Concerning reverse logistics, this will depend on whether it is fixed or mobile equipment. However, this is concentrated on the fixed equipment business, as they are their products, unlike mobile equipment. Figure 3.1 represents the direct logistics flow. This flow integrates the reception of equipment corresponding to the mobile and fixed business, which is then subject to quality control and storage before being dispatched to shops (owned or franchised shops), SPs (Service Providers), or online shopping. Although the flow is the same regardless of the type of equipment, the step entitled "production" only concerns the fixed equipment as this is the only one with the "NOS" brand. In

the case of the shops, the supplies are dispatched on tuesday and thursday and arrive at the shops on wednesday and friday, respectively.



Figure 3.1: Representation of the flow of direct logistics

Regarding the reverse logistics flow, the fixed equipment flow will be presented in Figure 3.2, given its magnitude and that it is the evaluation target of this project. Once the materials have been received, they are subjected to a series of functional tests, and depending on their results, they can be used for one of three possible purposes: visual inspection/refurbishment, slaughter stock and stock reparation.

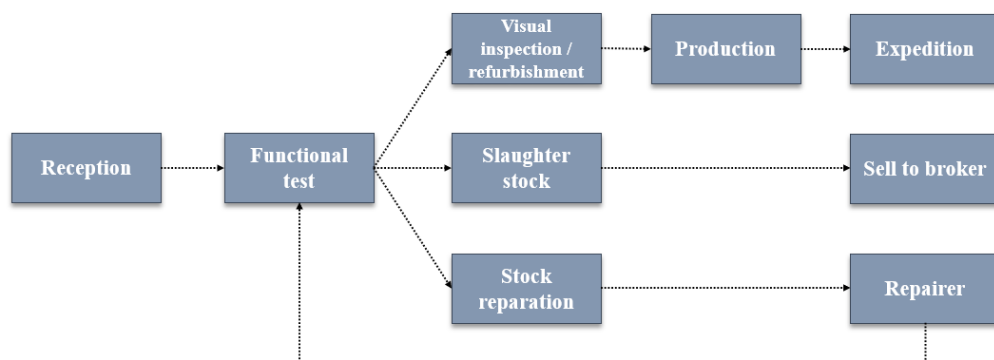


Figure 3.2: Representation of the reverse logistics flow of fixed equipment

3.1.2 Problem

As presented in the previous section, all logistics process flows that take place in the warehouse start with the "reception" of materials and end with their "expedition". The dispatch process is associated with the use of a large quantity of consumables to ensure the needs of the shops and SPs, transport and security.

In 2022, the volume of consumables used in shipments was approximately 104 tonnes. The division of this total is described in the chart shown in Figure 3.3. About 70,4 tonnes (68%) relate to consumables used in shipments to shops and SPs where the equipment for each shipment follows (EXP category). In comparison, 33,2 tonnes (32%) correspond to consumables sent via shipping orders out of the warehouse, SPs and shops, where no equipment follows (OREXP category).

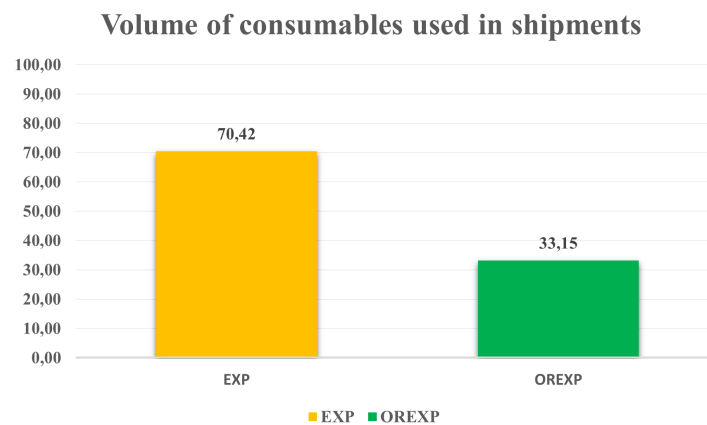


Figure 3.3: Volume of consumables used in shipping in the year 2022, in tonnes.

In the EXP category, the breakdown of the different consumables used is shown in the graph in Figure 3.4.

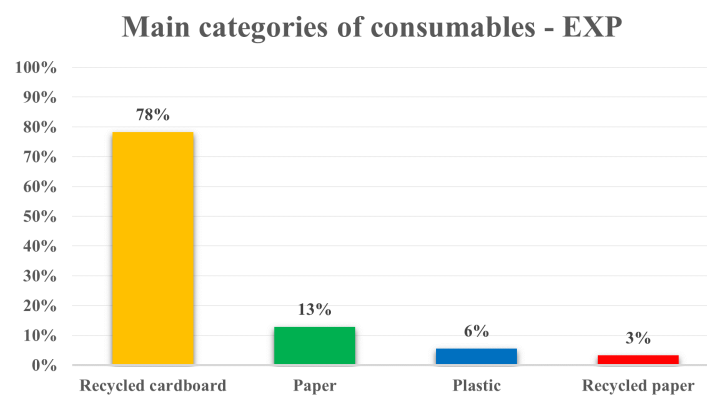


Figure 3.4: Main consumables category EXP in 2022

- **Recycled cardboard (78%)**: Shipping boxes.
- **Paper (13%)**: Labels, tapes, stamps, paper and envelopes.
- **Plastic (6%)**: Packaging, labels, tapes, seals and bags.
- **Recycled paper (3%)**: Paper and envelopes.

In the OREXP category, the breakdown of the different consumables used is shown in the graph in Figure 3.5. The main consumables used are:

- **Recycled cardboard (95%)**: Shipping boxes.
- **Plastic (5%)**: Packaging, labels, tapes, seals and bags.

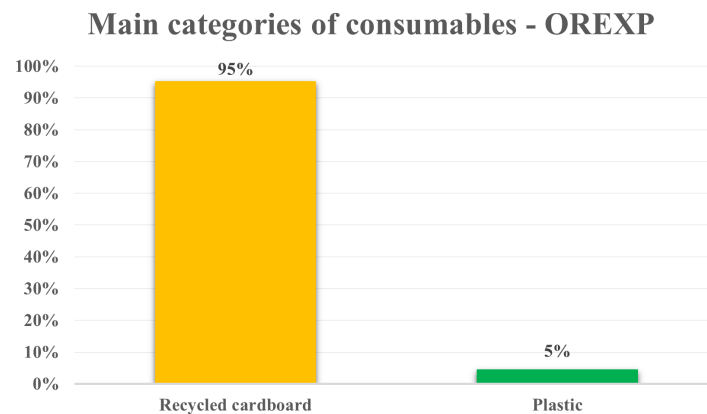


Figure 3.5: Main consumables category OREXP in 2022

When assembling the boxes for shipment, the size of the box is up to the operator handling the shipment. This practice becomes inefficient as a wrong choice generates free space that translates into costs and waste. In terms of sustainability, this process generates a large volume of waste, which makes it unsustainable. The use of disposable cardboard boxes that have only two cycles of use, on average, is one of the main factors contributing to this problem. In addition, the need to close the box and fill it with non-sustainable plastic materials in order to guarantee the integrity of the products during transportation aggravates the problem (see Figure 3.6).



Figure 3.6: Filling used in shipping

In this context, the adoption of circular plastic shipping boxes may represent a sustainable and economical alternative. These boxes are designed to be used during several transportation cycles, associated with the durability and strength of the plastic, which further reduces operating costs and contributes to the chain's sustainability. Given these characteristics, these boxes typically require less filling and their closure is sealed, which guarantees the safety of the transport. However, the evaluation of the dimensions and volumetry of shipments is also a crucial step in optimising transport box costs and reducing the logistics process's environmental impact. When larger boxes than necessary are used, space is wasted, cargo weight is increased, and additional transport and storage costs are incurred. On the other hand, when using smaller than necessary packaging to

transport their products, they risk damaging the products and increasing the boxes needed to meet demand. This can result in additional packaging and transportation costs and increase the logistics process's environmental impact.

In summary, by carefully evaluating the size and volume of shipments, the company can identify the best packaging options for each product type, ensuring that the boxes used are adequate to accommodate the number of products, minimise empty space and reduce the environmental impact of the process.

3.1.3 Approach

In order to make the dispatch process more circular, the approach taken will be to test the circularity of the dispatch boxes. A pilot of circular shipping boxes for the shops was made for this. For this purpose, the shops' dispatch and return history corresponding to the last semester of 2022 will be used. The database contains 164 shops, of which only 62 are own shops, and the rest are partner shops with a history of returns and dispatches of fixed and mobile equipment. However, internally, it was decided that for this pilot, only fixed equipment consignments would be considered for security and equipment value reasons, and it would run only in its own shops, given the ease of contact and monitoring. The initial approach was to collect the following categories, by shop, both for dispatches and returns, for fixed equipment (see Table 3.1). The categories analysed as well as all the tables presented below in the section can be analysed in detail in Appendix B

Table 3.1: Categories of analysis of dispatches and returns, by shop, for fixed equipment

Expeditions	Returns
Nº of shipments / Month	Nº Returns / Month
Average Nº Boxes / Shipping	Average Nº Boxes / Return

After segregating the data by category it was necessary to analyse metrics that would be useful to help decide which shops would be the best ones to choose to test the circularity of the shops.

The first metric analysed was the ratio between the number of dispatches/number of returns. The following table 3.2 shows the results obtained from the ratio, in a segmented manner, and the number of shops corresponding to each segment.

Table 3.2: Number of shipments/Number of returns ratio for own shops

Number of shipments / Number of returns	Nº of Shops	% of shops
N/A	3	5%
<0 %	51	82%
0-100 %	1	2%
100-200 %	0	0%
>200 %	7	11%

The category "N/A" corresponds to shops that have no returns and only shipments. The negative percentage values correspond to shops that have more returns than shipments while the positive values correspond to shops with more shipments than returns.

Based on this data, we can conclude that the overwhelming majority of shops make more returns than shipments. However, within the "<0%" category, the values are more concentrated, with 43 shops, between 1-50% and between 50-100%, with 8 shops.

The second metric to be analysed corresponds to the ratio between the number of boxes dispatched and the number of boxes returned. The following table (see Table 3.3) shows the results obtained in this ratio, in a segmented manner, and the number of shops corresponding to each segment.

Table 3.3: N° of boxes shipped / N° of boxes returned ratio for own shops

N° of boxes shipped / N° of boxes returned	N° of Shops	% of shops
N/A	3	5%
<0%	1	2%
0-100%	27	43%
100-200%	26	42%
>200%	5	8%

The category "N/A" corresponds to shops without boxes returned (with supply material) during the period. Similarly to the interpretation of the segmentation as mentioned earlier, the percentage values below zero show a higher number of returned boxes than shipped boxes, and the opposite happens for the segments with positive percentages, in which the number of shipped boxes is higher than returned ones. According to this analysis, we can conclude that there are more shipped boxes than returned (94%), and the percentage is quite expressive within each segment.

In general, the main conclusion drawn is that there is a higher frequency of returns than shipments. However, the number of shipped boxes is considerably higher than the number of returned boxes. The fact that there are more returns than expeditions can be explained by the need to free up back office space or that the minimum amount of equipment is being returned, which generates a higher frequency. As regards the number of boxes dispatched being higher than the number of boxes returned, it was expectable given the natural needs of this type of business.

In this sense, a matrix was generated in order to combine these two ratios and to understand where the highest concentration of shops was in order to choose the potential ones to house this pilot, which is presented in the table 3.4. Based on this analysis, we can conclude that the most significant quadrants, with 23 and 22 shops, respectively, relate to shops with a percentage of dispatched/returned boxes between 0-100% and 100-200% and with a higher number of returns than shipments. Given that these segments presented the percentage, they were chosen to select shops to host the pilot.

Table 3.4: Matrix analysis of the number of shops based on the frequency of dispatch/return and the number of boxes dispatched/returned

N° of Shops	Number of shipments / Number of returns				
N° of boxes shipped / N° of boxes returned	N/A	<0%	0-100%	100-200%	>200%
N/A	3	0	0	0	0
<0%	0	1	0	0	0
0-100%	0	23	1	0	3
100-200%	0	22	0	0	4
>200%	0	5	0	0	0

In this context, 6 shops were chosen within these segments (see Table 3.5), using the area of each back office (BO) as an extra criterion.

Table 3.5: Shops chosen to cover the pilot

Centre	Shop	BO Area (m^2)
L767	P-TVedras-Arena Shopping	26
L760	P-Aveiro-Glicinias Plaza	14
L755	P-Leiria-Leiria Shopping	37
L086	P-VReal-Nosso Shopping	33
L744	P-Coimbra-Alma Shopping	20
L711	P-Coimbra-Carmo	13

Organisation of pilot project to test circularity

The introduction of this project lasted three weeks, during which the logistical process, both for the dispatch and return of equipment, remained similar, except for one specific modification: the replacement of cardboard boxes with plastic boxes, exclusively for fixed equipment dispatches, and only in the shops selected to test the pilot.

The box chosen to test the circularity model was a plastic box with the dimensions 38 cm x 57 cm x 40 cm, shown in Figure 3.7, which had been used in the past for the exhibition process and was currently unused.



Figure 3.7: Box used in the pilot

It is important to mention that the main goal of this pilot is to test the circularity model rather than specifically if the box is adequate. The organisation and efficient coordination of information played a vital role in the implementation of this pilot. Considering that this is a logistics process, it was essential to communicate to the warehouse all the measures to be followed, as well as to the shops involved.

Regarding the warehouse, providing information about the shops involved in this project was essential. Furthermore, it was necessary to indicate that the boxes used would be plastic for the fixed equipment, specifying how the new packaging would be closed and where the shipping label would be placed to ensure that the transporter would carry out the shipment properly. To do this, it was necessary to test the box to check that the plastic seals would be sufficient to keep the equipment safe during transport and identify an area on the packaging that would allow the transporter to clearly identify the recipient, avoiding any doubt.

In this regard, visits were conducted that allowed for direct observation of shipping and receiving returns activities (see Figure 3.8). This enabled a deeper understanding of the challenges faced by operators during the handling and dispatch of products. It was possible to verify the difficulties encountered in the logistics process, such as delays in preparing orders or problems organising the products. These visits also provided the opportunity to interact with operators and listen to their suggestions and concerns, which enabled a valuable exchange of information to optimise procedures. This direct communication was fundamental to maintain effective monitoring of the project. By receiving updated information from the warehouse, it was possible to evaluate the performance of the logistics process, identify any problems and take corrective action if necessary.

As for the shops, the information provided was mainly related to the reception of the new boxes and instructions to check the state of the equipment's packaging. Ensuring the boxes were received correctly and the equipments was not damaged was extremely important in this context. In the context of the shops, the visits conducted during the receiving and returns process were equally important. These visits allowed us to gain a more detailed understanding of the challenges faced by shopkeepers in receiving and processing customer returns and to gather feedback on the operation. During the entire pilot, in order to monitor the project, questionnaires were conducted in shops after each receipt and return of equipment. These questionnaires made it possible to obtain information on the state of the equipment through detailed descriptions and sending photographs of the boxes. The questionnaires used are presented in Appendix C.

Concluding, the aim was to ensure that everyone involved was in sync and that procedures were clear for each step of the logistics process. Thus, careful organisation and accurate communication of information played a crucial role in the conduct of this pilot. By gathering and organising all relevant information, it was possible to guarantee efficiency and safety in the transportation of the equipment from the warehouse to the shops.



Figure 3.8: Monitoring of the dispatch process.

3.2 Sustainability opportunities in shops and CATs

Through this subtopic, will be carry out an analysis of the main opportunities identified during the periodic visits to shops and technical support centres (CATs) to raise the main sustainability-related problems. One of the challenges that was highlighted is the digitisation of the processes present in the shops, which results in a high volume of paper printed annually. In this context, the transformation of the documents collected into a digital and transparent format will be proposed through the use of technologies that allow the digital signature and the collection of identification documents in a digitised manner.

Within this perspective, opportunities of a more operational nature were also identified, where the main objective is to ally sustainability with operational efficiency and cost reduction. These opportunities involve the review and optimisation of logistics processes, the adoption of more sustainable practices in resource management, as well as the implementation of innovative solutions that may contribute to minimise environmental impact.

3.2.1 Background

Stores

One of the company's primary sales channels is still its shops. NOS has over 150 shops in Portugal (see Figure 3.9). These are the space where they receive the customer should reflect the strategic priorities of NOS, highlighting its products and services. For the different traffic clusters, 3 types of shops were defined: full shops, light shops and base shops. The differences between these categories are essentially the shop construction (full shops have more premium materials and furniture) and product, service and digital solutions experimentation (base shops do not have digital solutions, and experimentation is reduced).

Within the scope of sustainability, various advances were presented, such as the improvement of energy efficiency (e.g. control and monitoring of consumption, replacement of lighting with the led version) and the implementation of some measures to combat waste.

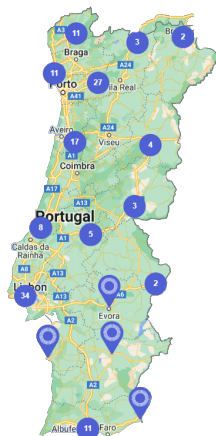


Figure 3.9: Distribution of NOS shops in Portugal

Technical support center - CAT

The scope of this sustainability opportunities assessment project was extended to the after-sales area, in this case the technical support centres, which among other services, offer technical support services to the client.

The technical support service is then available in six stores (see Figure 3.10). NOS provides a specialist support team in stores with a technical support service to help address software problems and assist clients with operating and setting up their equipment. Another characteristic of these stores is the ability to help customers transfer content between devices and with the initial configuration of smartphones. Three of these establishments have official repairers for major manufacturers, allowing for on-the-spot repairs in some situations. Repairs that need more specialist tools or particular brands are then forwarded to an outside repairer. NOS also operates a CAT in Alverca, which does not have a store because it is located within the company’s warehouse.

Store	Avenida da República	Avenida da Boavista	CC La Vie Funchal	Braga - Liberdade	Quarteira	Almada Fórum
Repair?	✓	✓	✓	✗	✗	✗

Figure 3.10: Stores with technical support service. Source: NOS SGPS

3.2.2 Challenge 1: Digitisation of processes

When developing sustainable initiatives, it is critical to have an in-depth understanding of the processes and activities developed in shops and technical support centres (CAT). Only then is it possible to identify opportunities for improvement and implement actions that contribute to the sustainability of the business. A practical and direct approach was taken throughout the project, with periodic visits to shops and CATs to understand the workflow and activities performed in each environment. This strategy allowed the identification of critical points and bottlenecks in

the logistic processes, as well as the observation of opportunities to decrease the environmental impact and improve the efficiency of the processes.

One of the problems identified in these two areas concerns the digitisation of processes. The digitisation of processes is a relevant topic regarding sustainability and efficiency in a company. Technology may be an invaluable ally in optimising operations, lowering costs, and minimising environmental effects. This practice allows for significant reductions in paper consumption and the necessity for printing and storing physical documents, which helps to decrease environmental effect.

Currently, in shops and CATs, there are two different softwares for customer service: Portal 360 and UNI. These softwares are responsible for registering all customer-related processes. However, one of the biggest obstacles to digitisation processes is collecting customer signatures or scanning identification documents. This happens because the UNI software is more recent and was explicitly designed for the shops where most of the processes and documents are contained. On the hybrid tablets available to shopkeepers, it is possible to automatically fill in the customer's details, collect the digital signature on the tablet and take a photo of the customer's ID. With this, everything is automatically entered into the UNI system without the need to print a single sheet. However, there are documents only available in Portal 360, which are not prepared to be operated on hybrid tablets and need to be printed so that the customer can sign them. In addition, it is necessary to scan the customer's identification document manually.

Thus, it was essential to consider the elimination of printed paper in shops and CATs, as this will bring numerous benefits, such as reduced costs and increased efficiency and agility of processes. Therefore, it was necessary to find solutions so all documents could be digitised and signed electronically. The list of documents that are still printed because of the portal 360, in shops and CATs, are presented in the following Tables 3.6 and 3.7, together with the corresponding number of pages and number of annual requests.

Although the implementation of digital solutions to eliminate the use of paper in shops and CATs may seem like a viable and implementable solution, it is important to note that this transition requires a significant financial effort from companies. The adoption of new technologies can be costly, and that may include the acquisition of specialized equipment and software.

Table 3.6: List of documents printed in shops

Document	Nº of sheets	Nº of annual requests
Pedidos de 2ª via de cartão SIM	1	102 286
Declaração de levantamento de equipamentos	1	13 285
Ativação stand alone (fixo) ou pós-pago	1	174 070
Desligamentos	1	32 963
Pagamento a prestações	1	28 603
Documento de furto ou extravio	1	457
Pedido de adesão tarifa social de internet	1	0
Autorização de recolha de dados	1	158

Table 3.7: List of documents printed in CATs

Document	Nº of sheets	Nº of annual requests
Ordem reparação	5	14 091
Troca de equipamentos Fixo em UNI	1	74
Relatório de intervenção	1	14 091
Devolução de equipamentos fixo portal 360	1	56
Ordens de substituição	5	9 487

3.2.3 Challenge 2: Process of purchasing stationery

The second opportunity identified in this research is related to the purchase of stationery for the shops. The current process is described graphically in the figure 3.11.

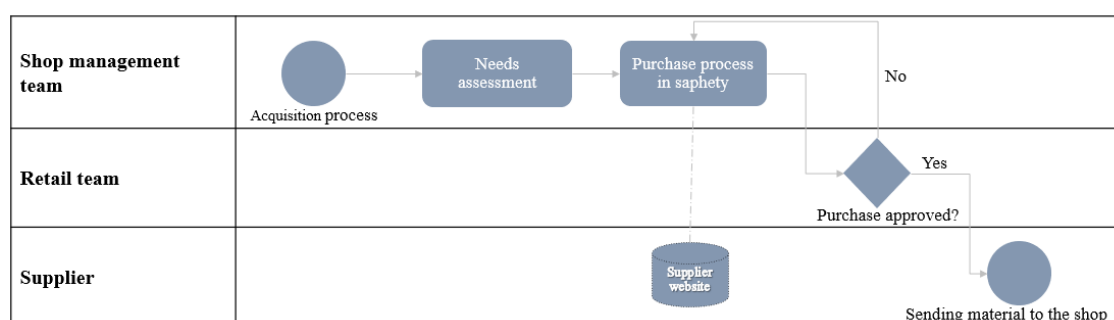


Figure 3.11: Current description of the procurement process for stationery

The process of purchasing stationery is carried out by the shop managers, who are responsible for identifying the specific needs of the respective shop and placing the orders through the Saphety platform. This platform is interconnected to the leading supplier's database, allowing managers to access the available references. If any reference is absent in the platform, it is necessary to go to the supplier's website to obtain the desired reference and make the corresponding order. Once the order is placed on the platform, it is forwarded to the retail team, which has access to the platform, where it is subject to approval, given the cost of the order. If it exceeds 300€, a special authorisation must be requested. However, in this process, there is no effective control over which items can or cannot be purchased and in what quantities. The approval decision is exclusively subject to the retail sector, where the cost factor is the predominant factor in making the decision. This lack of control may result in inconsistencies in inventory management, as well as in the excessive or insufficient acquisition of stationery, generating unnecessary costs and consumption. To maximise this opportunity, it is essential to review the availability of the range of materials, ensuring sustainable versions and carefully monitoring the quantity to be ordered in order to significantly reduce environmental impact. In Figure 3.12 is shown the top 5 most requested materials by shops this year 2023 to date.

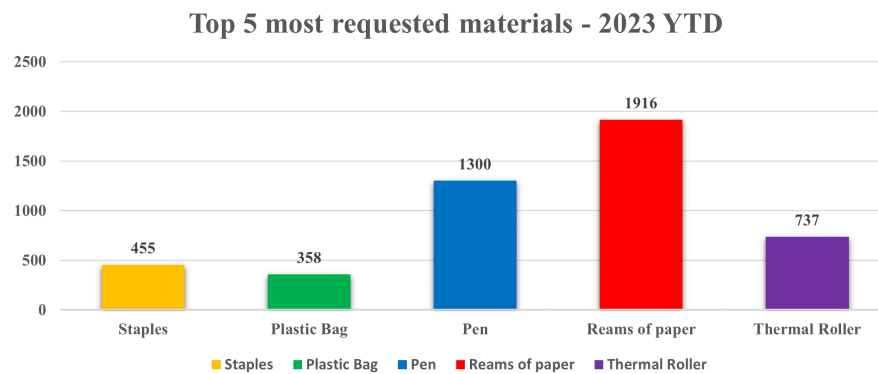


Figure 3.12: Top 5 most requested materials by shops this year 2023 to date

The main problem is the absence of an established contract with the supplier to determine the prices to be charged throughout the period. Currently, prices are based on the information available on the supplier's website, with no prior negotiation or contractual formalisation. This situation implies that prices may vary over time without adequate control by the company. The lack of price predictability compromises financial management and may result in higher costs than necessary.

Although not directly related to the issue of sustainability, the process of purchasing stationery has indirect implications on the use of natural resources and waste generation. The lack of control over which items and quantities can be purchased can lead to unnecessary or excessive purchases, increasing the consumption of plastic, paper and other non-sustainable stationery materials. A more efficient and targeted management would reduce the consumption of these resources, contributing to more sustainable practices within the company.

3.2.4 Challenge 3: After-sales label printing

Within the scope of this study, the last identified challenge related to label printing in the after sales process was analysed and addressed. In the current scenario, when a customer needs to repair a mobile device, it is received by shops with CAT or after-sales services. After registering the process and receiving the equipment, it is placed in a box to be forwarded for repair. In this box, it is necessary to print a label containing relevant information, such as the responsible technical centre, the receiving shop, and the device brand. Ideally, these labels should be printed using a printer for this purpose.

Nevertheless, during visits and direct contact with the processes, it was found that the labels were being printed on A4 paper and then cut and pasted with tape. The main reasons identified for this practice were the breakdown of the label printer or the absence of this equipment in the shops. In the case of a label printer being available, it is important to note that considering the post-sales volume of a given shop, the acquisition of a printer of this type may not be justifiable.

The label in question has 7 cm x 5 cm dimensions, while an A4 sheet measures 21 cm x 29 cm. This discrepancy results in an excessive use of paper, representing an increase of over 1640% in the area used (see Figure 3.13).

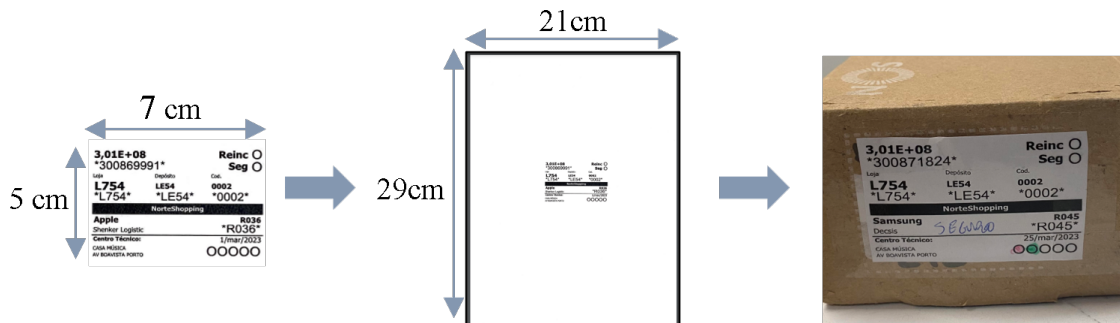


Figure 3.13: Area wasted by the label

The practice of printing the post-sales labels on A4 paper, manually cutting them out and taping them together presents several significant problems. The main problem is that there is considerable paper waste, as the area used to print the labels represents only a tiny fraction of the A4 sheet. In addition, this manual process is time-consuming and inefficient, affecting productivity and the quality of the after-sales process. These issues highlight the need to evaluate more sustainable and efficient alternatives.

In order to solve the problems presented, it is essential to identify possible flaws in the printing process of the label printer that lead to the need to use a conventional printer. Additionally, it is necessary to explore the feasibility of using A5 paper in shops with low post-sales volume, where the purchase of a specialized label printing machine may not be economically justifiable.

3.3 Environmental impact of pick-up in store vs delivery to address

Finally, in this subtopic, we will address the topic of the benefits of in-store collection. From a specific literature review in this sense performed in section 2.3, it was proven the benefit of the pick-up-in-store option when the displacements are not intentional for that purpose or when they are performed through environmentally friendly means of transport. Given this context and considering the company's current business model, it was necessary to assess the sustainable impact of this transition and analyse all associated implications.

Since the end consumer chooses the shipping method, this analysis was centred on the customer itself to understand their motivations and behaviours. Thus, it became possible to identify how this policy could be adopted based on the company's current model, taking into account the interests and needs of consumers. By understanding consumers' motivations and behaviours, the company can adopt appropriate policies that encourage in-store collection as a sustainable option.

Strategies such as effective communication about the environmental benefits of this option, providing clear information about the means of transport used and encouraging eco-friendly practices can help raise awareness and encourage consumers to adopt this alternative

3.3.1 Background

With the rise of e-commerce and the need to reduce carbon emissions, in-store collection has emerged as an increasingly popular alternative to home delivery. This section will evaluate the final consumer's decisions in choosing the shipping method and how the company can encourage them to make more sustainable decisions.

Based on the literature presented in section 2.3, it was found that there is an urgent need to reduce carbon emissions to mitigate climate change. Home delivery, while a convenient option for customers, can significantly impact the environment. Although some transporters are taking steps to make address deliveries more sustainable, the truth is that there is still a long way to go to make this method of shipping truly environmentally friendly. Although some routes can be designed and some transporters may already have electric transports running, this is not a global reality and most deliveries are still made through fossil fuel-powered vehicles. On the other hand, in-store collection can significantly reduce carbon emissions if trips to the shop are unintentional or by an environmentally friendly or zero-emission means of transport. A trip to the shop is considered intentional when the sole purpose of the trip is to pick-up the order. If the customer needs to make a specific journey to get to the shop, the carbon footprint of that journey may offset or even exceed the emissions that an in-store delivery would generate. So, if the customer has a defined weekly route and the shop is meeting that route, then opting for in-store collection may be a more sustainable option. In this case, the trip to the shop would not be additional or purposeful, but rather a stop that would already be planned in the weekly route.

In the universe of NOS online sales, the primary methods that consumers of the online platform used in the last six months of 2022 are presented in Figure 3.14.

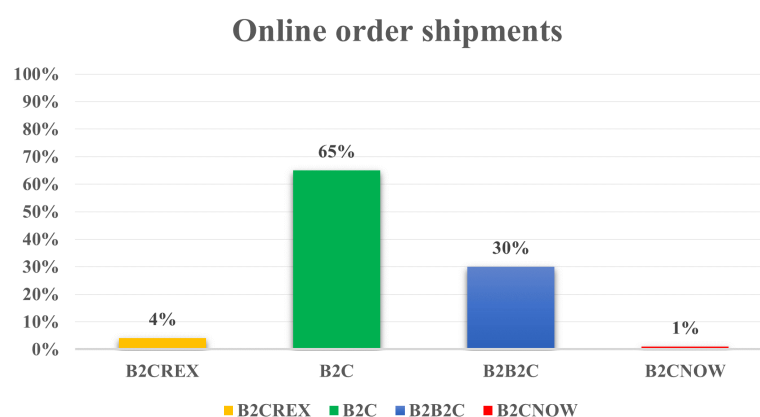


Figure 3.14: Analysis of orders sent by the NOS online shop in the last half of 2022

At the moment, there are 3 shipping methods available online, 1 exceptional method in shop:

- **B2C**: orders made online and sent to the customer's home;
- **B2B2C**: orders placed online for collection in shop;
- **B2CNOW**: orders online and dispatched for collection in shop within 2 hours.
- **B2CREX**: this shipping happens when the customer wishes to purchase a device in shop without stock. In this case, the purchase is made in shop on the online site and can then be picked up.

A common feature of home delivery and shop pick-up is that the shipping cost and delivery time are the same. In these two methods, the shipping cost is free, and the estimated time for delivery is two working days (if not available in the shop).

Considering that the end customer determines the choice of shipping method, it is of utmost importance to understand their motivations and environmental awareness. With this purpose in mind, a questionnaire was applied to identify the main factors influencing the decision of the shipping method, as well as the customers' environmental awareness and willingness to make more sustainable decisions. Through this approach, an in-depth understanding of customers' preferences and attitudes towards environmental issues is sought in order to develop strategies that promote the adoption of more sustainable shipping practices aligned with consumers' environmental concerns.

3.3.2 Approach

The questionnaire, presented in the Appendix D, was designed with questions assessing the importance of speed of delivery, cost of shipping, convenience, availability of delivery options and environmental sustainability in the choice of shipping method. In addition, the questionnaire sought to understand whether consumers are willing to change their decisions to make more sustainable choices, even if this may imply an additional cost or an increase in delivery time. In this section, only the most relevant issues for analysis will be presented.

The questionnaire presented was answered by 64 people aged 18 to 60 with a similar spread of age ranges. (see Figure A.11 on Appendix D).

Firstly, respondents were asked to rank the factors that were most important to them when choosing a shipping method. The main purpose of this question was to match respondents with crucial factors to understand which factors were paramount when choosing a shipping method. The results are presented in Figure 3.15. It is possible to conclude that the vast majority of respondents choose the delivery price as the main factor in choosing the shipping method, with 63%. This is followed in second place by delivery time, in third place by availability to receive the order and in fourth place by convenience. Finally, respondents consider "shipping method with less environmental impact" as the factor that weighs least in their choice of shipping method, with 52% placing this factor in last position.

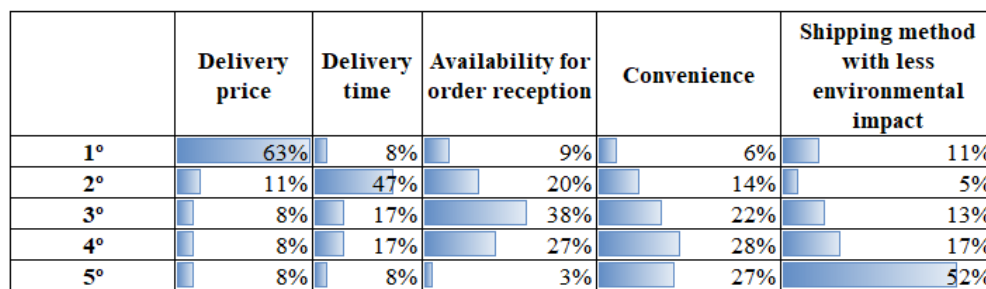


Figure 3.15: Ranking of factors when choosing the shipping method

Following this, there were carefully designed statements to confront two factors influencing the choice of shipping method and statements that were only intended to assess the opinion and environmental awareness of the respondents. The participants responded on a scale of agreement, ranging from "strongly disagree" to "strongly agree". By using this scale, it was possible to measure the participants' degree of agreement or disagreement with the proposed statements, allowing a quantitative analysis of the data collected.

An example of the type of questions used to confront the two factors was: "I am willing to pay more shipping to receive my order sooner". In case the respondent answered that he disagrees, then he values the price over the delivery time. However, if the respondent answered that he agrees, then he prefers the delivery time to the shipping price. Following this logic, questions were then asked to compare the factors of shipping cost, shipping time, convenience and sustainability.

The purpose of these statements was to corroborate the ordering made in the previous question to understand the most important factors when confronted and the environmental awareness in online shopping. These questions can be confirmed in Appendix D.

This way, the conclusions drawn from these questions are presented in the matrix of Table 3.8.

It is possible to verify that the delivery time prevails in the consumer's decision concerning the shipping price, i.e., they are willing to pay more shipping costs to receive their order sooner. Concerning convenience, this prevails over the price of shipping and delivery time, i.e., the customer is willing to wait longer or pay more shipping costs to choose the most convenient shipping method (delivery to address vs pick-up in-store). Finally, respondents are unwilling to pay more shipping costs for sustainable shipping. However, they are willing to wait longer to receive their order if the proposed method is more sustainable.

Table 3.8: Matrix of decision factors in the choice of shipping method

	Shipping costs	Shipping time	Convenience	Sustainability
Shipping costs		Shipping time	Convenience	Shipping costs
Shipping time			Convenience	Sustainability

Furthermore, based on the statements proposed to the respondents, it was possible to conclude that 74% of them consider home delivery to be more convenient than shop pick-up/pick-up point and that 64% choose home delivery whenever they have someone at home to receive it because

otherwise, they would choose shop pick-up. With this, it is possible to conclude that people give exceptional preference to home delivery but always consider whether someone is available at home to receive the order, and so the availability for receipt of the order becomes an important factor in the choice. Linked to this, 60% of these online shoppers say that distancing from the store/pick-up point is a barrier to choosing this shipping method.

Finally, to ascertain respondents' awareness of the most sustainable shipping methods, 66% stated that delivery in-store/pick-up point is more sustainable than delivery to the address. Therefore, it was possible to conclude that although sustainability was the last factor to be considered when shopping online, online shoppers are aware that home delivery is the shipping method with the most significant environmental impact.

Currently, in the company, the model of shipping orders to the shop or to the customer's house has a delivery time of 2 working days. In addition, regardless of the shipping method chosen, shipping costs are free. Given the price and delivery time equivalence between the two methods and the company's current model for sending online orders, the questionnaire was used to assess customer preferences. They were asked which method they would choose, delivery to address or delivery in-store/pick-up point, considering that both the price and the delivery time are the same. Given these conditions, 83% of the respondents chose delivery to an address and 17% chose delivery in a store/pick-up point.

Within this scope, the following questions were constructed using reverse engineering methodology to understand respondents' motivations, habits and levels of environmental awareness in relation to the shipping methods available. As mentioned above, given that the price and delivery time conditions are the same in the company's current model, participants were asked to indicate their preference between delivery to address vs pick-up at store/pick-up point. Based on the answers obtained, respondents were segregated into different questionnaires, allowing for further analysis of the importance of sustainability and the environmental impact of each shipping method, always conducting the questionnaire based on the answers given.

Regardless of the shipping method chosen by respondents, they were asked whether they take sustainability into consideration when making a choice. In the case of the home delivery option, respondents were confronted with information based on the background literature conducted in section 2.3, which indicates that pick-up in store or collection point, when it does not involve an intentional displacement and is carried out by environmentally friendly means of transport, can reduce carbon emissions intensively compared to home delivery. In this context, respondents were asked whether this information would influence their decision change. In meeting this information, respondents were also asked if they had any shop or collection point close to their residence or convenient with their usual commute. These questions were formulated to understand the impact of convenience and availability of these points on the choice of shipping methods, also considering the environmental aspect and the unintentional displacements that are the crucial aspect for reducing emissions.

The main groups of responses presenting relevance for the study, according to the preferred method of submission chosen, were:

Delivery to address

- **33%** of respondents are not willing to change their choice of shipping method when confronted with the environmental impact of this practice.
- **30%** of respondents changed their decision when faced with the environmental impact of this practice and have a shop that coincides with their weekly trips.
- **9%** of the respondents would change their decision when confronted with the environmental impact of this practice however they do not have a shop that coincides with their commute, or do not have a shop nearby.

Collection in store/pick-up point

- **5%** of respondents took sustainability into consideration when making their decision and did not make a purposeful trip to collect the order.
- **3%** of the respondents makes a purposeful trip to collect the order, but when confronted about this practice changed their decision.

Based on the conclusions obtained from the questionnaire, it is possible to identify that 33% of respondents opt for home delivery and, when questioned about the possibility of changing this practice, manifest the intention of maintaining their current decision. Therefore, this group proves to be unyielding as to their choices and, consequently, will be excluded from the scope of intervention. On the other hand, only 5% of the total respondents are adopting the most favourable option, which consists of collecting the product directly from the shop, avoiding purposeful trips and demonstrating full awareness of this sustainable approach.

Finally, the group with conversion potential corresponds to 30% of respondents who choose home delivery but are willing to change this decision and who have a shop close to their weekly commute. It is important to remember that this last factor is primordial, so the environmental impact is less than home delivery. In addition, this group of respondents is also willing to wait longer to have a more sustainable shipping method, and in this sense, strategies can be analysed. Thus, this sample of 30% will be the main focus of our attention, as it presents the most significant possibility of behavioural change, and it will be relevant to carry out an analysis of what would be the savings in terms of carbon emissions if this study group started to pick-up their orders in-store.

In this sense, it is also essential to highlight the importance of assessing and developing the best strategies to raise consumers' awareness of their shipping practices and motivate them to adopt more sustainable decisions. Through the analysis of the questionnaire results and the identification of the group with conversion potential, it becomes possible to direct efforts towards the development of customised strategies, such as awareness campaigns, clear information on the environmental impacts of the different shipping options and incentives to adopt more sustainable practices. By implementing such strategies, significant results are expected to change consumer decisions and encourage behaviour that is more aligned with environmental preservation.

Chapter 4

Proposed Solutions: Analysis of results and implementations

In this section, the detailed analysis of the results obtained and implementation proposals for each of the scopes addressed will be presented.

Section 4.1 will present the main results of the pilot project carried out to test the circularity of the model with the use of circular plastic boxes. The critical analyses performed will be described, such as the circularity rate, the optimal volumetry and the variation of the weight range. Finally, the financial analysis of this implementation, environmental impact of this movement and future proposals will also be highlighted.

In section 4.2, the materialisation of the opportunities identified in CAT will be done, considering their environmental impact and the benefit they can add to the better operation of these centres. For this section, the future implementations the company intends to carry out will be described based on the survey and materialisation of the opportunities.

Finally, in section 4.3, the environmental savings in terms of emissions resulting from in-store/pick-up point delivery will be shown, as well as the monetary savings arising from sending clients' orders to the shop on the days corresponding to the supply. In this sense, the awareness-raising strategies that should be adopted to make online shoppers aware of making more sustainable decisions will be presented.

4.1 Analysis of the circularity of the shipping model

This subsection aims to evaluate the main results obtained from the pilot project of circular shipping boxes to draw inputs for implementing this model throughout the logistics circuit. For this, the results related to the circularity of the shipping model using plastic boxes will be presented, as well as the evaluation of the optimum volumetry and the change in the cost of transport. Moreover, will be evaluated the reduction of carbon emissions arising from the implementation of this model in the logistics circuit, as well as the realization of an economic feasibility study of this implementation in the fixed and mobile equipment business through a business case. Finally, the

considerations that the company must take in the future to give continuity to this project will be presented.

Concerning the circularity analysis of the model, this is evaluated by understanding the number of boxes that were returned and the number of boxes that were shipped (see Equation 4.1).

$$\text{Circularity rate} = \frac{\text{Total returned boxes}}{\text{Total shipped boxes}} \quad (4.1)$$

Through this ratio, it is possible to understand that the model presents total circularity when the number of returned boxes equals the number of shipped boxes. Besides this, this ratio is always equal to or less than one because all returned boxes had to be shipped before. In this pilot, plastic boxes were used exclusively with fixed supply equipment. However, in order not to compromise the logistics process, in case the plastic boxes were insufficient to ensure the equipment's reverse logistics, instructions were given to the shops to return it in cardboard boxes. In this sense, extra cardboard boxes were dispatched for these cases. The circularity analysis of the pilot project can be seen in table 4.1 and in more detail in Appendix E.

Table 4.1: Analysis of circularity pilot project

Centre	N° of boxes shipped (Plastic)	N° of boxes returned (Plastic)	N° of boxes returned (Cardboard)
L767	8	7	2
L760	10	10	14
L755	7	10	6
L086	7	5	4
L744	5	5	4
L711	6	6	3
Total	43	43	33

Circulation rate	57%
Percentage of new boxes in the circuit (cardboard)	43%
Percentage of plastic boxes not returned	0%

Through this analysis, it was possible to verify that the shipping model adopted in the six shops presented a circularity rate of 57%. However, it was found that the rate of returns was significantly higher and did not accompany the number of boxes dispatched. As a result, it was necessary to use cardboard boxes for returns since the number of plastic boxes received was insufficient to meet the demand. Thus, an additional 43% of cardboard boxes were dispatched to meet the return volume. It is possible to verify that these two percentages are complementary since the n° of plastic boxes dispatched was equal to the n° of plastic boxes returned. One of the reasons for this occurrence is related to the feedback provided by the shops, in which they reported that the size of the back offices was too small and there was not enough space to store the equipment and the plastic boxes,

which resulted in frequent returns and the need to resort to cardboard boxes to meet the volume of returns.

Regarding the ideal volumetry of the box, we analysed the volumetry of all shipped and returned boxes. The box used in this pilot project has a volumetry of $86\,649\text{ cm}^3$. It is essential to mention that this box has a significantly larger volumetry than the cardboard boxes used and was used only to test the circularity model. Thus, the volumetry of the boxes was analysed, as well as the fit of the equipment inside them, subtracting the total volumetry of the equipment placed in the box from the volumetry of the empty box. For better interpretation, a scale was developed from 0% to 100%, where 0% indicates that the box was not adjusted to the equipment, and 100% indicates that the equipment was perfectly adjusted to the box. This detailed analysis is presented in Appendix E.

This analysis showed that the volume of discards boxes was considerably reduced and that the boxes contained relatively little material. However, shops were obliged to send them since they did not have enough space in the back office. Therefore, this volumetry was not a good indicator to determine the ideal volumetry. Thus, the volumetry of the shipments had more convincing values, and the adjustment rate was significantly higher. Accordingly, this value became the primary factor for establishing future box volumetry. However, it is essential to point out that this analysis is theoretical, considering that all equipment fits perfectly in the box without empty spaces. After some tests and feedback from the warehouse, it was found that the average box wastage rate, i.e. the rate of free space due to non-correct accommodation of equipment, is about 15%. Therefore, the ideal volumetry will be the value obtained analytically plus this waste rate.

The volumetry is presented in Table 4.2 and in more detail in Appendix E.

Table 4.2: Optimum volumetry proposed for the future box developed

Analytical volumetry (cm^3)	37 013
Optimum volumetry (cm^3)	42 565

In relation to the cost of transportation, the box used is quite robust and dense, which results in a heavier load. This factor is preponderant in the analysis since the weight of the plastic boxes is much higher than that of the cardboard boxes. The box weighs 3.05 kg, while the biggest cardboard box weigh 0.560 kg. After analysing each batch of equipment sent to the shops and returned, and based on the carrier prices charged for each weight range, there was an 8% increase in the cost of transport due to the use of plastic boxes, in shipping and in returns (see Appendix E).

In addition, feedback was obtained from experience with the pilot project, both from warehouse operators and the retailers involved, where the main difficulties during the project were identified and the functional characteristics they consider essential for the future box. The knowledge and contributions of these participants were carefully considered to improve the project. The main features suggested that should be strengthened is the size of the box and its weight. The future box should be foldable/stackable so that it can be stored in shop space and not incur excessive

returns, and it should be light so as not to raise transport costs. This survey can be checked in Appendix F.

To estimate the emissions saved in this movement, it is crucial to understand the emissions associated with producing a cardboard box and a recyclable plastic box. Based on the information obtained in the bibliography, it was found that each tonne of cardboard produced emits 3,31 tonnes of CO_2 . On the other hand, producing a recyclable polypropylene plastic box generates 3,46 tons of CO_2 (Kathy H., 2023). In this way, it was necessary to analyse the annual consumption of cardboard boxes in the supply logistics circuit and estimate the number of plastic boxes that would need to be purchased to introduce into the circuit. The estimation of boxes is presented in the appendix G.

In the initial phase, when introducing plastic boxes in the circuit, it is crucial to consider that the boxes will not be returned immediately after dispatch. Thus, for the project launch, it will be necessary to acquire more boxes to guarantee this contingency. This strategic approach accommodates the initial demands and establishes a solid base for the circular model. Since this is a circularity project, the boxes used have a life expectancy of 2 years. Therefore, in year one of the project, more boxes will be acquired than in the following years because, after the launch of this model, the boxes will naturally circulate. In the years following the project's launch, assuming a scenario where the turnover remains constant, and there is no change in the number of shops, the annual acquisition of new boxes is expected to correspond to 20% of the value assumed for the boxes in year one. This strategy of acquiring boxes over the years guarantees the project's sustainability, as the oldest boxes are replaced by new ones at regular intervals. For the purpose of analysis, the volume of cardboard boxes utilised and the weighted average weight of the different types of boxes used was employed, as well as the estimated number of plastic boxes that would be necessary to implement this model and the weight of 3,05 kg per box, the same as in the pilot project. The analysis of emissions, based on the above mentioned considerations are presented in Figure 4.1. With this analysis it was possible to verify a reduction in the first year of the project of 52,1 tonnes of CO_2 and in the following years a constant saving of 62,6 tonnes of CO_2 .

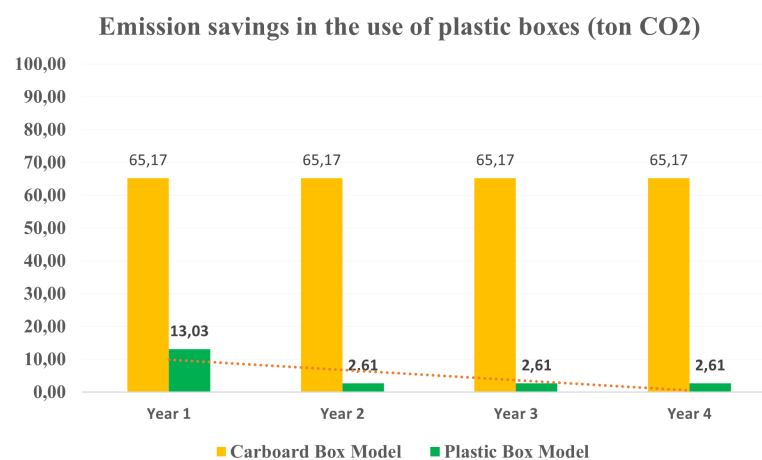


Figure 4.1: Annual emission savings in tonnes and CO_2 for the cardboard and plastic boxes model

Finally, to evaluate the feasibility of implementing this model, a business case was conducted to understand its viability, considering all analyses previously conducted and future assumptions.

In this business case, two scenarios were compared: the "As is" scenario, which represents the current situation with cardboard boxes, and the "To be" scenario, which corresponds to the large-scale implementation of the pilot model, covering all 162 shops, including the fixed and mobile equipment businesses. It was necessary to assume was the cost of the plastic boxes and also assumed for both scenarios that the volume of business was constant throughout the study period. Full details of this analysis are presented in Appendix H.

The cash flow analysis of the two scopes analysed and the balance between them is shown in Table 4.3.

Table 4.3: Cash flow analysis of the two scopes analysed and the balance between them

	Year 1	Year 2
As is	27 600 €	27 600€
To be	59 551 €	32 853€
Balance	-31 951 €	-5 253€

Due to the high annual transportation costs, along with the weight and price of the plastic box compared to the cardboard box, the process feasibility is compromised due to the lower cost of the cardboard boxes and their lighter weight. Through the evaluation of the financial indicators, it was found that the project does not present financial viability both in the ROI (Return on Investment) analysis and in the project's payback period (see Appendix H).

In this sense, the proposal presented to the company was to invest the difference of 31 951€ in the first year, given the project's start-up effort, and 5 235€ in subsequent years in obtaining the benefits of reducing its environmental impact, eliminating 20 tons of cardboard from the circuit, 2,1 tons of plastic and reducing emissions by 114,7 tons. However, for this project to become viable, it is proposed that the company consider a carbon price for sustainability projects. This approach to environmental impact pricing is a way to assign an economic value to sustainable actions, taking into consideration not only the immediate costs but also the long-term benefits to the environment. A study conducted by McKinsey revealed that 28% of companies in Europe already use this internal pricing and it is stated that through it companies can see " how, where, and when their emissions could affect their profit-and-loss (P&L) statements and investment choices" (McKinsey, February 10, 2021). However, there is still no concrete price set by the company, and it is therefore proposed to revisit the project after this evaluation.

4.2 Impact of sustainability opportunities identified in shops and CAT

4.2.1 Digitisation of processes

Based on the challenge presented in section 3.2.2, this section will address the main results regarding the impact of document printing in shops and CAT and the main strategies that can be adopted

to overcome this unsustainable practice.

According to the number of annual requests of the documents referenced in Tables 3.6 and 3.7 in section 3.2.2, respective to the shops and CAT, as well as the number of pages of each one of them, it was possible to evaluate the impact in tonnes of paper that this process generates at the end of the year and the annual monetary savings on printing these documents, which is presented in the following Table 4.4.

Table 4.4: Annual savings in tonnes of printed paper and annual monetary savings

	Annual volume of printed paper (ton)	Annual monetary saving (€)
Stores	1,7	7 040
CAT	0,6	2 700

The possibility of scanning the documents was evaluated, aiming to create an editable field in the signature area of the platform, allowing them to be digitally signed using pen tablets available in the shops. In addition, in cases where it is necessary to prove identification, it would be possible to take a photo of the front and back of the document, automatically associating it with the process (see Figure 4.2). This approach would allow processes to be digital, transparent and more efficient and would eliminate the need for printing.

Figure 4.2: Example of the design of the digital document process

This proposal aims to provide a more agile and sustainable experience, reducing paper consumption and promoting operational efficiency. The implementation of these measures requires the integration of the platform allowing digital signatures and the ability to process and store identification photographs securely. The IT department evaluated the architecture proposal a budget was given on what would be the effort to implement this tool for the 13 processes identified, 8 from shops and 5 from CAT, respectively. The budget given for implementing one process was 47 000 euros and required 125 Staff Days (SDs). After the implementation of the first process, the estimate for the other processes reduces to 86 SDs and 33 000 euros because it assumes the reuse of the photography and marking component, document signature and reuse of services. The payback formulation of the project is presented in the Table 4.5.

Table 4.5: Project payback analysis

Investment cost of the project (€)	Annual valuation (€)	Payback period (years)
443 000	9 740	46

The implementation of this project presents a high cost compared to the annual benefits provided by the digitisation of documents, resulting in a payback period of approximately 45 years, a quite significant value. In this sense, it is up to the company to carefully assess whether the transition is justified in the current terms, i.e. whether the company considers that digitisation and sustainability are worth the investment requested and are aligned with the interests and strategy of the organisation.

Additionally, to help decision-making regarding this project, it was suggested the consideration of the carbon price is suggested. As mentioned above, this metric consists of assigning a specific weight to each project based on its sustainable benefits so that the decision to move forward with a project is not based exclusively on the financial aspect. In this way, decision-making would be more environmentally conscious, considering not only the price in euros but also the positive environmental impact that digitisation can provide.

4.2.2 Process of purchasing stationery

This section presents the proposed solution to solve the problem identified in the purchase of stationery for the shops in order to control costs and adopt more sustainable practices.

In section 3.2.3, a problem was identified in the shops related to the absence of an established contract with a supplier, which resulted in purchases being subject to market fluctuations, a lack of control over the range and quantity of products purchased by shops as well as the revision of the range of materials to a more sustainable version.

In this sense, the actions already implemented to combat some of these challenges and steps that will take place in the future are:

1. Monitoring shop consumption

- **Awareness raising alert for shops:** Notice to shop for good practice in ordering office supplies, the need to reuse office materials and to prioritize the digitisation of documents whenever possible (see Figure 4.3).
- **Order control:** Previously the order control was only done above 300€. Now, any order over will be monitored.
- **Reduction in the number of reams of paper ordered:** It was diagnosed that the average consumption of the shops was 6 reams per month. This consumption amounts to approximately 20 000 euros and 12 tonnes of paper per year. Therefore, a movement was created to reduce 10% of paper orders in the top 20 shops, the equivalent to 1 or 2 reams per shop, which will result in a saving of 0,8 tonnes per year and 1 200 euros.

2. Review of the range of sustainable materials

- **Transition to recycled paper:** Given the amount of paper consumed annually by shops, it became necessary to consider the decision to change the type of paper used to a more sustainable option, recycled paper. In this sense, it was found that the cost of a ream of paper for the shop was significantly higher than the purchase price by the logistics warehouse. Therefore, it was crucial to assess the feasibility of this transition. In the scenario in which the transition to recycled paper was made with the prices practised in the shops, the annual cost would be 16 100 euros, taking into account each shop's consumption volume each year. On the other hand, considering the cost of purchasing the recycled paper that the warehouse can buy, the value would be reduced to 4 500 euros per year. Given this, the proposal presented to the company was to invest 4 500 euros per year in order to make the transition from 12 tonnes of paper per year to the more sustainable version.
- **Change of material range to sustainable version:** The retail team will be in charge of the identification of the materials that can be replaced by sustainable versions, as well as restrict the range of products that can be purchased. This team will be responsible for reviewing the shops' needs in terms of stationery to identify the materials required for daily activities and establish a specification with the essential categories and products.

3. **Purchase of stationery from the warehouse:** After surveying the needs of the material categories identified by the retail team, the proposed solution consisted of shops purchasing office supplies from the logistics warehouse. The warehouse already has an established contract with the supplier, which includes price policies and volumes to be considered annually. By aggregating the shops' purchases, it is possible for them to acquire office supplies at the best price, also benefiting from the cost reduction associated with purchasing in greater volume. Thus, this aggregation would be advantageous for all parties involved.



Figure 4.3: Awareness-raising communication made to shops in connection with the purchase of stationery

Finally, to ensure effective control of the shops' purchases and monitor their performance, the development of a dashboard was proposed. This dashboard will allow the retail team to track the purchases of each shop and their volumes, providing a comprehensive view of the activities and costs involved. Metrics such as "volume consumed per category/activity of the shop" was suggested to assist in the control and analysis of the data. In this way, it will be possible to have complete control over all activities regarding costs and environmental sustainability.

4.2.3 After-sales label printing

This section presents the main findings and proposed solutions to address the paper waste generated by printing after-sales labels.

As mentioned in section 3.2.4, some shops were facing unresolved hardware and software problems in the label printers, leading to the need to print the labels on A4 paper, cut them out and stick them on the equipment repair boxes. To address this issue, a process was developed on the KM company's corporate platform, which conveys relevant information and procedures to the entire organisation. A procedure called "After-sales label printer: The label printer has broken down! What should I do?" on this platform, in which all the steps to be followed by the shops in case of printer breakdown are presented in order to report the situation and enable its repair quickly (see Image 4.4). This procedure aimed to speed up the resolution of problems related to label printing, improving the efficiency and quality of after-sales service.

Novidades > Impressora de etiquetas Pós-venda

Impressora de etiquetas Pós-venda

Em vigor • Publicado a 31 mai 2023 - 14:31 • 89 visualizações

A impressora de etiquetas pós-venda avariou! O que debes fazer?

Se a impressora de etiquetas pós-venda está avariada, debes fazer um RM com o seguinte sintoma:

Sintoma	Hardware Informático - Multifunções / Impressora
Sub-Sintoma	Impressora de etiquetas/bilhetes - Avaria
Âmbito	Se a avaria persiste devem indicar: se não consegue imprimir só de um pc ou se não consegue imprimir de todos os pc's. A impressão sai defeituosa? Anexar um exemplo digitalizado
Descritivo Obrigatório	Serial Number, Marca e Modelo

As lojas que não têm impressora de etiquetas, recomendamos que encomendem folhas A5 para a impressão das etiquetas

Consultar "Retail Management Lojas Próprias | Lojas Corporate e Empresas e Individual e Residencial e Residencial Wireless"

Consultar "Retail Management Lojas Franchising | Lojas Corporate e Empresas e Individual e Residencial e Residencial Wireless"

Figure 4.4: Problem solving process for printers

For shops that do not have a sufficient volume of post-sales to purchase a label printer, it was recommended that they use A5 paper for this purpose. By choosing to print on A5 paper, the wasted area will be reduced by 196% compared to A4 sheets. Based on the total annual post-sales volume, an estimated saving of 38 kg/year of printed paper is expected when transitioning from A4 to A5 printing. This recommendation aims to optimise the use of resources, reducing paper

waste in shops with lower post-sales volume. Furthermore, the cost of a ream of A5 paper is roughly half the price of a ream of A4 paper, and in this sense, we will also be reducing costs. These changes resulted in a significant reduction in the amount of paper printed, promoting more efficient management of resources and minimising environmental impact. The measures adopted enabled an increase in efficiency, and the company made gains both in terms of sustainability and operational performance.

As future work, it was suggested to evaluate the activity per shop that performs these processes in order to verify the feasibility of inserting new printers in establishments that currently do not have them, provided that the annual activity justifies this decision. This way, such shops could count on a more productive and efficient process, and at the same time we would be reducing the environmental impact of this practice. It is important to conduct a careful analysis, taking into account factors such as demand, cost-benefit and environmental aspects, to ensure the proper implementation of printers and maximise positive results for shops and the environment.

4.3 Analysis of environmental and economic savings with delivery in store/pick-up point

Considering the analysis of the questions obtained in the questionnaire presented in section 3.3.2, this section will address the estimated emission savings associated with the shipping method. Taking into consideration that there is one analysis group that opts for home delivery but is willing to change its decision and habits in order to reduce its environmental impact, this group will be the target of the emissions analysis and how their conversion to pick-up in store can be beneficial in terms of environmental impact.

For this purpose, data referring to the first quarter of 2023 were used, corresponding to online purchases with home delivery and in-store purchases with home delivery (see Table 4.6). Based on this data, the emissions generated by each of the methods, the feasibility and the environmental benefits of converting to in-store collection/pick-up point were analysed. The conclusions drawn from this analysis will contribute to a better understanding of the environmental impact of home delivery.

Table 4.6: Total orders placed in shop and online with delivery to address in Q1 2023

	January	February	March	Total
Purchase in shop delivery to address	953	739	1 012	2 704
Online shop delivery to address	2 287	1 957	1 975	6 217

Following the previous approach, it is important to note that regardless of the shipping method chosen, delivery to the address or collection from the store/pick-up point, the steps an order takes until it reaches the end consumer are similar. However, there is a final stage that differs, corresponding to the distribution platform of the carrier responsible, which routes the orders for delivery in shop/pick-up point or to the delivery address. These delivery platforms are scattered all over the

portuguese territory. Therefore, to proceed with the analysis, it was necessary to establish contact with the transporter to obtain access to data regarding the distribution of the platforms throughout the country. Through this data, we identified the main distribution centres that sent a higher number of parcels, which will be used as our analysis sample (see Table A.1 in the Appendix I).

It is important to note that, of the delivery platforms analysed, Lisbon (LIS1, LIS2, LIS3, LIS5), Porto (OPO-Alfena) and Coimbra represent 75% of total orders in the period under analysis, making them the basis for our analysis. Given that the quantity of orders on these platforms is significant, it became necessary to restrict our sample for analysis. In this sense, a statistical study was conducted to verify the average number of parcels shipped daily on each of the platforms, in order to understand the variability of the data. To perform this analysis, it was used the coefficient of variation, which is the ratio between the standard deviation and the average. This statistical measure allows to assess the dispersion of the data and determine the consistency of the quantities of parcels dispatched daily on each platform. Based on the coefficient of variation, it was possible to identify whether the values are close to or far from the average, providing insights into the stability of the distribution operations on each platform. Values up to 50%, the sample presents few fluctuations and is stable. The sample presents significant variations for values between 50% and 100% and is considered variable. For a ratio greater than 100%, the sample presents significant variations and is therefore considered very variable.

The analysis is presented in Table 4.7 and the ratio used to analyse the samples is presented in Equation 4.2.

$$.Coefficient\ of\ variation\ (CV) = \frac{Standard\ Deviation}{Mean} \quad (4.2)$$

Table 4.7: Evaluation of the number of daily shipments per platform

Platform	Average N° of orders/day	Standard deviation	CV	State
Coimbra	9,70	4,69	48%	Stable
LIS1	11,77	6,25	53%	Variable
LIS2	15,44	7,66	50%	Stable
LIS3	22,45	10,39	46%	Stable
LIS5	12,05	6,02	50%	Stable
OPO	45,56	18,24	40%	Stable

In this sense, using the samples chosen previously and based on the number of shipments per day, it was simulated what would be the displacement of the carrier for two possible scenarios:

1. Displacement of the platform to the customer's home following the route of orders.
2. Displacement of the platform to the shop or pick-up point closest to the customer's home.

This simulation was done using the Google Maps tool to check the kilometres covered in each scenario, however, this has some limitations regarding the number of destinations that can be

placed and therefore, a general approach of an example route was made in those cases. In the case of the Alfena platform, given that it supplies more than one district from the same platform, it was necessary to consider two different scenarios. The analysis can be confirmed in Appendix J

According to European Environment Agency (2019), new diesel-fuelled goods vans spend on average between 160 and 161.2 kg CO_2 /km, and in this sense this will be our metric used to calculate the emissions per kilometre travelled.

The analysis is shown in Table 4.8.

Table 4.8: Emissions savings from delivery to address vs. delivery to store/pick-up point

Platform	Platform Route (km)	Platform Store/Pick-up point (km)	Emissions Savings (kg CO_2)
Coimbra	552	504	7,68
LIS1 (Cabo Ruivo)	58,4	44	2,30
LIS2 (São João da Talha)	218	168	8
LIS5 (Cacém)	117	93,8	3,71
LIS3 (Seixal)	164	122	6,72
OPO (Alfena)	180	127	8,48
OPO (Alfena)	531	502	4,64

Average emission savings (Kg CO_2)	5,93
--	-------------

Based on the analyses and considerations presented above, we can conclude that the average carbon emission savings with order collection at the nearest store/pick-up point compared to home delivery for the sample considered is 5.93 kg CO_2 , and considering a total number of orders used in each route, each individual order can save up to 0.66 kg CO_2 .

When analysing the questionnaire in section 3.3, it was found that our focus would be the group representing 30% of the respondents, willing to collect their orders in-store/pick-up point, where the displacement is not done intentionally or through an environmentally friendly means of transport. For this purpose, it was investigated how many emissions could be saved annually if this group of 30% opted for pick-up in store/ pick-up point. To obtain a more precise analysis, several adhesion rates were considered in order to identify the emissions savings in each of these scenarios against the number of parcels that were converted within the universe of the chosen focus group. The analysis is presented in Table 4.9.

Table 4.9: Estimated annual emissions saved from in-store/pick-up point delivery

Conversion success rates	25%	50%	75%	100%
Orders converted	2 676	5 353	8 029	10 705
Emissions saved (ton CO_2)	1,8	3,5	5,3	7,1

Following this analysis, the questionnaire evaluation concluded that the same group, corresponding to 30% of the respondents, are willing not only to collect their orders in shop, but also to wait for an additional period of time to obtain a more sustainable shipping option. Based on this interest, the company decided to study the feasibility of combining online order delivery with shop supply, using this group that is willing to collect in shop, provided the indicated travel conditions are met and that does not mind waiting longer for their order, in favour of more sustainable shipping. Considering that shop supply occurs on wednesdays and fridays, the study focused on understanding the estimated savings in transport costs that the company could achieve if the in-store collection option were adopted. The weight of the shipment determines the price paid by the company to the carrier, that is, the weight of the box or set of boxes destined for a specific location. There are weight scales, where each one corresponds to a specific cost, and the greater the aggregate weight of the shipment, the greater the associated volume discount.

Thus, in the sample for the first quarter of 2023, it was possible to identify the average shipping weight of the supply shipments made on tuesdays and thursdays to the shops of a given locality to be in the shops on wednesdays and fridays. Likewise, the average weight of online orders with home delivery was verified by location and day of the week. Therefore, the strategy adopted consisted of grouping orders from a given locality placed on monday of week N, tuesday until 17:00 of week N and friday of week N-1, to be inserted in the supply that occurs on Tuesdays of week N. The same procedure was performed for the thursday supply of week N, grouping orders placed on wednesday of week N and thursday until 17:00 of week N. In this manner, based on the combination of all this data, it was possible to determine the final average weight per shop in a particular locality and to verify if there was a change in the weight scale, as well as to calculate the cost savings resulting from this grouping of the orders. The analysis is presented on Appendix K.

Assuming the assumptions described above, the following Table 4.10 shows the breakdown of the savings analysed to one year, considering only that 30% (corresponding to our analysis group) of all orders were are customers willing to collect their order from wednesday or friday, depending on the day of the order.

Table 4.10: Estimated annual savings with aggregation of orders with shop supply (Total and converted group)

Total annual savings	44 928,40 €
Total annual savings with orders converted (30%)	13 478,52 €

Given these conclusions, the implementation proposed to the company for the future is to raise customers' awareness at checkout on the company's website. As proven in section 3.3, customers are willing to change their habits when faced with sustainable measures to reduce their emissions and wait longer to have sustainable shipping. In this sense, it is suggested to change the layout of the choice of shipping method as well as the options presented. Accordingly, when the customer chooses the shipping method, he is informed that in-store/pick-up point delivery is the

most sustainable option. In this field, he can choose between delivery at the physical shop (or the pick-up point) closest to his residence, or even that which is in accordance with his displacements. For this, a persuasive sentence is presented to encourage a change of habit and the adoption of more sustainable and conscious decisions (see Figure 4.5). Another option, called "NOS DAYS", will also be presented, in which the customer will have the possibility of choosing between collecting (in a shop) the order from wednesday or from friday , depending on which day you are placing the order, allowing him to make a more sustainable decision and helping the company to also contribute to the reduction of emissions (see Figure 4.6).

In conclusion, both proposed options aim at raising consumer awareness to make more sustainable decisions and adopt better habits in choosing the shipping method.

Agendamento

Agendamento de entrega | Equipamento

☐ Entrega em morada

Rua Nova nº 84,
☒ Igual à morada de faturação
☐ Outra morada

Modo de envio:

☒ Normal (Gratuito)
 Entrega estimada para o dia 07/06/2023

☒ Disponível para levantamento

☒ Recolha em Loja Normal

Loja NOS Fafe - Rua António Saldanha
 Rua Nova nº 84,
[Alterar](#)

Data estimada de entrega:
 07/06/2023

Combina as tuas deslocação e utiliza meios de transporte ecológicos para reduzires as tuas emissões. Estás a poupar 6,6 kg/CO2

☐ Recolha em Loja NOS DAY

Seguinte

Figure 4.5: Normal collection: Pick-up from shop / Pick-up point

Agendamento

Agendamento de entrega | Equipamento

☐ Entrega em morada

Rua Nova nº 84,
☒ Igual à morada de faturação
☐ Outra morada

Modo de envio:

☒ Normal (Gratuito)
 Entrega estimada para o dia 07/06/2023

☒ Disponível para levantamento

☐ Recolha em Loja Normal

☒ Recolha em Loja NOS DAY

Loja NOS Fafe - Rua António Saldanha
 Rua Nova nº 84,
[Alterar](#)

Data estimada de entrega:
 09/06/2023

Ajuda-nos a contribuir com a redução das emissões e levanta a tua encomenda em um dos NOS DAYS disponíveis. Lembra-te de combinar as tuas deslocação e utiliza meios de transporte ecológicos.

Seguinte

Figure 4.6: Pick-up from the shop at the NOS DAY option

Chapter 5

Conclusions

This chapter presents the main conclusions that were drawn while developing this project, where recommendations for future work will also be highlighted. Currently, sustainability plays a crucial role in companies, representing a competitive factor and demonstrating the commitment to reduce emissions related to operations, especially in the logistics sector.

The project had three main challenges: evaluation of a circular solution for shipping boxes, mapping opportunities in shops and CAT, and evaluation of the environmental benefit of pick-up in store.

Concerning the evaluation of a circular solution for shipping boxes, it was verified that the current shipping process to shops, in the direct and reverse logistics circuit, results in high consumption of cardboard and plastic. In this sense, adopting a circular solution emerges as the most sustainable option to reduce the environmental impact of this operation. When analysing the company's current model, it was found that the circularity rate is compromised due to the size of the shops' back office, which results in the dispatch of more boxes to keep up with the reverse frequency, especially considering the volume of returns. Still, a circularity scope was identified for future implementation. However, the implementation of this model requires a cashier solution suited to the company's needs, whose costs are high, thus compromising financial viability. Despite this, it was found that the environmental impact would be considerably reduced, both in terms of material consumption and emissions. In this sense, the main proposal suggested to the company is related to emissions pricing and environmental impact. This way, projects that do not present financial viability could be implemented based on this criterion.

Concerning the opportunities identified in the stores and CAT, in addition to the sustainability and logistics sector opportunities, operational and business opportunities, in general, were also identified that directly impacted reducing environmental impact. The first challenge identified concerns the digitisation of processes, in which there are still printed documents due to the need for the customer's signature. It was found that, although there is a reduction in environmental impact, the financial investment required for this implementation is significant. An operational opportunity was identified in the CAT label printers, where corrective measures were implemented to reduce paper consumption throughout the year. Finally, it was noted that the purchase of office supplies by

shops was not controlled by retail, and there was neither a sustainable range of materials available nor a contract with suppliers that established prices charged during the year. In response, measures were implemented to raise awareness of conscious purchasing by shops by establishing control over what can be purchased. In addition, the retail team will review the product range, focusing on sustainable versions, and the purchase of office supplies will be centralised in the logistics warehouse, which has a contract with suppliers, allowing taking advantage of volume discounts. With these implementation proposals, it will be possible to reduce paper consumption throughout the year considerably, promote the transition to sustainable materials and obtain financial savings.

Concerning the evaluation of the environmental benefit of pick-up in store, it was concluded that there is only reduction potential when the displacements are not purposeful, and an ecological means of transport is used. Since the decision on the shipping method lies with the consumer, the whole analysis focused on the consumer to understand his habits and behaviours. Groups willing to make conscious decisions regarding the shipping method, considering the environmental impact, were identified. In this sense, the savings in terms of carbon emissions with the adoption of this method were determined. To realise this opportunity, awareness-raising actions were suggested on the NOS website during checkout to make customers aware and encourage them to make more sustainable decisions. With the proposals presented, it will be possible to reduce the environmental impact and transport costs, combining the delivery of orders with the supply of the shops.

In conclusion, with all the identified opportunities and the suggestions proposed to the company, it will be possible to obtain annual savings of 23 tons of paper/cardboard, 3 tons of plastic and an estimated reduction of 69 tons of CO_2 . It is also expected to convert 12 tons of paper into its sustainable version (see Figure 5.1). Although some of the suggested opportunities require significant investment and have a distant implementation horizon, most would be feasible considering the pricing of emissions and environmental impact.

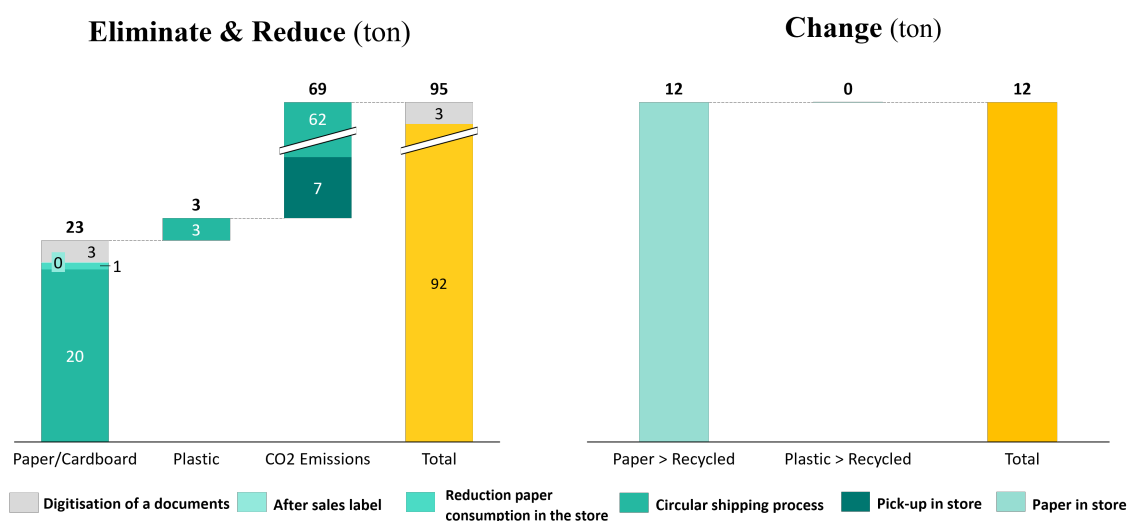


Figure 5.1: Analysis of the eliminated/reduced savings in materials and the change of waste source in tonnes

Bibliography

Accenture. Supply chains: The key to unlocking net-zero emissions. <https://www.accenture.com/ro-en/insights/supply-chain-operations/supply-chains-key-unlocking-net-zero-emissions>, January 6, 2022.

Ali Al-Qirim. E-commerce: Definitions, concepts, and issues. *Journal of Internet Commerce*, 5 (3-4):19–38, 2006.

Marika Arena, Natalia Duque Ciceri, Sergio Terzi, Irene Bengo, Giovanni Azzone, and Marco Garetti. A state-of-the-art of industrial sustainability: definitions, tools and metrics. *International Journal of Product Lifecycle Management*, 4(1-3):207–251, 2009.

Paul Buijs and Rudy Niemeijer. A greener last mile: Reviewing the carbon emission impact of pickup points in last-mile parcel delivery. *Available at SSRN 4169737*, 2022.

Forbes Business Council. How brands can impact consumer decisions about sustainable last-mile delivery, April 2022. URL <https://www.forbes.com/sites/forbesbusinesscouncil/2022/04/05/how-brands-can-impact-consumer-decisions-about-sustainable-last-mile-delivery?sh=18dfd37749b7>.

CTT Correios de Portugal. E-commerce report 2022. https://campanhas.ctt.pt/hubfs/CTT_eCommerceReport_2022.pdf, 2022. [Accessed: April 15, 2023].

Deloitte. The deloitte global millennial survey 2020. 2020.

DPD. eShopper Report 2021 Portugal. https://www.distribuicao hoje.com/wp-content/uploads/sites/2/2022/04/DPD_eShopper_Report_2021_Portugal_PT.pdf, 2021.

Antony John Edwards. *ISO 14001 Environmental certification step by step: Revised Edition*. Elsevier, 2003.

Julia B Edwards, Alan C McKinnon, and Sharon L Cullinane. Comparative analysis of the carbon footprints of conventional and online retailing: A “last mile” perspective. *International Journal of Physical Distribution & Logistics Management*, 40(1/2):103–123, 2010.

European Environment Agency. Average CO₂ emissions from new cars and vans 2019. <https://www.eea.europa.eu/highlights/average-co2-emissions-from-new-cars-vans-2019>, 2019.

European Parliament. Circular economy: The importance of re-using products and materials. <https://www.europarl.europa.eu/news/en/headlines/economy/20150701ST072956/>

- circular-economy-the-importance-of-re-using-products-and-materials, 2015.
- Comissão Europeia. Fechar o ciclo—plano de ação da ue para a economia circular. *Official Journal of the European Union, COM (2015)*, 24, 2015.
- Eurostat. Quarterly greenhouse gas emissions in the eu. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Quarterly_greenhouse_gas_emissions_in_the_EU#Greenhouse_gas_emissions, February 15, 2023.
- Behnam Fahimnia, M Bell, David A Hensher, and Joseph Sarkis. Green logistics and transportation. *Cham: Springer International Publishing*, pages 2–197, 2015.
- Maria Cristina da Silva Fernandes. Logística e sustentabilidade: Análise de casos de estudo e tendências. 2008.
- Jorge Miguel Cunha Ferreira. *Equity Research Zon Optimus Sgps*. PhD thesis, Universidade de Lisboa (Portugal), 2013.
- Edward Frazelle. *Supply chain strategy: the logistics of supply chain management*. MCGraw-Hill Education, 2002.
- Ruoqi Geng, S Afshin Mansouri, and Emel Aktas. The relationship between green supply chain management and performance: A meta-analysis of empirical evidences in asian emerging economies. *International journal of production economics*, 183:245–258, 2017.
- Philipp Goebel, Sabine Moeller, and Richard Pibernik. Paying for convenience: Attractiveness and revenue potential of time-based delivery services. *International Journal of Physical Distribution & Logistics Management*, 42(6):584–606, 2012.
- Sofia Adriana Soares Gonçalves. Identificação das melhores práticas da logística verde aplicadas à indústria automóvel. Master’s thesis, 2018.
- IAPMEI - Agência para a Competitividade e Inovação. Economia Circular. [https://www.iapmei.pt/Paginas/Economia-Circular-\(1\).aspx](https://www.iapmei.pt/Paginas/Economia-Circular-(1).aspx), 2023.
- Strategic Imperatives. Report of the world commission on environment and development: Our common future. *Accessed Feb*, 10:1–300, 1987.
- Noel Brings Jacobsen. Industrial symbiosis in kalundborg, denmark: a quantitative assessment of economic and environmental aspects. *Journal of industrial ecology*, 10(1-2):239–255, 2006.
- Gonçalo Novre João Santos Pereira. Nos é a 4ª telco europeia com melhor classificação esg segundo a moddy’s esg solutions. <https://greensavers.sapo.pt/nos-e-a-4a-telco-europeia-com-melhor-classificacao-esg-segundo-a-moodys-esg-s> 2023.
- Gaurav R. Kathy H. Carbon footprint of cardboard boxes, single & double wall, plastic storage boxes. <https://askwonder.com/research/carbon-footprint-cardboard-boxes-single-double-wall-plastic-storage-boxes-nf5> 2023. February 24, 2017.

- AS Lake and TJ Cherrett. The impact of information and communications technologies on travel and freight distribution patterns: Review and assessment of literature (london: Department for transport), 2002.
- Ângela Isabel Gonçalves da Costa Leal. *O impacto da Economia Circular na cadeia de valor: O contexto das empresas Portuguesas*. PhD thesis, 2015.
- Rhonda R Lummus, Dennis W Krumwiede, and Robert J Vokurka. The relationship of logistics to supply chain management: developing a common industry definition. *Industrial management & data systems*, 101(8):426–432, 2001.
- Alan McKinnon, Michael Browne, Anthony Whiteing, and Maja Piecyk. *Green logistics: Improving the environmental sustainability of logistics*. Kogan Page Publishers, 2015.
- McKinsey. The state of internal carbon pricing. *McKinsey & Company Insights*, February 10, 2021. URL <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/the-state-of-internal-carbon-pricing>.
- José Francisco Lopes Mesquita. *Caso study: a fusão Zon/Optimus*. PhD thesis, 2015.
- Joanna Nowakowska-Grunt et al. Impact of lean management on logistics infrastructure in enterprises. *Advanced logistic systems*, 2(1):71–74, 2008.
- Peterson Institute for International Economics. What is globalization? <https://www.piie.com/microsites/globalization/what-is-globalization>, October, 2022.
- Lúcia Assunção Freitas Pinheiro. *Análise da gestão logística e sustentabilidade numa empresa do setor têxtil*. PhD thesis, 2022.
- Michael Porter and Claas Van der Linde. Green and competitive: ending the stalemate. *The Dynamics of the eco-efficient economy: environmental regulation and competitive advantage*, 33:120–134, 1995.
- A Rajeev, Rupesh K Pati, Sidhartha S Padhi, and Kannan Govindan. Evolution of sustainability in supply chain management: A literature review. *Journal of Cleaner Production*, 162:299–314, 2017.
- Sameh Saad and Ramin Bahadori. Sustainability evaluation of last mile food delivery: Pickup point using lockers versus home delivery. In *International Food Operations and Processing Simulation Workshop, FoodOPS 2018*, pages 37–42. CAL-TEK Srl, 2018.
- Liyang Song, Tom Cherrett, Fraser McLeod, and Wei Guan. Addressing the last mile problem: transport impacts of collection and delivery points. *Transportation research record*, 2097(1): 9–18, 2009.
- UCLA Sustainability. What is sustainability? <https://www.sustain.ucla.edu/what-is-sustainability/>, 2021.
- Sai Tang, Zhuolin Wang, Gengqi Yang, and Wenwen Tang. What are the implications of globalization on sustainability?—a comprehensive study. *Sustainability*, 12(8):3411, 2020.
- United Nations. Sustainable Development Goals. <https://sdgs.un.org/goals>, 2016.

- Remko I Van Hoek. From reversed logistics to green supply chains. *Supply Chain Management: An International Journal*, 4(3):129–135, 1999.
- Marcel Van Marrewijk and Marco Werre. Multiple levels of corporate sustainability. *Journal of Business ethics*, 44(2-3):107–119, 2003.
- Johan Visser, Toshinori Nemoto, and Michael Browne. Home delivery and the impacts on urban freight transport: A review. *Procedia-social and behavioral sciences*, 125:15–27, 2014.
- K Vitasek. Cscmp supply chain management definitions and glossary. *Council of Supply Chain Management Professionals*, 2013.
- Dany Vyt, Magali Jara, Olivier Mevel, Thierry Morvan, and Nélida Morvan. The impact of convenience in a click and collect retail setting: A consumer-based approach. *International Journal of Production Economics*, 248:108491, 2022.
- Haw-Jan Wu and Steven C Dunn. Environmentally responsible logistics systems. *International journal of physical distribution & logistics management*, 1995.
- Khalid Zaman and Sadaf Shamsuddin. Green logistics and national scale economic indicators: Evidence from a panel of selected european countries. *Journal of cleaner production*, 143: 51–63, 2017.

Appendix A

Appendix

Appendix A - Representation of the supply chain and allocation of projects

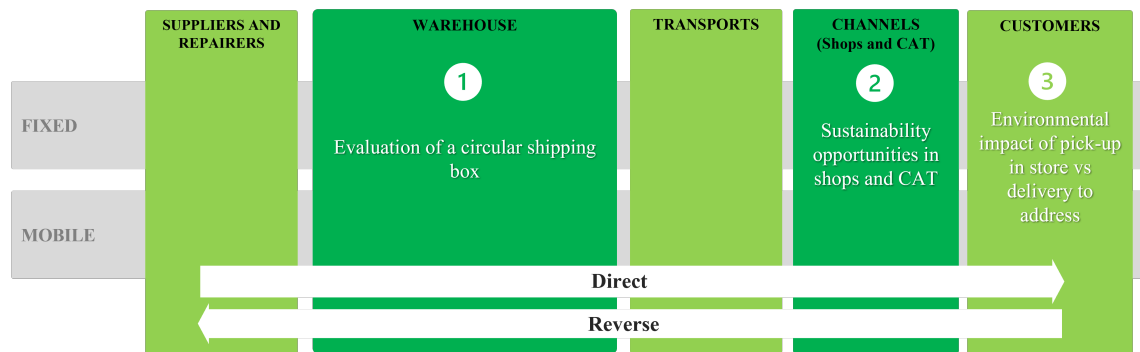


Figure A.1: Allocation of projects in the supply chain

Appendix B - Historical analysis of shipments and shop returns

Tipo de Loja	Centro	Área BO	Nº Caixas Exp. Fixo	Nº Caixas Dev. Fixo	Caixas Expedidas / Devolvidas	Nº Exp. Fix (mês)	Nº Dev. Fix (mês)	Expedições / Devoluções
Outros	3700	0	2	0	N/A	10	15	-35%
Outros	9600	0	3	0	N/A	9	9	-7%
Loja própria	L786	0	0	0	N/A	0	0	N/A
Loja própria	L787	0	0	0	N/A	0	0	N/A
Loja própria	LQ52	0	0	0	N/A	0	0	N/A
Outros	W0K1	0	8	1	650%	0	0	100%
Loja própria	L770	35,4805	11	3	279%	11	20	-44%
Loja própria	L764	36,8563	9	3	266%	12	21	-43%
Loja própria	L735	25,3102	5	2	240%	11	14	-20%
Loja própria	L766	7,6219	8	2	236%	11	20	-43%
Outros	W0C2	0	4	1	198%	11	17	-33%
Outros	W0J7	0	1	1	83%	5	1	314%
Loja própria	L751	55,4237	9	3	209%	9	19	-52%
Loja própria	L763	29,3453	7	3	104%	10	20	-47%
Outros	W090	0	5	2	186%	10	19	-50%
Loja própria	L778	24,7	8	3	189%	13	16	-17%
Loja própria	L768	21,7721	7	3	182%	12	17	-30%
Loja própria	L700	27,8087	3	1	177%	11	19	-45%
Loja própria	L756	38,0886	8	3	171%	12	18	-32%
Loja própria	L761	29,7036	6	2	166%	9	19	-53%
Outros	W0G3	0	2	1	124%	11	7	56%
Loja própria	L711	12,6441	3	1	133%	11	13	-21%
Loja própria	L758	73	8	3	153%	9	19	-53%
Loja própria	L772	17,621	10	4	152%	15	20	-27%
Loja própria	L750	31,08	9	5	76%	11	20	-47%
Loja própria	L754	17,2268	7	3	143%	11	19	-44%
Outros	W0F5	0	3	1	125%	10	6	54%
Outros	W074	0	1	0	N/A	0	0	N/A
Outros	W0D4	0	2	1	116%	11	13	-16%
Loja própria	L769	23,67	8	3	144%	11	20	-47%
Loja própria	L065	22,75	7	3	140%	10	18	-46%
Outros	T030	0	1	1	78%	9	7	21%
Outros	W0J4	0	3	1	122%	9	13	-30%
Loja própria	L032	61	4	2	131%	10	17	-40%
Loja própria	L747	45,65	7	3	139%	12	18	-33%

Figure A.2: Analysis returns and dispatches fixed equipment S2 2022- Part 1

Tipo de Loja	Centro	Área BO	Nº Caixas Exp. Fixo	Nº Caixas Dev. Fixo	Caixas Expedidas / Devolvidas	Nº Exp. Fix (mês)	Nº Dev. Fix (mês)	Expedições / Devoluções
Loja própria	L016	361	2	1	114%	8	11	-21%
Loja própria	L752	19,0425	4	2	119%	10	19	-44%
Outros	T0E2	0	1	1	70%	7	8	-19%
Loja própria	L776	2,85	3	1	113%	8	17	-52%
Outros	W0G7	0	2	1	130%	9	10	-10%
Loja própria	L074	67,6436	5	2	118%	10	13	-23%
Outros	W030	0	2	1	87%	9	15	-40%
Loja própria	L063	33,18	4	2	123%	10	16	-37%
Outros	W0C3	0	2	1	86%	10	12	-14%
Loja própria	L720	24,4036	3	1	110%	9	13	-30%
Loja própria	L777	5,9	2	1	94%	9	14	-35%
Loja própria	L767	25,8414	3	2	96%	12	13	-9%
Loja própria	L753	30,08	7	3	118%	11	18	-41%
Outros	T032	0	1	1	60%	8	7	15%
Loja própria	L069	4,6546	2	1	69%	9	11	-19%
Outros	T038	0	2	1	78%	8	9	-11%
Outros	W0F8	0	1	1	62%	9	7	29%
Loja própria	L780	19,5	4	2	96%	10	15	-37%
Loja própria	L753	26,8201	4	2	101%	9	17	-44%
Outros	W0F1	0	2	1	86%	9	17	-45%
Loja própria	L087	15,5433	2	1	87%	9	13	-32%
Outros	T0G3	0	1	1	54%	7	4	79%
Loja própria	L775	8,5948	4	2	99%	9	20	-53%
Loja própria	L784	15,75	2	1	70%	9	14	-39%
Loja própria	L762	28,6093	4	2	99%	10	19	-46%
Outros	T0H5	0	1	1	71%	7	6	21%
Outros	T0D7	0	2	1	71%	2	4	-48%
Outros	W022	0	1	1	35%	8	11	-30%
Loja própria	L760	14,27	5	3	87%	12	15	-22%
Outros	T045	0	1	1	54%	7	7	10%
Outros	T0A9	0	1	1	65%	7	4	91%
Outros	W092	0	1	0	N/A	1	0	N/A
Loja própria	L755	37,4186	4	2	86%	11	15	-26%
Outros	W011	0	2	1	56%	9	10	-10%
Outros	W091	0	4	2	80%	12	16	-25%
Outros	W018	0	2	1	63%	10	6	69%

Figure A.3: Analysis returns and dispatches fixed equipment S2 2022- Part 2

Tipo de Loja	Centro	Área BD	Nº Caixas Exp. Fixo	Nº Caixas Dev. Fixo	Caixas Expedidas / Devolvidas	Nº Exp. Fix (mês)	Nº Dev. Fix(mês)	Expedições/ Devoluções
Outros	T064	0	1	1	57%	4	2	156%
Loja própria	L046	9,2	2	1	70%	10	10	-2%
Outros	W053	0	1	0	N/A	1	0	N/A
Outros	W0G5	0	3	1	235%	7	1	1367%
Outros	W095	0	1	0	N/A	1	0	N/A
Outros	W0E9	0	2	1	60%	9	15	-42%
Outros	W081	0	2	1	56%	11	9	13%
Outros	T0B3	0	1	1	44%	9	6	56%
Loja própria	L077	44,1742	2	1	181%	11	3	306%
Outros	W056	0	1	0	N/A	0	0	N/A
Outros	T0G6	0	1	1	43%	9	8	22%
Loja própria	L052	4,61	1	1	44%	8	11	-24%
Outros	W0E7	0	2	1	60%	9	12	-23%
Loja própria	L749	56,6275	8	5	83%	12	16	-27%
Outros	T0E1	0	1	1	42%	7	4	83%
Outros	T009	0	1	1	40%	7	5	26%
Outros	T042	0	2	1	51%	9	11	-25%
Outros	W0H4	0	1	1	38%	8	7	14%
Loja própria	L743	9,758	2	1	39%	9	10	-9%
Loja própria	L703	35,6753	4	2	66%	11	13	-18%
Outros	W0J9	0	1	1	21%	2	1	367%
Outros	T0H9	0	1	1	68%	7	4	63%
Outros	W0H6	0	1	1	36%	11	10	5%
Outros	W0F7	0	1	1	32%	7	4	58%
Outros	T0H6	0	1	1	26%	6	4	48%
Outros	W0I3	0	2	1	30%	11	9	17%
Loja própria	L053	1,3387	1	1	51%	8	11	-24%
Outros	T0A2	0	1	1	49%	7	4	71%
Outros	W0J8	0	3	2	48%	7	11	-38%
Loja própria	L709	0	1	1	89%	4	1	500%
Outros	W0J5	0	2	1	38%	9	13	-27%
Loja própria	L086	33	3	2	50%	10	18	-45%
Loja própria	L733	32,8925	2	2	56%	9	12	-23%
Outros	W001	0	2	1	51%	9	5	72%
Outros	W0G4	0	2	1	253%	9	1	700%
Outros	T0C7	0	2	1	41%	9	10	-12%

Figure A.4: Analysis returns and dispatches fixed equipment S2 2022- Part 3

Tipo de Loja	Centro	Área BD	Nº Caixas Exp. Fixo	Nº Caixas Dev. Fixo	Caixas Expedidas / Devolvidas	Nº Exp. Fix (mês)	Nº Dev. Fix(mês)	Expedições/ Devoluções
Outros	T0G2	0	1	1	34%	5	8	-35%
Outros	T0F3	0	1	1	26%	8	8	-2%
Outros	T051	0	2	1	25%	8	7	18%
Loja própria	L744	19,8596	2	2	36%	12	15	-23%
Outros	T091	0	1	1	21%	10	7	41%
Outros	T0H3	0	1	1	19%	9	11	-18%
Loja própria	L051	0	1	1	15%	7	6	26%
Loja própria	L774	255,487	2	2	49%	9	16	-46%
Loja própria	L096	6	3	2	103%	11	1	700%
Outros	W0G8	0	1	1	18%	8	4	96%
Loja própria	L773	7,8067	1	1	133%	7	2	330%
Loja própria	L757	7,0296	2	1	53%	9	12	-26%
Outros	W0B7	0	1	0	N/A	0	0	N/A
Outros	T081	0	2	1	21%	8	5	81%
Outros	T0I1	0	1	1	19%	3	4	-35%
Outros	T0H1	0	1	1	12%	9	10	-10%
Outros	W0C1	0	2	2	34%	11	15	-30%
Outros	W028	0	1	1	9%	8	5	52%
Outros	W0A3	0	2	1	10%	11	11	0%
Outros	W029	0	1	1	9%	9	11	-22%
Outros	W020	0	2	1	22%	8	8	-6%
Outros	T0D2	0	1	1	-7%	7	6	22%
Outros	T088	0	1	1	49%	6	2	217%
Outros	T0D3	0	1	1	-6%	7	5	59%
Outros	W0B5	0	2	1	19%	11	7	52%
Outros	T0F9	0	1	1	-9%	8	14	-42%
Outros	W067	0	1	1	5%	8	10	-19%
Loja própria	L785	5,1	1	1	103%	8	1	463%
Outros	T0F1	0	1	1	17%	6	2	250%
Outros	T0H2	0	2	1	15%	6	3	80%
Outros	W047	0	1	1	44%	5	1	967%
Outros	W0F4	0	3	2	14%	11	10	5%
Outros	T0B4	0	2	2	7%	9	8	13%
Loja própria	L076	1,4	2	2	5%	10	18	-43%
Outros	W0B9	0	1	1	7%	9	5	75%
Outros	W054	0	0	0	N/A	n	n	N/A

Figure A.5: Analysis returns and dispatches fixed equipment S2 2022- Part 4

Tipo de Loja	Centro	Área BO	Nº Caixas Exp. Fixo	Nº Caixas Dev. Fixo	Caixas Expedidas / Devolvidas	Nº Exp. Fix (mês)	Nº Dev. Fix (mês)	Expedições/ Devoluções
Outros	T0G4	0	1	1	-13%	8	6	25%
Outros	w0F6	0	2	2	21%	7	0	1850%
Outros	w0H9	0	1	1	9%	5	0	3100%
Outros	T0G5	0	1	2	-6%	8	10	-17%
Loja própria	L078	7,384	1	1	26%	6	1	850%
Outros	w0J1	0	1	1	10%	5	0	1350%
Outros	T0F7	0	1	2	-16%	10	3	239%
Outros	w0Z1	0	1	1	0%	3	4	-25%
Outros	w0C5	0	1	1	-23%	8	13	-39%
Outros	w0B4	0	0	0	N/A	0	0	N/A
Outros	w0I5	0	2	2	-19%	10	7	45%
Outros	w0Z4	0	1	1	44%	5	1	238%
Loja própria	L028	2,8632	1	1	19%	7	0	2050%
Outros	w073	0	0	0	N/A	0	0	N/A
Outros	w0J6	0	1	2	-33%	7	4	71%
Outros	T0H8	0	1	2	-26%	4	1	257%
Outros	w070	0	0	0	N/A	0	0	N/A
Outros	T065	0	1	1	-4%	5	1	383%
Outros	w0D2	0	2	3	-42%	11	3	256%
Outros	w071	0	0	0	N/A	0	0	N/A
Outros	w0B3	0	0	0	N/A	0	0	N/A
Outros	w0J2	0	1	2	-35%	4	1	243%
Loja própria	L091	0	0	1	-100%	0	0	-100%
Outros	w069	0	1	2	-66%	1	1	67%
Outros	T0F6	0	0	1	-100%	0	1	-100%

Figure A.6: Analysis returns and dispatches fixed equipment S2 2022- Part 5

Totalidade Lojas			Lojas Próprias		
Caixas Expedições/Devoluções	N° Lojas	% Lojas	Caixas Expedições/Devoluções	N° Lojas	% Lojas
N/A	17	10%	N/A	3	4,84%
<0%	16	10%	<0%	1	1,61%
0-100%	94	56%	0-100%	27	43,55%
100-200%	33	20%	100-200%	26	41,94%
>200%	8	5%	>200%	5	8,06%
Expedições/Devoluções	N° Lojas	% Lojas	Expedições/Devoluções	N° Lojas	% Lojas
N/A	15	9%	N/A	3	5%
<0%	87	52%	<0%	51	82%
0-100%	41	24%	0-100%	1	2%
100-200%	2	1%	100-200%	0	0%
>200%	23	14%	>200%	7	11%
N° lojas próprias			frequência direta vs. Inversa		
tx de caixas exp vs. Inversa	N/A	<0%	0-100%	100-200%	>200%
N/A	3	0	0	0	0
<0%	0	1	0	0	0
0-100%	0	23	1	0	3
100-200%	0	22	0	0	4
>200%	0	5	0	0	0
Percentual de lojas			frequência direta vs. Inversa		
tx de caixas exp vs. Inversa	N/A	<0%	0-100%	100-200%	>200%
N/A	5%	0%	0%	0%	0%
<0%	0%	2%	0%	0%	0%
0-100%	0%	37%	2%	0%	5%
100-200%	0%	35%	0%	0%	6%
>200%	0%	8%	0%	0%	0%
N° lojas piloto			frequência direta vs. Inversa		
tx de caixas exp vs. Inversa	N/A	<0%	0-100%	100-200%	>200%
N/A	0,3	0,0	0,0	0,0	0,0
<0%	0,0	0,1	0,0	0,0	0,0
0-100%	0,0	2,2	0,1	0,0	0,3
100-200%	0,0	2,1	0,0	0,0	0,4
>200%	0,0	0,5	0,0	0,0	0,0

Figure A.7: Shop clusters

0%-100% <0%										
(valor por expedição/mês)										
Tipo de Loja	Centro	Nome Loja	Área BO	N° Caixas Exp. Fixo	N° Caixas Dev. Fixo	Caixas Expedidas / Devoluções	N° Exp. Fix (mês)	N° Dev. Fix(mês)	Expedições/Devoluções	Deadpool
Loja própria	L777	P-Beja-Continente	5,9	2	1	94%	9	14	-35%	
Loja própria	L787	P-Tvedas-Arena Shopping	25,844	3	2	98%	12	13	-9%	
Loja própria	L069	P-Guarda-La Vie Guarda	4,6546	2	1	63%	9	11	-19%	
Loja própria	L780	P-Vicente-Enteao/Viana	18,6	4	2	98%	10	15	-32%	Afetado
Loja própria	L087	P-Evora-JoachimAguilar	15,5433	2	1	87%	9	13	-32%	
Loja própria	L775	P-Portimao-Aqua Portimao	8,5948	4	2	98%	9	20	-53%	Afetado
Loja própria	L784	P-Braga-Nova Arcada	15,75	2	1	70%	9	14	-39%	Afetado
Loja própria	L782	P-Faro-Forum Algarve	20,6893	4	2	99%	10	19	-46%	Afetado
Loja própria	L780	P-Aveiro-Gilviana Plaza	14,27	5	3	87%	12	15	-22%	
Loja própria	L755	P-Letitia-LetitiaShopping	37,4188	4	2	86%	11	15	-28%	
Loja própria	L046	P-Braganca-Braganca Shopping	9,2	2	1	70%	10	10	-2%	
Loja própria	L052	P-Covilha-Serra Shopping	4,61	1	1	44%	8	11	-24%	
Loja própria	L748	P-Lisboa-Colombo	56,6376	8	5	83%	12	16	-27%	Afetado
Loja própria	L743	P-Guimarães-Espaco Guimarães	9,758	2	1	38%	9	10	-9%	Afetado
Loja própria	L703	P-Lisboa-Amoreiras	35,6759	4	2	68%	11	13	-18%	Afetado
Loja própria	L059	P-CBranco-Forum Castelo Branco	1,3387	1	1	50%	8	11	-24%	
Loja própria	L088	P-VilaReal-Nosso Shopping	33	3	2	50%	10	18	-45%	
Loja própria	L733	P-Quarteira-CarlosPiñero	32,8305	2	2	50%	9	12	-25%	Afetado
Loja própria	L744	P-Coimbra-Alma Shopping	19,8596	2	2	36%	12	15	-23%	
Loja própria	L774	P-Porto-Boavista	255,487	2	2	48%	9	16	-46%	Afetado
Loja própria	L757	P-Porto-Via Catarina	7,0296	2	1	53%	9	12	-28%	Afetado
Loja própria	L076	P-Portalegre-Continente	14	2	2	5%	10	18	-43%	

Figure A.8: Selection of shops for pilot project - Part 1

100-200% / <0% (valor por expedição)										
Tipo de Loja	Centro	Nome Loja	Área BD	Nº Caixas Exp. Fixo	Nº Caixas Dev. Fixo	Caixas Expedidas / Devolvidas	Nº Exp. Fix (mês)	Nº Dev. Fix (mês)	Expedições / Devoluções	Deadpool
Loja prc L763		P-Seixal-Rio Sul	29,3453	7	3	192%	12	20	-39%	
Loja prc L778		P-Deiras-Deiras Parque	24,7	8	3	189%	13	16	-17%	Afetado
Loja prc L768		P-Loures-LoureShopping	21,7721	7	3	182%	12	17	-30%	Afetado
Loja prc L700		P-Lisboa-CampoGrande	27,8087	3	1	177%	11	19	-45%	Afetado
Loja prc L756		P-Sintra-Alegro Sintra	38,0886	8	3	171%	12	18	-32%	Afetado
Loja prc L761		P-Matosinhos-Mar Shopping	29,7036	6	2	166%	9	19	-53%	Afetado
Loja prc L711		P-Coimbra-Carmo	12,6441	3	1	133%	11	13	-21%	
Loja prc L758		P-VNGaia-GaiaShopping	73	8	3	153%	9	19	-53%	Afetado
Loja prc L772		P-Lisboa-Yasco da Gama	17,621	10	4	152%	15	20	-27%	Afetado
Loja prc L750		P-Almada-Almada Forum	31,08	9	6	151%	13	20	-33%	
Loja prc L754		P-Matosinhos-NorteShopping	17,2268	7	3	143%	11	19	-44%	Afetado
Loja prc L769		P-Amadora-UBBO	23,67	8	3	144%	11	20	-47%	Afetado
Loja prc L065		P-Maia-MaiaShopping	22,75	7	3	140%	10	18	-46%	Afetado
Loja prc L032		P-Odivelas-Strada Outlet	61	4	2	131%	10	17	-40%	Afetado
Loja prc L747		P-Cascais-CascaisShopping	45,65	7	3	139%	12	18	-33%	Afetado
Loja prc L016		P-Braga-Liberdade	361	2	1	114%	8	11	-21%	Afetado
Loja prc L752		P-Braga-Braga Parque	19,0425	4	2	119%	10	19	-44%	Afetado
Loja prc L776		P-Albufeira-AlgarveShopping	2,85	3	1	113%	8	17	-52%	Afetado
Loja prc L074		P-Santarem-CandidoReis	67,6436	5	2	118%	10	13	-23%	
Loja prc L063		P-VNGaia-ArrabidaShopping	33,18	4	2	123%	10	16	-37%	Afetado
Loja prc L720		P-VNGaia-Republica	24,4036	3	1	110%	9	13	-30%	Afetado
Loja prc L759		P-Alfragide-Alegro	30,08	7	3	118%	11	18	-41%	Afetado
Loja prc L753		P-Viseu-Palacio do Gelo	26,8201	4	2	101%	9	17	-44%	

Figure A.9: Selection of shops for pilot project - Part 2

Appendix D - Questionnaire "Consumer Choice - Shipping Method"

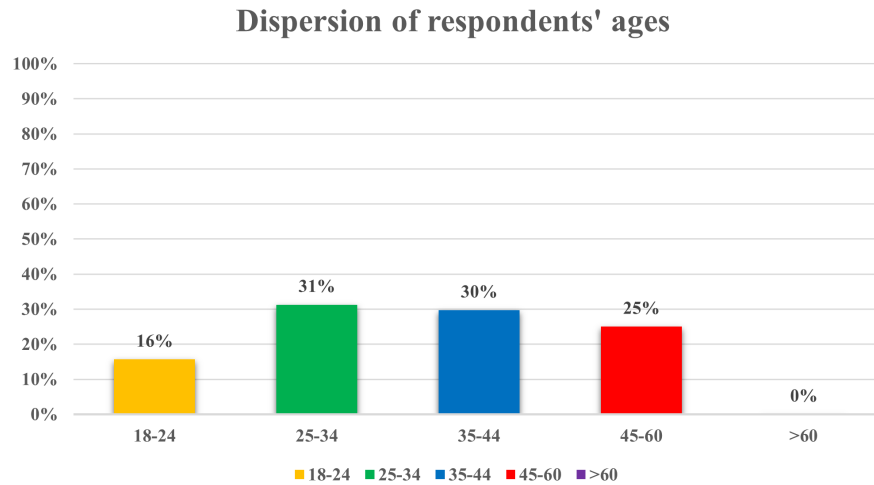


Figure A.11: Dispersion of respondents' ages

ESCOLHA DO CONSUMIDOR - MÉTODO DE ENVIO

À medida que o mundo se torna cada vez mais dependente do e-commerce, a importância de opções fiáveis e sustentáveis tornou-se primordial. Dada a variedade de métodos de envio disponíveis, desde a entrega em morada até entrega em loja/pick-up point, os consumidores têm o poder de escolher como e quando as suas encomendas serão entregues.

O objetivo do presente questionário é recolher informações sobre diversos fatores que influenciam as decisões dos consumidores.

O preenchimento dura aproximadamente 5 minutos, e todas as informações recolhidas serão utilizadas apenas para fins de pesquisa.

Agradeço a tua colaboração!

Nota: No decorrer do questionário surge frequentemente a expressão "deslocação propositada". A deslocação propositada ocorre quando o único objetivo da viagem é a recolha da encomenda.

* Indica uma pergunta obrigatória.

Pular para a pergunta 1 Pular para a pergunta 1

1. Qual é a tua idade? *

Marcar apenas uma oval.

- ☐ 18-24
☐ 25-34
☐ 35-44
☐ 45-60
☐ >60

2. Na escolha do método de envio, quais dos seguintes fatores são os mais importantes * para ti?

Sendo o 1º fator o mais importante e o 5º fator o menos importante.

Marcar apenas uma oval por linha.

	1º	2º	3º	4º	5º
Preço de envio	☐	☐	☐	☐	☐
Prazo de entrega	☐	☐	☐	☐	☐
Disponibilidade para receção de encomenda	☐	☐	☐	☐	☐
Comodidade/Conveniência	☐	☐	☐	☐	☐
Método de envio com menos impacto ambiental	☐	☐	☐	☐	☐

3. Há algum outro fator que aches importante? *

Marcar apenas uma oval.

- ☐ Sim
☐ Não

4. Se sim, qual?

(a) Questionnaire "Consumer choice - shipping method - Part 1

(b) Questionnaire "Consumer choice - shipping method - Part 2

5. Numa escala de 1 a 5, sendo 1 discordo totalmente e 5 concordo totalmente, avalia cada uma das seguintes afirmações.

Marcar apenas uma oval por linha.

	1- Discordo totalmente	2- Discordo	3- Neutro	4- Concordo	5- Concordo totalmente
A sustentabilidade é um fator que tenho em consideração quando escolho o método de envio.	☐	☐	☐	☐	☐
Estou disposto a pagar mais portes de envio para ter um envio mais sustentável.	☐	☐	☐	☐	☐
Dou preferência a métodos de envio gratuitos mesmo que tenha de me deslocar a uma loja/pick-up point.	☐	☐	☐	☐	☐
A entrega em morada é mais cómoda que entrega em loja/pick up point.	☐	☐	☐	☐	☐
Estou disposto a pagar portes de envio para poder escolher o método de	☐	☐	☐	☐	☐

envio que me é mais conveniente.

Opto pela recolha em loja porque me dá a liberdade de escolher quando quero levantar a encomenda.

Estou disponível a pagar mais portes de envio para receber a minha encomenda mais cedo.

Escolho entrega em morada sempre que tenho alguém para receber a encomenda. Caso contrário, escolho recolha em loja/pick-up point.

Para que possa escolher o método de envio que me é mais cómodo, estou disposto a esperar mais tempo para receber a minha encomenda.

Se uma loja/pick-up point estiver na minha rota

- (c) Questionnaire "Consumer choice - shipping method - Part 3

- (d) Questionnaire "Consumer choice - shipping method - Part 4

Escolha do Método de Envio

6. Assumindo que o preço e prazo de entrega são os mesmos em ambos os métodos de envio, qual deles escolhes?

Marcar apenas uma oval.

- ☐ Entrega em morada *Pular para a pergunta 7*
☐ Recolha em loja/pick-up point *Pular para a pergunta 12*

Entrega em Morada

7. Quando escolhes este método de envio, tens o fator sustentabilidade em consideração?

Marcar apenas uma oval.

- ☐ Sim *Pular para a pergunta 9*
☐ Não *Pular para a pergunta 8*

Seção sem título

8. A recolha em loja/pick-up point, caso a ida não seja propositada ou optes por um meio de transporte ecológico, pode reduzir as tuas emissões até 24 vezes, comparativamente à entrega em morada.

Na posse desta informação, alteravas a tua escolha do método de envio?

A deslocação propositada ocorre quando o único objectivo da viagem é a recolha da encomenda.

Marcar apenas uma oval.

- ☐ Sim *Pular para a pergunta 10*
☐ Não *Pular para a seção 7 (Obrigado pela tua resposta! 🙏)*

- (e) Questionnaire "Consumer choice - shipping method - Part 5

Obrigado pela tua resposta! 😊

É compreensível que nem sempre seja fácil tomar decisões sustentáveis, mas é importante lembrar-te que pequenas mudanças nos nossos hábitos podem fazer uma grande diferença no futuro do nosso planeta.

**9. Se sim, em que sentido? ***

Pular para a seção 9 (Obrigado pela tua resposta! 😊)

Obrigado pela tua resposta! 😊

É importante lembrar que nossas escolhas podem ter um grande impacto no meio ambiente e que podemos fazer a diferença com pequenas ações.

🔗 **Sabias que** a recolha em loja/pick-up point pode ser uma opção mais sustentável? Ao escolheres esta opção, caso a ida não seja propositada ou optes por um meio de transporte ecológico, poderás reduzir as tuas emissões até 24 vezes, comparativamente à entrega em morada.

10. Tens uma loja/pick-up point perto da tua residência ou local de trabalho? *

Marcar apenas uma oval.

- ☐ Sim
☐ Não

11. Tens uma loja/pick up point que coincide com as tuas rotas/deslocações semanais? *

Marcar apenas uma oval.

- ☐ Sim *Pular para a seção 11 (Obrigado pela tua resposta! 😊)*
☐ Não *Pular para a seção 11 (Obrigado pela tua resposta! 😊)*

(f) Questionnaire "Consumer choice - shipping method - Part 6

14. Se sim, qual é o meio de transporte que utilizas? *

Marcar apenas uma oval.

- ☐ Carro pessoal (combustão)
☐ Carro pessoal (elétrico, plug-in, híbrido, GPL)
☐ Transportes públicos
☐ Transportes sem emissões (Bicicleta, a pé,...)

15. Qual é a distância de uma loja/pick-up point da tua residência ou local de trabalho? *

Marcar apenas uma oval.

- ☐ <1 km
☐ 1-5km
☐ 5-10 km
☐ >10km

16. Uma deslocação num meio de transporte não ecológico ou propositada a uma loja/pick-up point é até 24 vezes superior à entrega em morada. *

Na posse desta informação, alteravas a tua decisão?

A deslocação propositada ocorre quando o único propósito da viagem é a recolha da encomenda.

Marcar apenas uma oval.

- ☐ Sim *Pular para a seção 16 (Obrigado pela tua resposta! 😊)*
☐ Não *Pular para a seção 17 (Obrigado pela tua resposta! 😊)*

(h) Questionnaire "Consumer choice - shipping method - Part 8

Obrigado pela tua resposta! 😊

Incrível! Estás comprometido em tomar decisões mais sustentáveis! Optar pela recolha em loja, nas condições que te apresentamos, é uma excelente iniciativa para reduzir o impacto ambiental.

Continua a fazer escolhas conscientes e sustentáveis! É essencial protegermos o nosso planeta e criar um futuro mais sustentável para todos. 😊

Recolha em loja/pick-up point**12. Quando escolhes este método de envio, tens o fator sustentabilidade em consideração? ***

Marcar apenas uma oval.

- ☐ Sim *Pular para a pergunta 13*
☐ Não *Pular para a pergunta 17*

13. A tua deslocação para a recolha da encomenda é propositada? *

A deslocação propositada ocorre quando o único propósito da viagem é a recolha da encomenda.

Marcar apenas uma oval.

- ☐ Sim *Pular para a pergunta 14*
☐ Não *Pular para a seção 14 (Obrigado pela tua resposta! 😊)*

Obrigado pela tua resposta! 😊

Primeiramente, gostaria de te felicitar pela preocupação em tornares as tuas escolhas mais sustentáveis! É incrível saber que estás a escolher a opção mais sustentável ao recolher a tua encomenda na loja sem precisares de fazer uma deslocação propositada.

Continua a fazer escolhas conscientes e sustentáveis! É essencial protegermos o nosso planeta e criar um futuro mais sustentável para todos. 😊

Obrigado pela tua resposta! 😊

Primeiramente, gostaria de te felicitar pela preocupação em tornares as tuas escolhas mais sustentáveis!

É incrível saber que estás sensibilizado com a importância de reduzir as deslocações propositadas.

Continua a fazer escolhas conscientes e sustentáveis! É essencial protegermos o nosso planeta e criar um futuro mais sustentável para todos. 😊

Obrigado pela tua resposta! 😊

É compreensível que nem sempre seja fácil tomar decisões sustentáveis, mas é importante lembrar-te que pequenas mudanças nos nossos hábitos podem fazer uma grande diferença no futuro do nosso planeta.

**17. A tua deslocação para a recolha da encomenda é propositada? ***

A deslocação propositada ocorre quando o único propósito da viagem é a recolha da encomenda.

Marcar apenas uma oval.

- ☐ Sim *Pular para a pergunta 18*
☐ Não *Pular para a seção 19 (Obrigado pela tua resposta! 😊)*

Obrigado pela tua resposta! 😊

É importante lembrar-te que pequenas mudanças nos nossos hábitos podem fazer uma grande diferença no futuro do nosso planeta. 😊

🔗 **Sabias que**, comparativamente à entrega em morada, a recolha em loja/pick-up point só é a opção mais sustentável se a tua deslocação não for propositada ou fores num meio de transporte ecológico?

Optando por um destes cenários, poderás reduzir as tuas emissões até 24 vezes.

(i) Questionnaire "Consumer choice - shipping method - Part 9

18. Se sim, qual é o meio de transporte que utilizas? *

Marcar apenas uma oval.

☐ Carro pessoal (combustão)

☐ Carro pessoal (elétrico, plug-in, híbrido, GPL)

☐ Transportes públicos

☐ Transportes sem emissões (bicicleta, a pé...)

19. Qual é a distância de uma loja/pick-up point da tua residência ou local de trabalho? *

Marcar apenas uma oval.

☐ <1 km

☐ 1-5km

☐ 5-10 km

☐ >10km

20. Sabendo que o preço e prazo de entrega é o mesmo em ambos os métodos de envio, que não tens em consideração o fator sustentabilidade e que a tua deslocação foi propositada, o que te levou à loja/pick-up point? *

Pular para a seção 21 (Obrigado pela tua resposta! 🙏)

Obrigado pela tua resposta! 🙏

É compreensível que nem sempre seja fácil tomar decisões sustentáveis, mas é importante lembrar-te que pequenas mudanças nos nossos hábitos podem fazer uma grande diferença no futuro do nosso planeta. 🌱

🔔 Sabias que, comparativamente à entrega em morada, a recolha em loja/pick-up point só é a opção mais sustentável se a tua deslocação não for propositada ou fores num meio de transporte ecológico?

Optando por um destes cenários, poderás reduzir as tuas emissões até 24 vezes.

Este conteúdo não foi criado nem aprovado pelo Google.

Google Formulários

(j) Questionnaire "Consumer choice - shipping method - Part 10 (k) Questionnaire "Consumer choice - shipping method - Part 11

Figure A.12: Questionnaire "Consumer choice - shipping method

Appendix E - Analysis of pilot project results

Centro	Nome do Centro	Expedições/Semana	3weeks		3weeks		3weeks	
			Nº caixa expedidas (Plast.)	Devoluções/Semana	Nº Caixas Devolvidas (Plast.)	Nº Caixas Devolvidas (Cart.)	Nº Caixas não devolvidas (Plast.)	
L767	P-TVedras-Arena Shopping	2	8	2	7	2	0	
L760	P-Aveiro-Glicínias Plaza	2	10	2	10	14	0	
L755	P-Leiria-LeiriaShopping	2	7	2	10	6	0	
L086	P-VReal-Nosso Shopping	2	7	2	5	4	0	
L744	P-Coimbra-Alma Shopping	2	5	3	5	4	0	
L711	P-Coimbra-Carmo	2	6	3	6	3	0	
Total			43		43	33	0	
			130					
Taxa de Circularidade Efetiva		57%						
Percentagem novas caixas no circuito		43%						
Cx. Expedidas não devolvidas		0%						

Figure A.13: Circularity analysis

Centro	Nome do Centro	Volumetria caixa Piloto				Volumetria caixa Cartão				% Ajuste (Analítico)				% Ajuste (Analítico)			
		86640	cm³			48000	cm³			[0-25]	[25-50]	[50-75]	[75-100]	[0-25]	[25-50]	[50-75]	[75-100]
0,16667 L767	P-TVedras-Arena Shopping	27224		2	3	1	0			10160,395	8	1	0	0	0	0	0
0,25 L760	P-Aveiro-Glicínias Plaza	31967		3	3	3	0			7887,201905	20	2	1	0	0	0	0
0,16667 L755	P-Leiria-LeiriaShopping	33013		1	3	2	0			6334,7635	10	0	0	0	0	0	0
0,16667 L086	P-VReal-Nosso Shopping	25602		3	3	0	0			9684,9775	7	1	0	0	0	0	0
0,11111 L744	P-Coimbra-Alma Shopping	35069		1	2	0	0			6294,1815	7	1	0	0	0	0	0
0,13889 L711	P-Coimbra-Carmo	26787		2	2	1	0			11989,30571	6	1	1	0	0	0	0
Total		37013								13674							
Volumetria Ótima		42565															

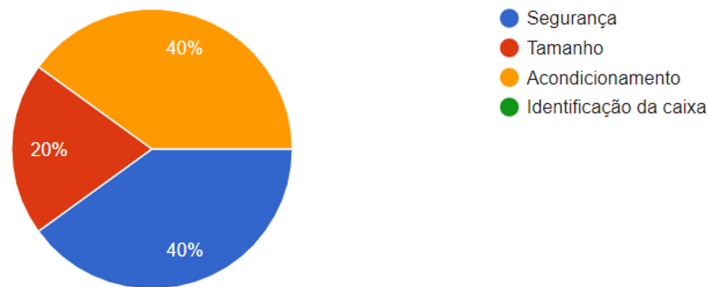
Figure A.14: Volumetry analysis

Figure A.15: Transport costs analysis

Appendix F - Evaluation of project experience and characteristics of the future box

Na tua opinião, qual é a característica mais importante a ter em consideração na futura caixa?

5 respostas



Na tua opinião, quais são os requisitos funcionais e/ou características adicionais que a futura caixa deve contemplar?

5 respostas

rebatível

Rebatíveis.

Caixa desmontável

os selos deveriam ser mais resistentes

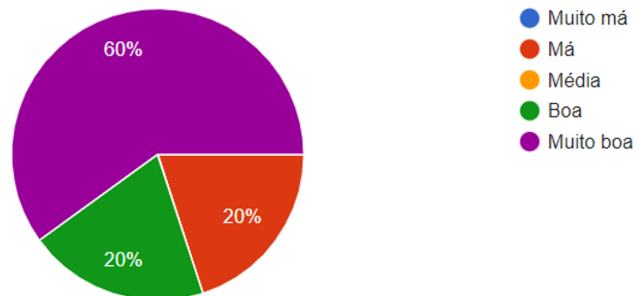
Empilhável, o tamanho está perfeito

- Rebatível/desmontável
- Empilhável
- Leve
- Rastreável
- Fecho por selo (segurança)
- Área de identificação
- Prescindir de enchimento
- Ajustável

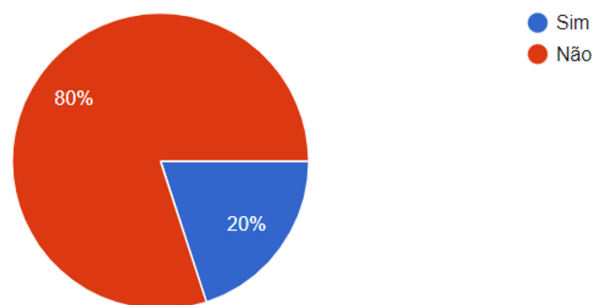
Figure A.16: Collection of the characteristics of the future box

Como classifica a experiência com a utilização das caixas de plástico do piloto?

5 respostas

**As caixas de plástico circulares afetaram a organização da loja de alguma forma?**

5 respostas

**De que maneira afetou?**

1 resposta

O numero de caixas nao era de todo suficiente para o volume de equipamentos que damos tratamento. O tamanho da caixa tambem nao é adequado para organização do backoffice.

Figure A.17: Feedback questionnaires experiences plastic boxes(retailers)

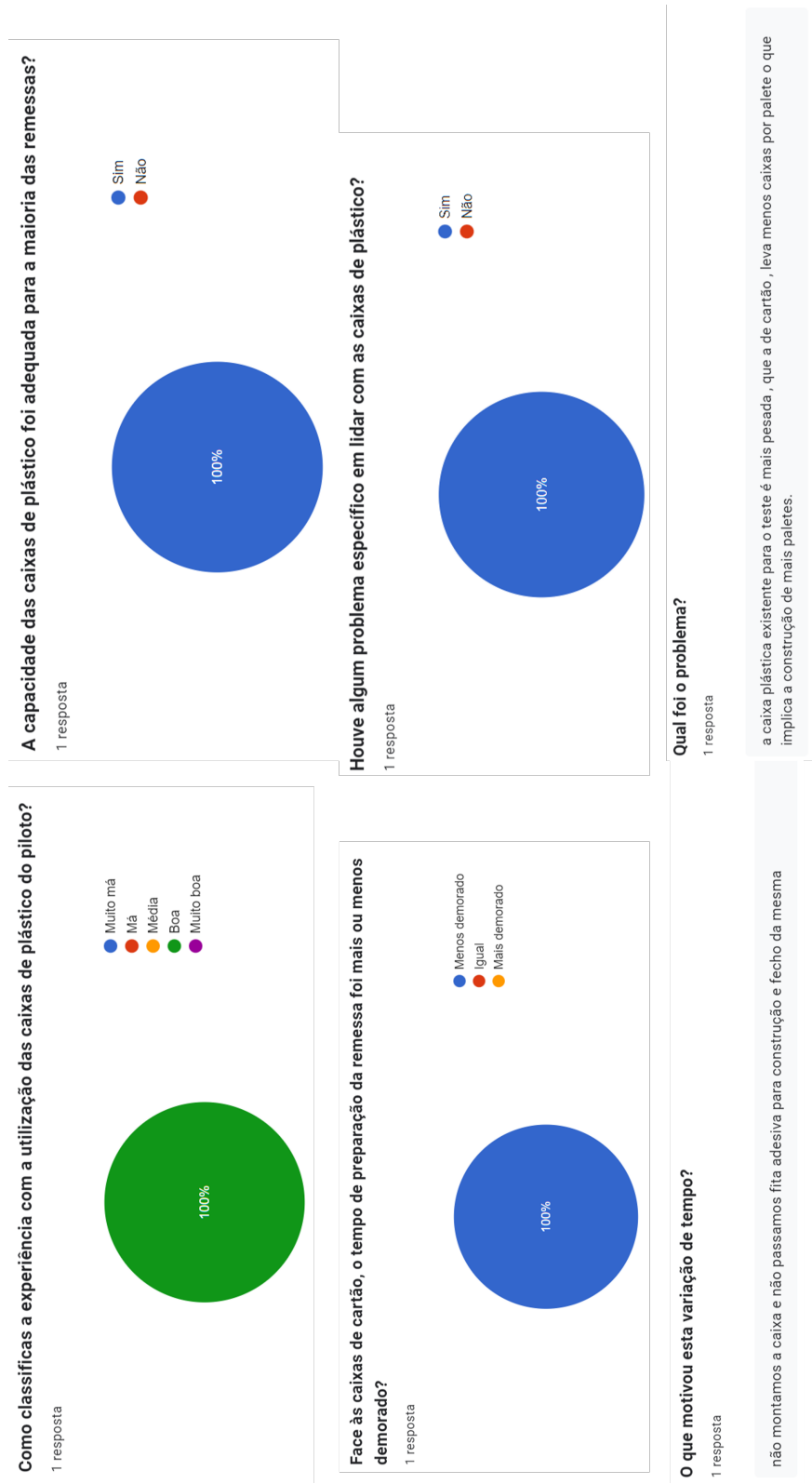


Figure A.18: Feedback questionnaires experiences plastic boxes (warehouse operators)

Appendix G - Emissions plastic box vs cardboard

Pelo histórico S2 2022				
Totalidade das lojas (162)				
Nº Caixas expedidas Fixo + Móvel / expedição	618			
Ter pelo menos 2 vezes para o arranque	1236			
Caixas devolvidas fixo / semana	227			
Caixas Ano				
Ano 0	Ano 1	Ano 2	Ano 3	Ano 4
1236	247	247	247	247
Assumindo que não há alteração no numero de lojas nem a operação do volume por lojas				

Figure A.19: Calculation of the annual consumption of cardboard boxes and estimate of plastic boxes

	Emissões		
Cartão	3,31	ton CO2/ ton cartão	
Polipropileno reciclável	3,456	ton CO2/ ton plástico	
Abastecimento lojas (fixo + móvel) Caixa exp1 , Caixa exp3 , Caixa exp9	Caixas Cartão	80000	(un.) em 2 anos
	Peso Cx.Cartão	0,492	kg
	Peso total Caixas	39,4	ton cartão em 2 anos
	Emissões	130,3	ton CO2 em 2 anos
	Caixas de Plástico (2 anos)	1483	(un.) em 2 anos
	Peso Cx.Plástico (un.)	3,05	kg
	Peso total	4,52376	ton plástico em 2 anos
	Emissões / 2 anos	15,6	ton CO2 em 2 anos
	Emissões ano N	2,6	ton CO2 em 1 ano
	Poupança 2 anos	114,7	ton CO2/2 anos
	Poupança ano 3-n	127,7	ton CO2/ano

Figure A.20: Emissions plastic box vs cardboard

Appendix H - Plastic boxes - Business case

Business Case

Caixas de cartão	
Nº caixas / anual (fixo + móvel)	40000
Preço caixa de cartão	0,60 €
Preço fita cola /caixa	0,09 €
Custo transportes / ano	258 590,27 €

Peso ponderado

Caixas de plástico		
Ano 1	Nº caixas / anual (fixo + móvel)	1236
Ano 2-n	Nº caixas / anual (fixo + móvel)	247
	Selos por caixa	4
	Preço selo	0,05 €
	Acrescimo transporte / ano	8%
	Preço da caixa	27,00 €

Nº Lojas		162
Por loja		
Caixas expedidas/semana		2,52
Caixas devolvidas/semana		1,2
Expedições/semana		2
Devoluções/semana		2
Selos Ano		125349

Modelo	Ano 1	Ano 2	Ano 3	Ano 4
As is	27 600 €	27 600,00 €	27 600,00 €	27 600,00 €
To be	59 551 €	32 853,31 €	32 853,31 €	32 853,31 €

Balanço

Ano 1	Ano 2	Ano 3	Ano 4
-31 951 €	-5 253,31 €	-5 253,31 €	-5 253,31 €

Ano 1	Ano 2	Ano 3	Ano 4	NPV
-30 736,80 €	-4 861,65 €	-4 676,91 €	-4 499,19 €	
-30 736,80 €	-35 598,45 €	-40 275,37 €	-44 774,56 €	

Discount Rate	3,95%
5Y Portuguese Government Bond (risk-free rate)	

ROI	-155%
NPV	-44 774,56 €
Payback	N/A

Figure A.21: Business case

Appendix I - Sample of orders by carrier platform

Table A.1: Percentage of orders with delivery to address by platform

Platform	% orders
Ilhas	2%
Coimbra	5%
Évora	5%
Faro	4%
Guarda	1%
Leiria	3%
LIS1 (Cabo Ruivo)	10%
LIS2 (São João da Talha)	10%
LIS3 (Seixal)	11%
LIS5 (Cacém)	8%
OPO (Alfena)	30%
Torres Novas	4%
Vila Real	3%
Viseu	2%
Total	100%

Appendix J - Analysis of the different routes from the distribution platform

Estação	DPD Coimbra, Mercado Abastecedor		
Carrinha 8L/100 Km	0,16	kg CO2/ km	
	Loja NOS	Pick up Point	
3850-630	Loja NOS, CC Glicínias Plaza	DPD Pickup loja, Av. Fernando Augusto	
3080-051	Loja NOS, Buarcos,	DPD Pickup loja, Tv. da Rua Fernandes	
3070-761	Loja NOS, Rua Henrique Barreto	DPD Pickup loja, Av Manuel Milheirao	
3750-726	Loja NOS, R. Rio Grande S/N	DPD Pickup loja, Largo Dr. Elísio Sucena	
3040-002	Loja NOS, Av. José Bonifácio de Andrada	DPD Pickup loja, R. Central da Mesura	
3140-601	Loja NOS, Buarcos	DPD Pickup loja, R. Fernão Mendes Pinto	
3140-601	Loja NOS, Buarcos	DPD Pickup loja, R. Fernão Mendes Pinto	
3860-071	Loja NOS, Praçeta Francisco	DPD Pickup loja, Av Visconde Valdemouro	
Plataforma_Rota (KM)	Plataforma_Lojas (KM)	Diferença	Poupança (KG CO2)
552	504	-48	-7,68
Estação	DPD Av. Infante (Cabo Ruivo)		
Carrinha 8L/100 Km	0,16	kg CO2/ km	
	Loja NOS	Pick up Point	
1170-113	NOS, Av. da República	DPD Pickup loja, R. Damasceno Monteiro	
1500-700	Loja NOS Lisboa - Colombo	DPD Pickup loja, Av. dos Bombeiros Voluntários	
1000-232	NOS, Av. da República	DPD Pickup loja, R. Pascoal de Melo	
1000-117	NOS, Av. da República	DPD Pickup loja, R. Dona Filipa	
1000-117	NOS, Av. da República	DPD Pickup loja, R. Dona Filipa	
1500-487	Loja NOS Lisboa - Colombo	DPD Pickup loja, R. Elias Garcia	
1675-100	Loja NOS Lisboa - Colombo	DPD Pickup loja, R. Cap. Salgueiro Mai	
1900-089	NOS, Av. da República	DPD Pickup loja, Av. Alm. Reis	
1070-099	NOS, Av. da República	DPD Pickup loja, Av. Fontes Pereira	
Plataforma_Rota (KM)	Plataforma_Lojas (KM)	Diferença	Poupança (KG CO2)
58,4	44	-14,4	-2,304
Estação	DPD EN 10 (São João da Talha)		
Carrinha 8L/100 Km	0,16	kg CO2/ km	
	Loja NOS	Pick up Point	
2590-430	NOS, R. Francisco Augusto Leite	DPD Pickup loja, Alto Da Lagoa,	
2580-474	Loja NOS, R. Alm. Cândido dos Reis	DPD Pickup Station, Urb Sol Carregado	
2655-132	NOS, R. Francisco Augusto Leite	DPD Pickup Station,	
2700-582	NOS, Praça Padre Eduardo Ferreira	DPD Pickup loja, R. Elias Garcia	
2695-659	Loja NOS, Avenida Descobertas	DPD Pickup loja, R. Alfredo Vitorino da Costa	
2700-296	NOS, Praça Padre Eduardo Ferreira	DPD Pickup loja, R. Elias Garcia	
1800-333	NOS, Av. da República	DPD Pickup loja, R. das Escolas	
1800-333	NOS, Av. da República	DPD Pickup loja, R. das Escolas	
2650-233	Loja NOS, Centro Comercial UBB	DPD Pickup loja, Rua Capitaes De Abril	
2650-233	Loja NOS, Centro Comercial UBB	DPD Pickup loja, Rua Capitaes De Abril	
Plataforma_Rota (KM)	Plataforma_Lojas (KM)	Diferença	Poupança (KG CO2)
218	168	-50	-8
Estação	DPD Cacém, 2735-512 Aqualva-Cacém		
Carrinha 8L/100 Km	0,16	kg CO2/ km	
	Loja NOS	Pick up Point	
2770-214	Loja NOS, R. José Relvas	DPD Pickup loja, Mercado	
2635-620	Loja NOS, CC Fórum,	DPD Pickup loja, Estrada Marquês	
1495-130	NOS, Estrada Nacional 249-1	DPD Pickup loja, Av. Carolina Michaelis	
2635-645	Loja NOS, CC Fórum	DPD Pickup loja, Rua Retiro Dos Pacatos	
2725-699	Loja NOS, CC Fórum,	DPD Pickup Station, Rotunda Da, Estr. Cavaleira	
2775-192	Loja NOS, R. José Relvas	DPD Pickup loja, Praça 5 de Outubro 4	
2745-766	NOS, R. Bartolomeu Dias	DPD Pickup loja, R. da Milharada	
2635-635	Loja NOS, CC Fórum	DPD Pickup loja, Rua Retiro Dos Pacatos	
2605-118	NOS, Praça Padre Eduardo Ferreira	DPD Pickup loja, R. Margarida Malheiro	
Plataforma_Rota (KM)	Plataforma_Lojas (KM)	Diferença	Poupança (KG CO2)
117	93,8	-23,2	-3,712

Estação	Parque Industrial do Seixal Rua Lino de carvalho, Seixal			
Carrinha 8L/100 Km	0,16 kg CO2/ km			
	Loja NOS	Pick up Point		
2865-669	NOS, Centro Comercial Rio Si	DPD Pickup loja, Av. da Liberdade		
2865-669	NOS, Centro Comercial Rio Si	DPD Pickup loja, Av. da Liberdade		
2910-328	Loja NOS, Av. Luísa Todi	DPD Pickup Station, Praça da Independência		
2975-320	Loja NOS, Estrada Nacional	DPD Pickup loja, R. Piteira Santos		
2815-885	NOS, R. Sérgio Malpique	DPD Pickup loja, R. da Liberdade 538		
2830-307	Loja NOS, CC Fórum Barreiro	DPD Pickup loja, R. 5 de Outubro		
2830-055	Loja NOS, CC Fórum Barreiro	DPD Pickup loja, R. Miguel Bombarda		
2835-110	Loja NOS, CC Fórum Barreiro	DPD Pickup loja, N11-1 62		
2825-412	NOS, R. Sérgio Malpique	DPD Pickup loja, Pct Ns Dos Navegante		
Plataforma_Rota (KM)	Plataforma_Loas (KM)	Diferença	Poupança (KG CO2)	
164	122	-42	-6,72	
Estação	DPD Portugal, R. Bernardino Machado 355			
Carrinha 8L/100 Km	0,16 kg CO2/ km			
	Loja NOS	Pick up Point		
4630-200	Loja NOS, Largo Sacadura Cabral	DPD Pickup loja, Av. Manuel Pereira Soares 323		
4750-180	Loja NOS, Lg. Largo Camilo Castelo Branco	DPD Pickup loja, Urb. 4750-132		
4990-097	NOS Ponte de Lima, R. do Mercado	DPD Pickup loja, R. do Sobral		
4500-819	Loja NOS, R. 23 348,	DPD Pickup loja, R. 19 825, 4500-254		
4100-130	Loja NOS, Av. da Boavista	DPD Pickup loja, Av. da Boavist		
4100-130	Loja NOS, Av. da Boavista	DPD Pickup loja, Av. da Boavist		
4540-151	Loja NOS Vale de Cambra - Av. Camilo Tav	DPD Pickup loja, R. Alferes Diogo Malafaia,		
4810-225	Loja NOS Guimarães - S. Francisco Centro	DPD Pickup loja, R. de Belos Ares		
	Loja NOS	Pick up Point		
4580-104	Loja NOS, Rua Doutor José Firmino Ferrei	DPD Pickup loja, Rua D, R. Dona Rosalina		
4000-099	Loja NOS, CC Via Catarina	DPD Pickup loja, Rua da Constituição		
4100-454	Loja NOS, Av. da Boavista	DPD Pickup loja, R. Jorge Reine!		
4100-113	Loja NOS, Av. da Boavista	DPD Pickup loja, Av. da Boavista		
4200-534	Loja NOS, CC Via Catarina	DPD Pickup loja, R. de Damião de Góis		
4630-204	Loja NOS, Largo Sacadura Cabral	DPD Pickup loja, Av Avelino		
4460-109	Loja NOS - NorteShopping,	DPD Pickup loja, R. de São Gens		
4250-446	Loja NOS, Av. da Boavista	DPD Pickup Station, Rua da Constituiçã		
Distantes	Plataforma_Rota (KM)	Plataforma_Loas (KM)	Diferença	Poupança (KG CO2)
	531	502	-29	-4,64
Próximas	Plataforma_Rota (KM)	Plataforma_Loas (KM)	Diferença	Poupança (KG CO2)
	180	127	-53	-8,48

Figure A.22: Analysis of the different routes from the distribution platform

Appendix K - Savings in transport costs with the delivery of orders with the supply of the shops

Lojas																		
Item Labels	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total
Grand Total	6194.5464	30966.3	3276.2	31019.9	1833.07	79942.01	Pess Médio	2ª Feira	Pess Médio	3ª Feira	Pess Médio	4ª Feira	Pess Médio	5ª Feira	Pess Médio	6ª Feira	Pess Médio	
USOIA	166	253	272	250	55	1351	5.4	27.5	1	21.4	9.3	21.4	9.3	21.4	9.3	21.4	9.3	
ALMADA	105	102	85	127	31	2710	43.1	53.0	2	48.8	55.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
VILA NOVA DE B.A.	19	100	80	95	10	240	43.3	46.6	2	47.7	50.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
MARIA	271	785	125	1008	21	2200	76.6	25.8	3	22.4	27.7	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
CUSTOSIMYS	240	750	80	930	5	2108	59.7	77.2	1	41.2	78.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
PORTO	275	704	64	919	24	1687	9.8	34.1	5	44.8	91.1	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ARMADORA	15	725	140	839	24	1538	8.6	26.4	3	21.4	28.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
BARREIRO	71	636	49	955	109	1609	24.5	36.7	2	27.6	38.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
CARNADE	100	876	42	938	15	1891	62.8	55.7	1	47.1	67.1	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
MONTILLO	105	607	37	688	5	1362	13.6	53.4	1	47.3	53.1	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
MATOSINHOS	90	659	16	941	11	1725	25.3	36.2	2	28.5	38.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
BUCELAS	126	674	86	836	4	1606	25.5	33.1	2	26.8	32.7	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
RIO TINTO	71	772	49	796	6	1604	59.4	60.5	1	63.3	63.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALDEIA DE PAIO PARES	200	962	61	1149	10	1601	44.7	57.6	1	51.4	63.1	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
PAÇO DE ARCOS	16	672	64	759	7	859	50.7	59.2	1	52.7	63.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
RECIFE NOVO	6	728	62	794	10	799	56.8	54.2	1	58.1	56.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ADAFUPE	7	656	166	829	13	1468	25.2	25.6	2	28.6	25.5	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
SETUBAL	268	985	95	1093	10	1615	21.7	22.8	2	23.3	24.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALCABEDDE	21	552	37	607	7	1164	45.6	62.1	1	48.5	64.6	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
GUIMARÊS	18	636	36	739	10	1000	20.7	29.4	2	23.8	29.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALVOR	83	995	95	1133	14	1340	21.3	20.5	2	23.8	21.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
FAIO	29	591	36	659	10	1000	22.4	20.5	2	23.8	22.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
LINDA A VELHA	246	439	467	296	270	1103	0.8	30.4	1	2.2	35.5	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
DOVELAS	30	581	36	649	7	999	20.2	20.5	2	23.8	20.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
AVEIRO	432	282	36	430	11	1064	22.5	19.5	1	25.4	33.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
COMEIRA	277	209	36	260	10	594	7.7	16.5	2	10.4	13.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
AFIFE	76	399	16	403	9	905	36.1	21.0	1	35.3	32.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
REBU	14	241	25	267	6	751	24.2	22.8	1	21.9	25.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALMAGALGUES	4	407	41	331	9	790	31.3	25.5	1	21.9	25.5	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ANER	16	366	20	386	6	796	26.6	30.0	1	27.5	21.5	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALBUFERA	163	254	60	289	6	754	9.8	11.1	1	11.3	14.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ADAFETE	71	287	9	369	6	741	22.1	28.3	1	23.5	29.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
POVONGA VAREM	14	274	26	329	39	734	7.9	16.0	3	7.8	18.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALBERNIA	25	456	14	489	3	695	26.1	14.5	1	39.0	5.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
Processos																		
Lojas																		
Item Labels	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total
Grand Total	6194.5464	30966.3	3276.2	31019.9	1833.07	79942.01	Pess Médio	2ª Feira	Pess Médio	3ª Feira	Pess Médio	4ª Feira	Pess Médio	5ª Feira	Pess Médio	6ª Feira	Pess Médio	
FIGUEIRA DOZ	1	24	25	23	5	61	21.4	27.5	1	21.4	21.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALFARCO	95	238	10	109	4	636	9.7	14.6	1	10.5	8.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
A LOZINHADOS	16	289	22	278	7	600	30.7	36.8	1	32.2	37.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ABRAGA	97	244	20	143	8	579	18.8	11.5	1	22.0	10.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
BRAGA	9	306	6	304	6	529	18.8	7.8	2	10.6	8.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
FUNCHAL	1	489	34	3	2	530	7.5	0.0	0	7.9	6.1	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ESCARIS	16	234	32	200	2	469	18.0	15.4	1	20.2	18.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
EVORA	1	112	10	95	4	402	24.9	19.9	1	24.1	24.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
AVANTES	5	177	11	275	2	470	13.6	21.2	1	21.7	14.1	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ARRIANA VPR	2	207	15	169	2	395	6.9	13.0	1	21.3	6.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ABADE DE NOVA	17	141	10	156	5	319	14.4	7.5	2	15.7	13.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
A DOZ FRAZIOS	2	210	17	116	3	351	9.4	5.0	1	18.1	9.5	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALGOS	409	364	9	79	6	769	4.9	11.2	1	16.1	7.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALMADA	122	102	11	102	3	330	8.6	7.9	1	10.9	8.7	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
AGD	193	70	14	95	3	345	6.5	10.9	1	10.9	8.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALMADRA	19	104	6	85	1	315	52.3	52.7	1	50.8	52.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
QUARTERA	10	12	16	14	10	52	10.9	7.9	1	10.9	10.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
VILA NOVA DE FAVALIZ	11	182	12	141	2	337	10.7	10.8	1	10.1	10.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
BARRO DO S.O. JOAO	37	162	10	171	1	281	18.9	9.9	1	12.7	9.1	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALCADA DO MANTO	37	103	10	53	10	203	16.1	4.1	1	16.5	5.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
CARVALHOSA	6	757	13	104	6	286	6.9	4.0	2	8.0	4.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ESPINHO	4	140	5	120	10	279	16.5	10.5	1	10.5	16.5	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
COVILHA	61	11	6	10	5	263	6.2	8.4	1	10.8	6.1	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
BEIRE	3	129	10	111	1	256	13.6	13.9	1	14.8	13.6	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
JURCEIRA	6	122	9	93	5	236	9.4	7.2	1	9.4	8.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALCORNELIA	5	166	12	103	1	282	16.6	16.1	1	16.1	16.6	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
CAMPO VIL	11	118	4	102	3	230	8.5	7.8	1	8.1	8.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ISCOMAR	5	79	7	107	1	194	6.8	10.8	1	6.8	6.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
BARCELOS BEL	0	109	1	90	1	210	9.2	6.9	1	10.8	8.3	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ALMADRA COR	0	166	16	151	1	334	7.8	6.9	1	6.9	7.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ENTRECAMENTO	5	106	7	95	1	209	8.1	6.5	1	8.1	7.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
CACHOFA	0	166	16	151	1	334	6.8	6.9	1	6.9	6.8	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
AFONSHIM	11	61	7	102	10	196	4.7	7.8	1	6.9	7.9	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ARILL	72	10	102	2	105	5.6	7.9	1	6.9	6.2	6.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
Processos																		
Lojas																		
Item Labels	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total	2ª Feira	3ª Feira	4ª Feira	5ª Feira	6ª Feira	Grand Total
Grand Total	6194.5464	30966.3	3276.2	31019.9	1833.07	79942.01	Pess Médio	2ª Feira	Pess Médio	3ª Feira	Pess Médio	4ª Feira	Pess Médio	5ª Feira	Pess Médio	6ª Feira	Pess Médio	
GUARDELIA	1	62	11	96	2	162	6.3	7.4	1	7.5	7.4	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
CACHA	0	77	12	85	3	177	6.9	12.5	1	10.2	10.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
ABRAGA	0	104	6	76	3	190	6.0	5.9	1	9.2	7.2	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	Não Altera	
LAMEIRO	0	77	12	85	3	177												