A Tetra Pak case study

MSc Thesis Sustainable Development

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Improving sustainability strategy in the supply chain

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ABSTRACT

The concern regarding sustainability issues have been increasingly growing and have been influencing the way business is done. This case study was conducted with Tetra Pak, a processing and beverage and food packaging multinational. Wanting to improve the sustainability strategy throughout the supply chain, Tetra Pak focused on improving the relationship with its retailers, since by deciding which products will be sold, they have power to influence the entire supply chain and drive consumers towards a more sustainable choice.

To do so, it was vital to understand the retailers' perspective on sustainable development, including their current practices and aims for the future, and also their views on beverage/food packaging and its environmental impacts. The research was carried out with Dutch and Belgian retailers and was assessed by online research and by semi-structured interviews about their sustainability practices and aims on reduction of carbon emission, energy and packaging usage. Inputs from consumers and producers were also integrated by an online survey and informal interviews, respectively. A literature review on sustainability concepts and life cycle assessment of different beverage packaging was compared to the results retrieved with retailers. The views of producers and consumers were also analyzed in this research considering its relevance for retailers.

Most retailers mentioned the Sustainable Development Goals when talking about their sustainability strategy and their aims to reduce CO_2 emissions and packaging use, especially plastic. The life cycle assessments results are practically unanimous regarding the impacts of primary packaging options, pointing beverage carton as the lowest environmental impact for all impact's categories, except land use, since over 70% of the packaging is consistent of paper from wood fiber.

The results show that there are still misconceptions regarding the impacts of beverage packaging options from all stakeholders which is seen as one of the main barriers in choosing the most sustainable option. The initial concept that retailers are the main decision-makers of packaging choice was actually transferred to producers and suppliers. This is the perception of the retailers themselves who understanding producers and suppliers know more about packaging, want to improve the upstream of the supply chain. The final part of this report has recommendations on how Tetra Pak can improve the sustainability strategy throughout the supply chain retrieved from the findings of this report.

Keywords: beverage and food packaging, primary packaging, supply chain, sustainability strategy, beverage carton.

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TABLE OF CONTENTS

Table of figures

"In the presentation of products as answers to the demands of modern culture, busy lives, and youth perceptions, packaging goes beyond being just a container and becomes a product in its own right (...)"

(Akenji & Bengtsson, 2010, p.33)

1 INTRODUCTION

With the current and expected increase of population, natural resource depletion and environmental impacts, it has become clear that business as usual is no longer feasible (Dean, 2013). Climate change has been causing a shift in the market, directly challenging business strategies to be innovative in order to survive (Laszlo & Zhexembayeva, 2017). Powering this shift are environmental and social legislations, media pressure, as well as attitudes and value of consumers (Jones, Clarke-Hill, Comfort, & Hillier, 2008).

Business innovation is becoming more and more decisive to improve social and environmental spheres (Bocken et al., 2014). When businesses set sustainability as a goal, strategy innovation is constant and results in the development of hard to match competencies (Nidumolu, Prahalad, & Rangaswami, 2009). These become competitive advantages and with them, companies are more likely to thrive, for they see sustainability as a long-term strategy and not as mere market "greenwashing" (Laszlo & Zhexembayeva, 2017; Nidumolu et al., 2009). Market incumbents are not only increasing the pressure towards sustainable development (Hockerts & Wüstenhagen, 2010), but it is progressively expected from them that they contribute do so (Kolk & van Tulder, 2010). Multinationals are especially relevant, since for having a broader market, their actions can lead to a wider-ranging impact (Hockerts & Wüstenhagen, 2010). Multinationals account for 25% of global gross domestic product, which shows the importance that they contribute to sustainability (Unctad, 2017). Some authors go even further, stating that sustainability is not even possible without corporations and in the lack of defined international environmental standards, large multinational are defining sustainability rules in their own supply chains, working as global regulators (Dauvergne & Lister, 2012; Fuchs, Kalfagianni, & Havinga, 2011; Schaltegger, Lüdeke-Freund, & Hansen, 2012).

1.1 PACKAGING: A PROBLEM AND A CURE

Today, beverage and food packaging, also referred to as primary packaging, are usually single use and get discarded right away. This coupled with the fact that the variety of packaged food is continuously increasing, is leaving consumers with fewer alternatives to avoid waste (Pasqualino, Meneses, & Castells, 2011). On the other hand, packaging has a significant role on maintaining food quality and safety from environmental, chemical and physical factors (Risch, 2009).

The issues around waste generation have gained more attention from the community and governments and are pushing companies to act on the matter (Sonneveld, James, Fitzpatrick, & Lewis, 2005) and find innovative solutions (Risch, 2009).

1.2 TETRA PAK, ITS RETAILERS AND BEVERAGE/FOOD CARTONS

This report was developed in cooperation with Tetra Pak, a multinational focused on processing and packaging solutions (Tetra Pak, 2018b). The company dedicates significant effort to its sustainability strategy focusing on the three pillars of sustainable development (Tetra Pak, 2017).

Nevertheless, Tetra Pak wanted to further decrease the environmental impact of beverage packaging and broaden the value creation of sustainability throughout the supply chain. Knowing that companies aiming to reduce their footprint must consider internal and external stakeholders (Bocken & Allwood, 2012), Tetra Pak took into consideration the actions and perception of retailers. Even though all of stakeholders involved matter, in this first step, the company wanted to focus on the downstream, specifically on its retailers. This is because Tetra Pak understands the crucial role retailers have on the market. This is attributed to different factors: retailers intermediate manufacturers and producers with the final consumers; can dictate which products and packaging will be sold (Jones, Comfort, & Hillier, 2012); and when if they also have their own brands, as many do, retailers have the power to directly influence the supply chain (Sharma, Iyer, Mehrotra, & Krishnan, 2010). This influence can, therefore be used to drive the market and consumers towards a more sustainable choice (Jones et al., 2012). Organizations that adapt and incorporate sustainability trends as forecasts for the future, can turn them into long-term strategies. This will be done with arising urgent matters and will position itself by not only preventing impacts, but by benefiting of new industries and technologies (Moon, 2007; Willard & Hitchcock, 2009).

Sustainability is however very contextual, varies depending on the location in question and is also at the mercy of urgency, which changes with time. Even though sustainability is more and more understood as composed by three pillars: social, economic and environmental responsibilities, also known as the Triple Bottom Line (Bansal & DesJardine, 2014), the broadness of the concept, gives space for different interpretations. As a result, companies give different emphasis to different matters (Barkemeyer, Holt, Preuss, & Tsang, 2011)

Therefore, to get closer to its retailers and improve the sustainability throughout the supply chain, there was the need to better understand what elements of sustainability are valued by its retailers as well as their aims for the future. Their perception of the environmental

impacts of different packaging options and of their own importance as market influencers towards more sustainable options, were also of extreme importance in this report.

1.3 PROBLEM DEFINITION AND KNOWLEDGE GAP

For companies to become more sustainable they must understand what the impacts of their business are (Epstein & Roy, 2001). Therefore, it is crucial to understand the importance retailers give today to sustainable development by analyzing their sustainability strategy, current practices and future aims. For being retailers, packaging, more specifically, beverage and food packaging should be part of their sustainability strategy. However, retailers' knowledge on the environmental impacts of packaging options was taken as main gap of this report. Gaps were also expected regarding how these impacts directly affect various steps of the supply chain and how they could be improved by sustainability strategy.

1.4 RESEARCH AIM

The aim of this research was to help Tetra Pak retailers improve their sustainability strategy by reducing their footprint by using the most sustainable and feasible beverage/food carton. This was done reaffirming their sustainability strategy to its retailers and strengthening their relationship to continue to move towards a more sustainable development. It is important to highlight it is not on Tetra Pak's scope to tell how its retailers should work on their sustainability strategy. However, by understanding their current practices, it becomes easier to evaluate in which ways they are willing to improve it and what Tetra Pak could do to help.

1.5 RESEARCH QUESTION AND SUB-QUESTIONS 1, 2 AND 3

RQ: How can Tetra Pak and the use of beverage and food cartons help improve the sustainability strategy with its retailers throughout the supply chain?

SQ1: What are the sustainability concepts used by Tetra Pak's retailers, how are these defined and how are they implemented throughout the supply chain?

SQ2: What are the knowledge gaps between the perception of retailers and the actual environmental impact of beverage/food carton packaging and its alternatives?

1.6 SOCIETAL AND SCIENTIFIC RELEVANCE

This research can help stakeholders and more specifically retailers, to have a better understanding of how practical concerns, actions and basic supply chain elements are linked

to sustainability. By understanding such, it becomes clearer the areas in which they can innovate to move towards sustainable development.

This report highlights the importance of broadening the sustainability practices throughout the supply chain as well as of supplier and retailers working together, taking into consideration its consumers' needs and expectations. By focusing on retailers and consumers, this study sheds light on the downstream of the supply chain, which refers to sales, use and disposal phases. This case study highlights the necessity of moving together towards sustainable development and can be used as a practical example to other companies that desire to do the same in their supply chain.

2 BACKGROUND

2.1 PACKAGING

The first evidence of usage of packaging as food containers was in 7000B.C. with pottery, paper and glass. Since then the composition of glass barely changed apart from some color additives (Risch, 2009). Since 1880s milk was delivered and collected by the “milkman” in consumers doors and was sold with the intention of being returned and reused (Vaughan, Cook, & Trawick, 2007). In fact in some countries the bottles were considered legal propriety of the bottler, obliging consumers to return it, which meant a reduced cost for consumers since the bottle was not repassed to them (Busch, 1987). Later, improvements in refrigeration and transport had a significant impact on the industry, since it amplified the distance between production and consumption (Vaughan et al., 2007).

In 1935, non-returnable bottles for beer started appearing, but after the World War II there was a continuous growth of non-returnable beverage bottles. Plastics were discovered in 1800 but were only used as packaging, as PET, after 1970, patented by Pepsi (Freinkel, 2011). Since then, the use of glass as beverage packaging has been drastically declining (Vaughan et al., 2007). So much, that 30 years after the end of the war, 62% of packaged soft drinks and 89% on packaged beer were non-returnable (Busch, 1987). In 2013, packaging alone corresponded to 32% of total municipal waste in the European Union (Eurostat, 2013).

What before was looked merely as “reduce, reuse, recycle”, now requires a more holistic approach broadening the attention to the entire life-cycle of the product (Sonneveld et al., 2005). This broadened focus is supported by Marsh and Bugusu (2007), who state that all environmental impact studies of food packaging need to consider not only the impacts, but also the benefits, such as reducing food waste. At least one-third of the food produced globally is wasted annually, resulting in waste of land, water and energy resources and contributing to unnecessary CO_2 emissions and financial losses (FAO, 2011). Packaging can reduce not only these impacts, but extend shelf-life (Marsh & Bugusu, 2007) and also increase transport efficiency (Magnier & Schoormans, 2015), consequently reducing food waste, costs and environmental impacts.

To combine environmental standards with economical requirements of transport and distribution, while protecting the product throughout its supply chain are, according to Sonneveld et al. (2005), characteristics of a sustainable packaging. These are in line with the European Organization for Packaging and the Environment which elucidates that sustainable packaging should be designed to keep the product safe during its life cycle, be made from

responsibly sourced materials that can be recycled or efficiently recovered after use, optimize environmental performance, while also meeting market criteria of performance, cost and consumers expectation (Europen, 2018).

2.2 LEGISLATIONS

The European Parliament and the council of the European union set up in 1994 the directive on packaging and packaging waste, which shows member states policies that need to be incorporated. The directive has as aims to prevent and reduce the impact in the environment while avoiding obstacles of trading between the member states (EC Packaging Waste Directive, 1994). Some common EU targets are to recycle 75% of packaging waste by 2030 and to reduce landfill to maximum of 10% of municipal waste by 2030 (European Commission, 2017). Its latest revision was done in 2015. The directive states that reuse and recycling should be considered as first options regarding recovery of material for reducing the use of energy and resources. This recycling rate varies accordingly to European countries and their regulations in order to avoid barriers to trade. It also states that the inclusion of recycled materials in packaging should go against health, hygiene or consumer safety. The directive passes the responsibility to those involved in the production, usage and distribution of packaging and packaged goods according to the polluters-pays principle to take responsibility for the waste (EC Packaging Waste Directive, 1994).

To comply with the European goals, the Netherlands emitted the Dutch packaging Decree in 1997 and the Framework Agreement for Packaging. The Decree refers to the Netherlands Institute for Sustainable Packaging*, as supervisor of pilot projects as collection reuse or recycling of beverage cartons and to develop a methodology to create target for packaging production (Beatrix, Nederlanden, Aan, & Na, 2014). Dutch targets were bolder than those found in the European policies, as for recycling for example. However, a study done by Rouw and Worrell (2011) which evaluates the effectiveness of Dutch policies in reducing the total packaging volume, shows that the policies stopped being effective from 2000 on. This was due to the fact that packaging consumptions increased at a higher rate.

Since January 2009, the Belgian legislation, as called, Cooperation Agreement in the prevention and management of packaging waste has determined decrees that should be followed in the country, including Brussels-Capital Region, the Flemish Region and the Walloon Region. Some of the specifications are for example, recycling percentages variating

* Kennisinstituut Duurzaam Verpakken in Dutch, is an independent institute founded in 2012 consists of representatives of national government, packaging industries, scientists, amongst others.

on material type (60% by weight of beverage carton, 30% weight of recyclable plastics) (PEETERS et al., 1999).

The Belgian agreement mentions take policies stipulating that companies that place more than 300kg of packaging per year on the market is responsible for taking-back the materials. Sellers should also inform of their packaging prevention plans every 3 years. Both measures however, exclude retailer (PEETERS et al., 1999).

Europe has the 2030 climate and energy framework in which it is stablished the aim to reduce the greenhouse gas emissions by 40% compared to 1990, have a 27% share of renewable energy and the same percentage in improvements in energy efficiency (European Commission, 2018). However, those are not directly applicable to corporations. For corporations, the Environmental Energy Act requires them to implement energy saving measures with a payback of 5 years or less.

2.3 SUSTAINABILITY CONCEPTS & VALUE CREATION IN THE SUPPLY CHAIN

"Just doing good is no longer enough"
(Unctad, 2017)

Sustainability is key to achieve a successfully developed society (Baumgartner, 2014). However, the concepts regarding sustainability must first be clear, so that effective measures can be taken. According to Willard and Hitchcock, (2009) when there is a clear understanding of sustainability, it becomes easier to realize how it can bring positive improvements to the business, and once in the sustainability path, companies usually remain in this path.

Corporate social responsibility (CSR) has been widely used by companies and is sometimes misplaced as an equivalent to sustainable development (Baumgartner, 2014). Even though the term has been evolving since the 50's, environmental responsibility was only included in the 80's (Carroll, 2009). Coupled with the misleading name, there is still uncertainty around its definition, resulting in the misuse of the concept by not including the environmental practices (Dahlsrud, 2008). However, according to (Moon, 2007), corporate social responsibility is a way the company can self-regulate in order to contribute to social and environmental welfare. In other words, CSR refers to how a company can integrate social and environmental problems in its activities (Baumgartner, 2014).

As mentioned, sustainable development is more and more understood as composed by three pillars: social, economic and environmental responsibilities, also known as the Triple Bottom Line (figure 1), as created by Elkington (1998). Sustainable development focuses on the global impacts of actions done locally by the business (Moon, 2007). In this concept, ecology and economy merge into a win-win situation, reducing costs by increasing the efficiency in the use of energy and materials while keeping ethics and equity as a focus point, to ensure the needs of present and future generations are met (Baumgartner, 2014). According to Bansal and DesJardine (2014), sustainable development may require trade-offs such as smaller investments for short-term profits and higher for long-term. Corporate Social Responsibility (CSR) on the other hand, does not require this trade-off with time and usually produces actions that are good for society and the firm. By including time, the company recognizes that the future is neither always predictable nor controllable, which is acceptable when the business is resilient (Bansal & DesJardine, 2014). According to Moon (2007) companies have as main drivers to incorporate sustainability practices: market (consumers, suppliers, etc), society (NGO, media and general society expectations), government (policies and legislations) and globalization. A representation of the relation between the different sustainability concepts can be found in figure 2.

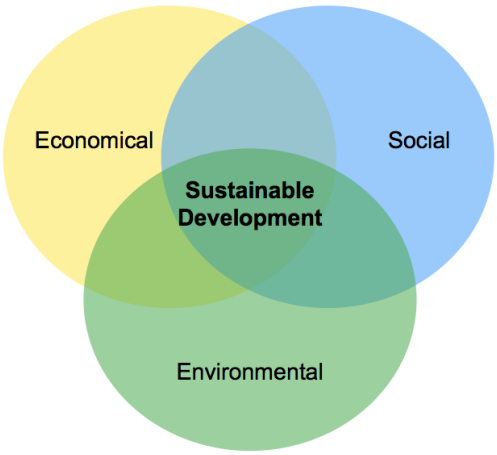

Figure 1: Representation of the Sustainable Development triple bottom line as defined by Elkington (1998).

Economic globalization has made corporations compete for the cheapest manufacturing and services, which is linked to the rise of retailing and brand power in the world economy. This results in considerable control from these brands over the global supply chain (Dauvergne & Lister, 2012). Since goods are being sourced all over the world, consumers, governments, and the own brands have been concerned about quality, safety and traceability of possible negative impacts in the supply chain (Trienekens & Zuurbier, 2008). The use of standards facilitates the verification and compliance of suppliers around the globe (Chkanikova & Mont, 2015), increases the transparency to the end-use consumer while also legitimatizing the power of retailers to require sustainability actions from suppliers (Chkanikova & Mont, 2015). Nowadays, there is a range of standards in the food industry differentiating products in a moral and health perspective. Some examples are UTZ Certified and Roundtable on Sustainable Palm Oil (RSPO) frequently used standards by producers. According to Kalfagianni and Fuchs (2012) standards are effective depending different factors including: how well defined and measurable it is, if it is audited by a 3rd party, to what extend is the

standard adopted and complied by producers and bought by consumers, and how well is it actually positively impacting the issue.

When a private standard is created, various aspects of food quality can be included, making it unnecessary to comply with a variety of different standards. On the positive side, this cuts costs, reducing therefore, the price of products on the shelves (Fuchs & Kalfagianni, 2010). It also helps transfer the demands of consumers and retailers upstream of the chain and improve supplier standards (Trienekens & Zuurbier, 2008). On a negative side, since the reporting is voluntary, companies that act unsustainably, can leave this information out of the report or only report it partially (Fuchs, Kalfagianni, Clapp, & Busch, 2011). This can result in an inconclusive efficacy and stringency of private standards (Fuchs & Kalfagianni, 2010).

Some companies adopted Codes of Conduct, which work as guidelines for retailers to deal with suppliers, government authorities, and stakeholders. It can be seen as an instrument used by companies that want to improve their CSR approach (Erwin, 2011). However, as some private standards, Codes of Conduct are not necessarily "certifiable" (Fuchs, Kalfagianni, Clapp, et al., 2011). To analyze its effectiveness, the quality of the codes' content, its implementation and its performance, should be analyzed (Erwin, 2011).

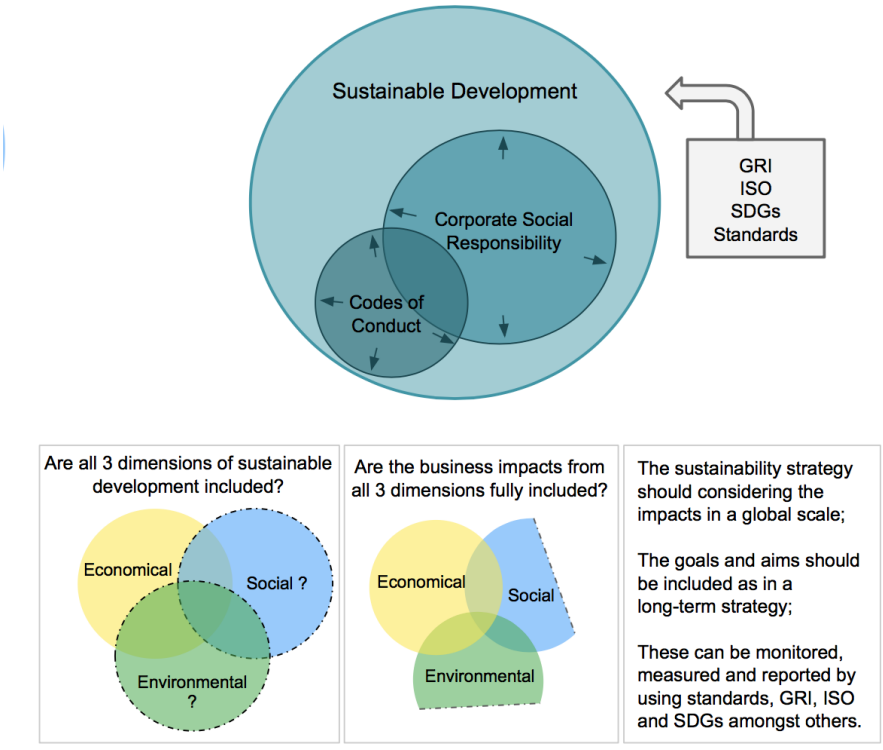

Figure 2: Representation of how sustainability concepts can interact according to literature. Codes of conduct and CSR can be used by companies to get closer to sustainable development, composed its three pillars. According to literature this should be done by tackling all impacts caused by the business in a global scale, with a long-term strategy. National and international guidelines should be used to measure these impacts and keep the business UpToDate with new demands.

There are different methods and guidelines that companies can use to incorporate and report about their sustainability strategy. The Global Reporting Initiative (GRI) for example, is a set of international guidelines on environmental, social and economic performance for companies to standardize their corporate social responsibility efforts. The International Organization for Standardisation (ISO) develops international standards that can be used by companies. GRI and other guidelines use ISO as metrics. By following these guidelines, firms can be certified (Morhardt, Baird, & Freeman, 2002). Some authors however, defend that there is a necessity to better translate international standards and guidelines into local sustainability practices, which can be done by including the Sustainable Development Goals (SDGs) (Unctad, 2017).

In 2015, the UN released the Sustainable Development Goals which is composed by 17 goals (Figure 3) and 169 targets and indicators with qualitative and qualitative objectives that tackle the social, economic and environmental spheres of sustainable development to be achieved until 2030. Even though these goals are not legally binding, governments are expected to develop frameworks to achieve these goals (Unctad, 2017; United Nations, 2018b).

Figure 3: The 17 Sustainable Development Goals.

The SDGs can be used by companies to improve their CSR practices (Unctad, 2017). The authors defend that the SDGs provide measurable targets for all stakeholders and increase partnership in the supply chain since they can identify common interests to tackle issues beyond one companies' border. Furthermore, using the SDGs would help companies have a broader focus and a cleared pathway to sustainability (Unctad, 2017). For example, Goal 12: Responsible Consumption and Production has as an aim to reduce waste generation

by prevention, reduction, recycling and reuse until 2030. It also highlights the necessity of actors in the supply chain cooperating to engage consumers and increase awareness and education regarding sustainable development (United Nations, 2018a).

Nevertheless, it is crucial to realize that regardless of the concepts, framework or methodology used*, actions are only incorporated if/when those in charge of decision-making are convinced of the value creation that will come with them (Manda et al., 2016). Value creation happens when a company recognizes opportunities in a new business, market or revenue stream (Bocken et al., 2014), which can result in cost and risk reduction, as well as product differentiation (Manda et al., 2016). Some studies show that there are three advantages common in many case studies of companies that adopted the triple bottom line model: economic and market share growth, higher employee retention as well as community support (Schulz & Flanigan, 2016).

Value creation can go even further when broadening its application to the entire supply chain. Sustainability is progressively linked to the supply chain management domain, especially when associated with environmental issues (Thöni & Tjoa, 2017). Sharma et al., (2010) highlight that environmentally responsible companies need to address not only consumers but also the supply chain, which should present a great inter-functional coordination. By managing the supply chain, companies improve the relationships between those involved, that will result in sustainable competitive advantage (Seuring & Müller, 2008; Sharma et al., 2010). These advantages can come not only as cost savings but also as economic sustainability and reputation enhancement, amongst others (Carter & Rogers, 2008). Vachon and Mao (2008) show practical cases in which a strong supply chain can walk hand-in-hand with economic growth and sustainability, by considering environmental and social performances and practices. This was observed with Nestlé, who was able to further strengthen the supply chain while improving its environmental performances, and with Nike, who realized that strengthening the relationship with their partners would result in better-monitored processes (Vachon & Mao, 2008).

Therefore, as depicted in figure 4, to help the sustainability strategy of retailers, it was first necessary to understand which sustainability concept(s) they make use of and what practices are currently taken by the company, if they are sufficient when it comes to sustainability effort, and then evaluate how this could be improved, complemented by theory.

* There are different frameworks and methods a company can use to incorporate and improve sustainability in its business model and in its supply chain. Even though this is not in the scope of this report, it is relevant to point for further reference concepts like explained by Bocken et al. (2014) on how a company can explore opportunities for innovations inside its business, or how a company can aim for a sustainable business model as explained by (Joyce & Paquin, 2016).

Regarding beverage/food packaging it was necessary to evaluate if their perception on the environmental impacts of packaging is in accordance with literature and how these are being addressed within their sustainability strategy. It was also important to verify if the perception of these impacts by packaging company, as Tetra Pak, is according to literature to avoid misinformation of retailers.

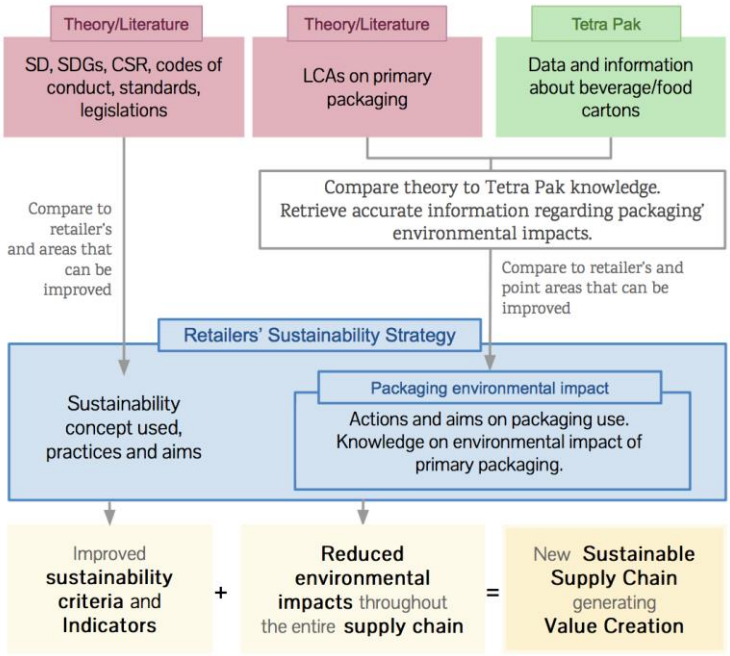

Figure 4: Conceptual Theory

If both changes are implemented by companies, they would result in a more complete set of sustainability criteria and indicators to be used that reduce their impacts throughout the supply chain, including their beverage and food packaging impacts. Turning these into action and applying them throughout the entire supply would result in a more sustainable supply chain and consequently generate value creation.

3 METHODS

Due to time restraints and aiming to give Tetra Pak clear and objective actions from the expected results, the report will devote more focus on the environmental pillar of sustainability. The research is divided into four research segments which are: literature, Tetra Pak, retailers, producers and consumers. In this report, “producers” is referring to brand owners that use Tetra Pak’s beverage/food carton or other packaging alternatives to pack products. Retailers sell products from different producers, but also from their own brand. However, most retailers do not fabricate their own products. For this, they do business with producers to fabricate a product under the retailer’s name. A schematic view of the methodology can be found in Figure 5. The comparison and relation between the different segments are depicted as a Venn Diagram in Figure 6.

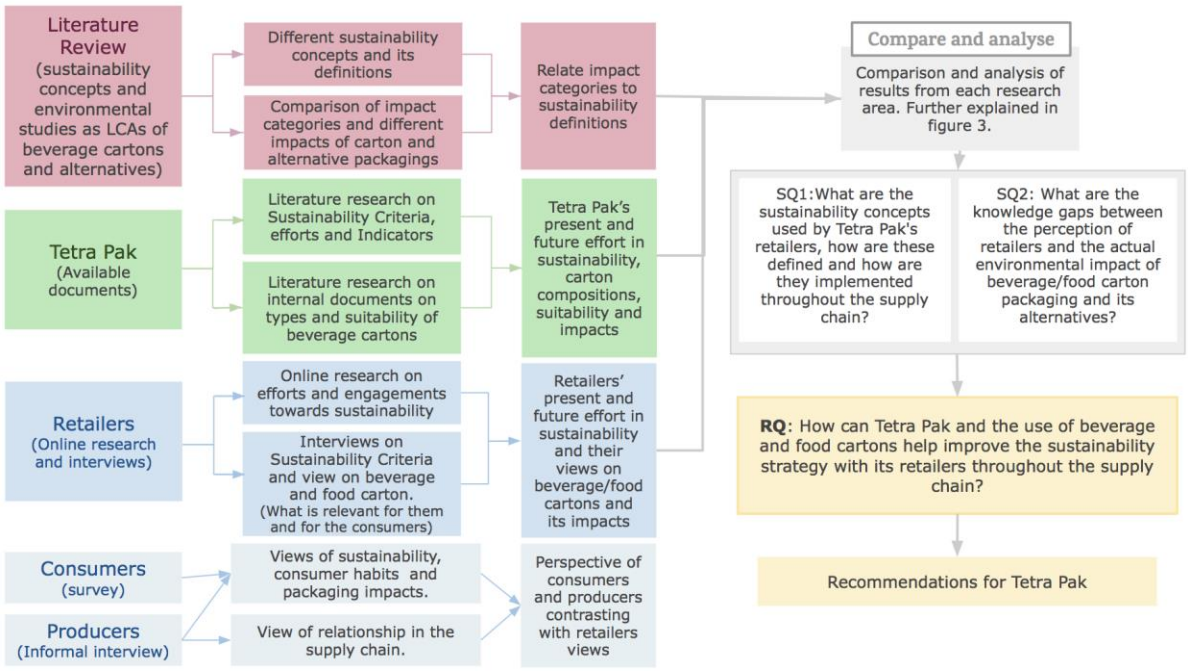

Figure 5: Research Framework.

Consumers and producers were considered in the methodology because Tetra Pak wanted to have a better view of their perspective before interviewing the retailers. This was due to the fact that retailers frequently base their choices relying on producers and especially on consumer’s preferences. By doing a survey with consumers and the interview with producers, it was possible to analyze differences between their views and retailers’ own perceptions.

After comparing and analyzing the results retrieved from the four research segments, it was possible to answer all sub-questions. Understanding the differences in sustainability concepts, the knowledge gaps regarding beverage/food carton impacts and what are the barriers to change to carton packaging, it then became possible to answer the research questions and make recommendations for Tetra Pak and its retailers. These will be further explained in the Results and Discussion sections.

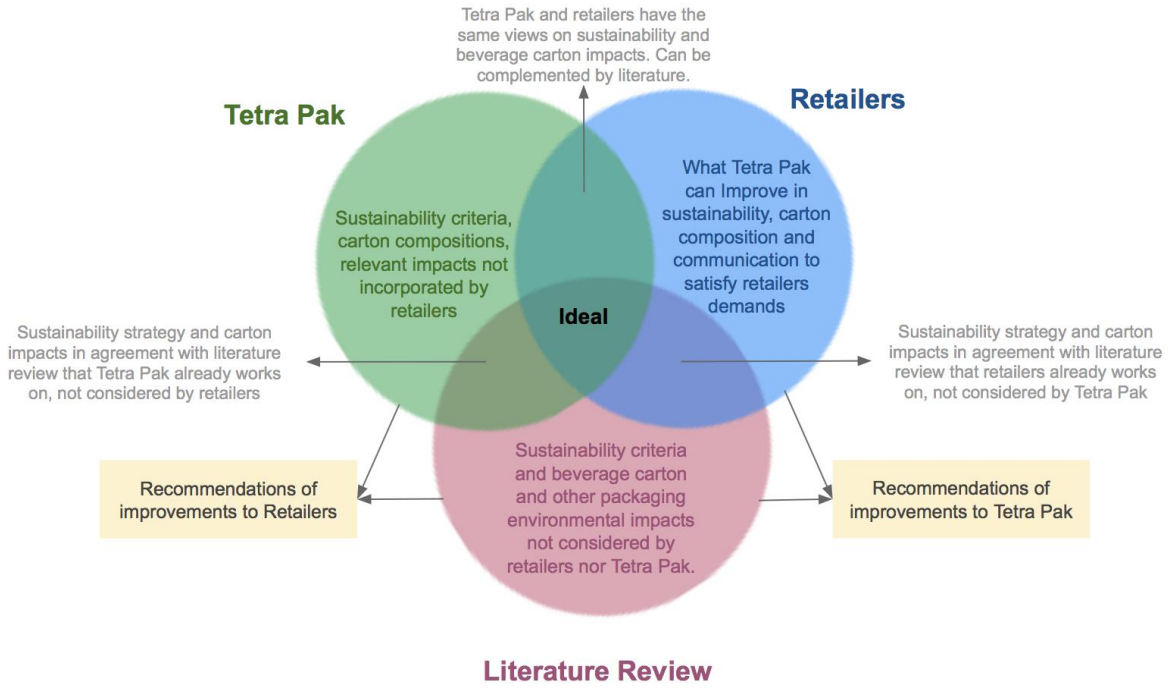

Figure 6: Three circle Venn Diagram further clarifying the comparison between the results retrieved from the three areas of the research.

Figure 6 is depicted as a Venn diagram so that the different interaction between research areas becomes clearer. The ideal situation is when Tetra Pak and retailers' sustainability practices are aligned between them and in agreement with the theory (literature review). This is also the case for the knowledge of the impacts of beverage and food carton packaging that should be known by both and be in accordance with literature. Outside the ideal situation there are three intersections in which two actors are in harmony, but there is still a third one to consider. Stakeholders, as consumers and producers, are not represented here since the main focus of this report is on retailers' practices and perspectives.

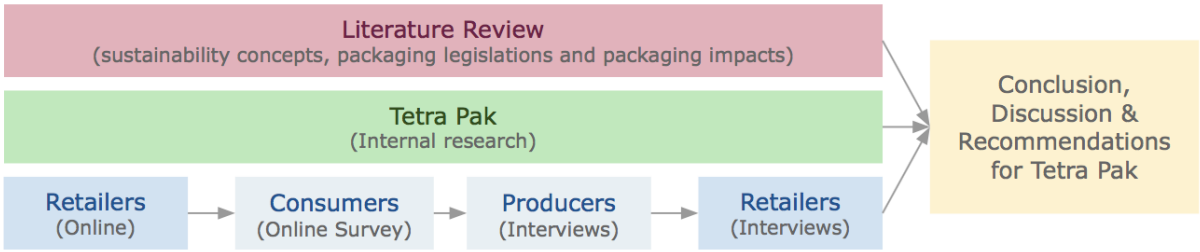

Figure 7: Three segments of methodology displayed chronologically.

Figure 7 is a chronological representation of the methodology. It was planned as such to more effectively gather information from each step.

3.1 LITERATURE REVIEW OF LIFE CYCLE ASSESSMENTS

Studies on environmental impacts of beverage/food packaging, such as life cycle assessments, were reviewed. Since Tetra Pak is the case study of this report and its main products are beverage and food carton packaging, the studies reviewed must compare the impact of beverage/food cartons to other types of packaging, such as plastic, glass and can. This step made it possible to evaluate what has been concluded so far on scientific researches concerning the environmental impacts of beverage packaging and which are the most frequently used impacts categories. These categories are impacted differently depending on the packaging material, showing the hotspots of each type. These hotspots were later analyzed and compared to preconceptions and views of retailers and consumers, revealing knowledge gaps on the matter.

The composition of the beverage and food cartons of the impact studies reviewed must be the same of those produced by Tetra Pak. This way, the studies' results can be used by Tetra Pak to better communicate with its retailers and consumers about the impacts of different packaging options.

3.2 TETRA PAK

The research on Tetra Pak was based on three sources: Internal documents, publicly available information and eventually interviews with staff in case additional information was necessary. These sources are essential to have a better understanding of the company, the processes around the entire product supply chain, their sustainability strategy and their current relationship with the retailers.

The different types of food/beverage cartons that are currently being produced, developments of new compositions that may be used in the future and its general suitability for different market segments were also retrieved. Understanding more about the products

and future aims can reflect the sustainability path the company aims to achieve. Their view and focal points on sustainability, as well as the way they perceive the demands and expectation of the retailers, gave better background information to understand some of what is backing their current sustainability strategy.

3.3 CONSUMERS

In order to better prepare for the retailers' interviews, and have a more holistic view of the participating factors of packaging consumption, a consumer survey was inserted in the methodology, also because it could give a perspective on consumers opinions that may be different from those experienced by retailers and Tetra Pak. The survey was constructed expecting to better understand consumers' perceptions on beverage packaging and its impact. The questions aimed at what is expected from an environmentally friendly company, what are consumer actions, and perceptions regarding consumption and disposal of packaging, what are their concerns regarding environmental impacts caused by packaging and which changes they would like to be made in purchasing and disposal options. The complete questionnaire can be found in Appendix B1.

The survey was conducted with 400 consumers from The Netherlands and Belgium, from the Flemish region, since Tetra Pak desires to focus on these specific areas. To ensure comprehension by the respondents, the questionnaire was launched in Dutch, their mother tongue. In Appendix B1, the questions are in English to be comprehensive to non-Dutch speakers and follow the use of English of this report. The survey platform used was Toluna QuickSurvey. This tool made it possible to determine which group of people are desired to answer the questionnaire, which in this case was a range of 18 years old and higher being these male or female. The questions could be set up as multiple choice, ranking options and order of importance, which was used depending on the question, these are specified after each question. During the formulation of the questions, it was also taken into consideration the answers from a consumer survey done by Tetra Pak in 2017.

3.4 PRODUCERS

During the PLMA* event in Amsterdam in May of 2018, it was possible to retrieve insights from producers regarding their influence of the stakeholders in the supply chain, as well as their perceptions on Tetra Pak and beverage cartons. It is important to notice that the

* PLMA is an acronym for Private Label Manufacturers Association, a non-profit organization that represents over 4.000 members around the world. The event in Amsterdam was attended by almost 3.000 companies aiming to bring retailers and manufactures together. Source: PLMA (2018)

producers interviewed were not exclusively Tetra Pak clients. The interviews were very informal and to maintain the anonymity of the interviewees, their names will not be mentioned. Since recording was not suitable for the situation, notes were taken of the interviewees' opinions. The results retrieved from this section were useful to have a basal perception of producers' opinions. Instead, a summary of the insights retrieved is presented in the results section of this report.

3.5 RETAILERS

This possible dissonance between theory and practice of sustainability shows how they perceive the environmental impacts of packaging options and if they realize how sustainability is actually linked to different topics of supply chain, such as transport and shelf-life. The efforts were also expected to vary depending on the sustainability concept the company makes use of, which shows how they see sustainability and the relevance they give to it. The literature was reviewed depending on which concepts were used by retailers. This helped to clarify the differences between theory and what was stated by retailers online and on the interviews.

The fact that sustainability terms are being used, does not mean that the companies fully grasp the concept, let alone apply it in its full magnitude. It was then imperative to analyze which concept were being used by the company, to then verify if they were congruent with the practices and indicators used to address the impacts caused by the business. This was done in two ways:

- Internal Policies

By analyzing if they used internal policies to control the primary packaging use, which could be a proactive measure or mirrored in national legislations.

- Measurement of the most relevant impact categories of the LCAs

Understanding that a life cycle assessment, determines the impacts caused by a product composition and by the processes throughout its life cycle in time and space, including material extraction, production, use and disposal (Finnveden et al., 2009), another way to evaluate their practices was to translate the impacts, as shown in life cycle assessment studies, into indicators of the company, for example CO_2 emissions, energy use, etc..

The research with Tetra Pak retailers, from the Netherlands and Belgium, was composed by two steps: online research and semi-structured interviews, which are explained below. The retailers aimed to be studied in this report are Ahold Delhaize, Albert Heijn, Jumbo, Colruyt, Carrefour, Ekoplaza, Superunie, Lidl and Aldi.

3.5.1 ONLINE RESEARCH

Firstly, online research on their own websites and available documents was carried out. This preliminary research was extremely useful so that the interviews could be better directed to their current sustainability practices and aims for the future, such as carbon emission reduction, energy use or plastic/ packaging policies.

3.5.2 SEMI-STRUCTURED INTERVIEWS

The interviews were conducted as semi-structured because these allow a set of pre-defined questions to focus on the topics that should be covered while also allowing flexibility for the conversations to vary according to the interviewees' opinions (Fylan, 2005).

The interviews were constructed with common questions, so that is would be possible to compare all retailers' answers. Extra few personalized questions for each retailer were asked depending on specific doubts on current actions or on information that could not be found online. The interviews were conducted by phone, due to the availability of the interviewees. The analysis of the interviews was done by manually verifying the similarities between what was until then found in available literature and by collecting additional information on topics that still required clarifying. The results of the interviews and of the online research are discoursed together in the result section to give a broader perspective of the actions and practices of each retailer. The interview's questions can be found in Appendix C1.

The Interview with retailers made it possible not only to have a deeper comprehension on their current sustainability practices and goals for the future, if/what they want to improve, but also on their expectations of Tetra Pak, their views on beverage/food packaging impacts and on their roles as retailers and change-makers.

4 RESULTS

4.1 LITERATURE REVIEW OF LIFE CYCLE ASSESSMENTS

Four articles and a meta-analysis of 22 LCA were reviewed. All articles are very consistent regarding the results of environmental impacts of beverages and food packaging options excluding minor exceptions. All articles consider as part of the life cycle the beverage production, transport, packaging production, waste collections and packaging disposal, this considering incineration, landfill and recycling. The impact categories presented differed from article to article, however, the most recurrent impact categories were: global warming potential, which measures the greenhouse gas emission (expressed in CO_2 equivalent), was present in all of them; cumulative energy demand (expressed in MJ), which indicates the amount of energy accumulated throughout the life-cycle, and acidification potential, which evaluates the release of gases such as SO_2, NO_x, NH_3 that produce sulfuric or nitric acid which acidifies soil and water being also responsible for the acid rain. A table comparing the articles considered can be found in Appendix A.

The article containing the meta-analysis done by Von Falkenstein, Wellenreuther and Detzel (2010) global warming potential, was considered in all 22 articles. The lowest impact was attributed to beverage carton in all cases with exception to one article that also took multi-use glass bottles into consideration. Cumulative energy demand was addressed in 19 of the 22 articles, of which 18, pointed beverage carton as the lowest impact option. Again, the one article that showed a different result, compared beverage carton to multi-use glass bottle. The result for acidification potential was the same, pointing carton as the lowest emission option, with one exception, which attributed a smaller impact for PET due to assuming higher recycling rate. Beverage/food carton showed the lowest impacts also in summer smog and eutrophication potential. However, Von Falkenstein et al. (2010) highlighted that for Land Use, beverage carton is always associated with a larger impact compared to alternatives, due to the use of paper from wood fiber* and that

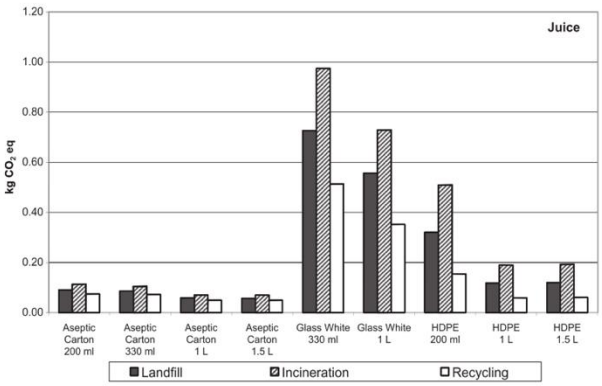

Figure 8: GWP Indicator for different juice packaging alternatives (Pasqualino et al., 2011).

* The results of water use are only showed in three articles and has a mixed result for beverage carton.

human toxicity was studied in only 3 cases and resulted in an unclear conclusion since the results varies depending on the indicator used.

Pasqualino et al., (2011) analyzed the life cycle of juice, including landfill, incineration, and recycling of different packaging options and sizes. The packages considered were carton, glass and HDPE. Figure 8 depicts the results on global warming potential. Energy use was analyzed and showed that glass has the highest impacts and carton the lowest. Regarding the disposal option, recycling was pointed as the least impactful option, followed by landfill and incineration. Another conclusion was that the larger the package, the lower the emission, pointing 1L package as the best alternative.

Meneses, Pasqualino and Castells (2012) evaluated the Global warming Potential and Acidification Potential of different sizes of aseptic carton, HDPE and PET bottles (Figure 9). The authors concluded that carton had the lowest impact for both indicators and recycling was again pointed as the disposal option with the lowest impact compared to landfill and incineration.

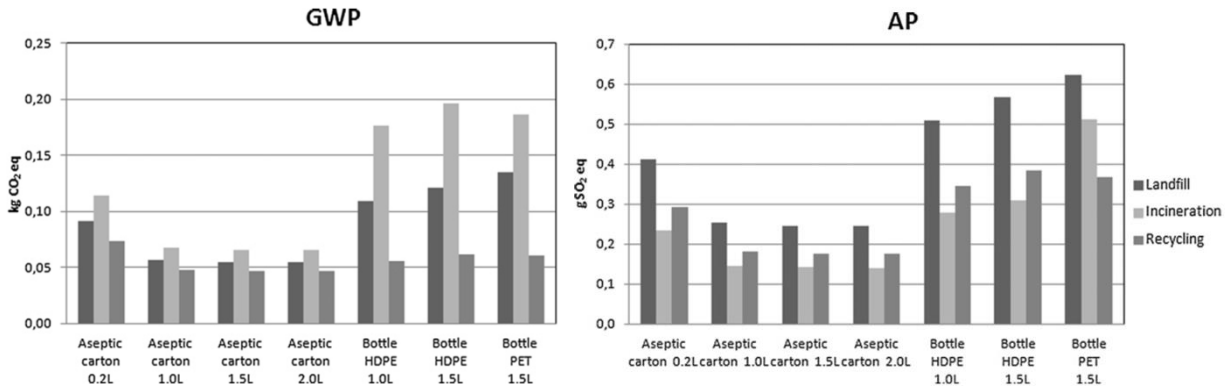

Figure 9: Global Warming Potential (GWP on the left) and Acidification Potential (AP on the right) of aseptic carton, HDPE and PET bottles (Meneses et al., 2012)

Bertolini, Bottani, Vignali and Volpi (2013), considered more impact categories, which are: cumulated energy demand, global warming potential, photochemical ozone creation potential, stratospheric ozone depletion potential, human toxicity potential, acidification potential and eutrophication potential. For all impact categories, beverage carton showed the lowest environmental impact (on average 30% lower than HDPE and PET) except for human toxicity*.

Many of the articles mentioned point to the fact that the material production phase is the most energy and emission intensive. Ghenai (2012), separates this footprint by material production, manufacturing, and transport phases as shown in Figure 10. The author highlights

* This article states that the packaging studied makes use of PVC labels. If this is no longer the case, the outcome for the impacts on human toxicity would be the lowest for beverage/food carton.

the fact that aluminum can and glass have the highest emissions during all phases, however, they can be reused. If so, 94% and 64% of the energy used to produce cans and glass respectively is recovered, stating that reuse is the best end of life option to reduce CO_2 emissions and recover energy.

	Material Production	Manufacturing	Transport
Plastic	825	394	164
Glass	2370	1450	218
Carton	204	74	9
Aluminum	9720	543	180

Figure 10: Carbon foot print CO_2 (Kg) the for materials, manufacturing and transport phases (Ghenai, 2012).

Cleary (2013) evaluates the environmental impact of changing from conventional single-use glass bottles to alternatives such as aseptic carton, lightweight glass and PET bottles. The results show that refillable glass and aseptic carton have the lowest impacts, being able to reduce up to 87% of the endpoint impact compared to single-use glass bottles. It is important to note that transport is responsible for a large part of the life cycle impact, so these need to be studies for each case in order to see if single-use bottle would still have low impact.

4.2 TETRA PAK

"A packaged should save more than it costs"

Ruben Rausing

Focusing on grocery distribution specifically on milk, in 1943 Ruben Rausing started developing a milk packaging that required a minimum of material. In 1944, the tetrahedral shape that gave Tetra Pak its name was born, providing savings in transportation and storage (Tetra Pak, 2002).

The idea of continuous filling came from Ruben's wife after he shared with her the difficulty of obtaining the correct amount in each package, since milk foams during filling. This continuous filling made it possible for packages to be filled completely while also removing oxygen, which prevents milk spoiling (Tetra Pak, 2002).

4.2.1 THE ASEPTIC CARTON

In 1961, Tetra Pak developed the aseptic sterilization technology for bacteria-free milk with heated hydrogen peroxide, which is later eliminated using pressure rollers or hot air. This technology together with the UHT (Ultra High Temperature) pasteurization process that heats

up the milk up above 135 Celsius, makes it possible to store the product up to 6 months without refrigeration and conservatives (Tetra Pak, 2018a). These aseptic packages prolong shelf-life, and by extending self-life, food waste is reduced, and resources are saved (Van Sluisveld & Worrell, 2013).

4.2.2 THE COMPOSITION OF BEVERAGE/FOOD CARTON

The beverage/food carton package is composed of six layers as shown in Figure 11. Around 75% of the entire packaging is paper alone, which gives rigidity to the package. The plastic layers isolate and protect the product from oxygen and external agents while protecting the paperboard from external and internal humidity. The packages can be of two different compositions, with or without aluminum foil, depending on the product. The aluminum provides an extra layer of protection against oxygen and light, necessary for products that degrade with luminosity. Figure 12 exemplifies how carton packaging can further reduce food waste by protecting the product against oxidation by having no air inside the package, protecting it against oxygen penetration and serving as a light barrier compared to alternative packages.

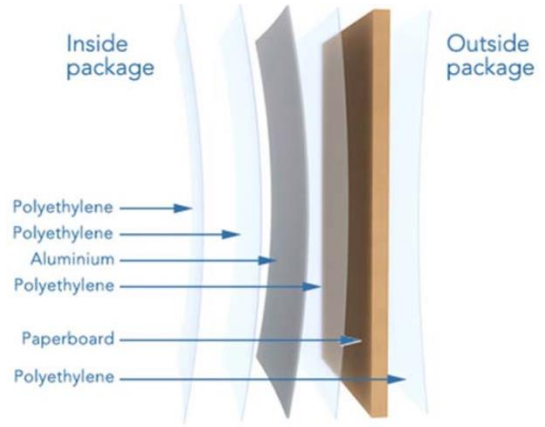

Figure 11: Layers of Tetra Pak Beverage/Food carton. Source: (Tetra Pak, 2018d)

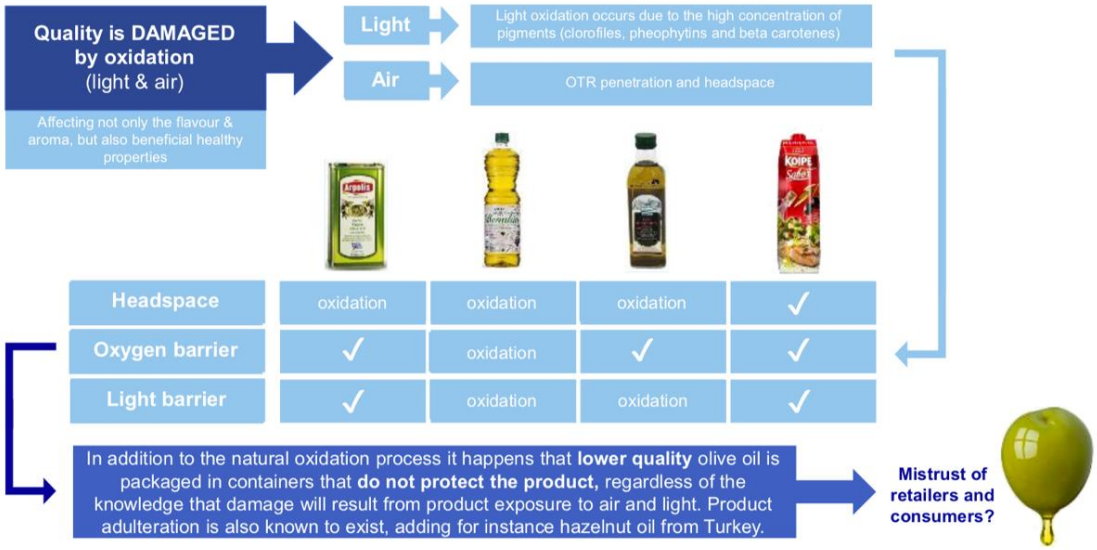

Figure 12: Comparisons between packaging alternatives and product damage (Personal communication with Tetra Pak Iberia.

Today, Tetra Pak packaging is used for milk, water, juices, wine, sauce, amongst others. The packaging and compositions are depicted in Figure 13. Furthermore, Tetra Pak's market researches show that when compared to can, these packages can save from 30% to 40% of shelve space at stores and more than 18% packs per pallet saving on transport space.

Figure 13: Tetra Pak packaging options for ambient temperature and food have the aluminum layer for extra protection, extending its life-time. Aluminum is not in the composition of chilled packaging options (Tetra Pak, 2018a).

4.2.3 PLANT-BASED BEVERAGE/FOOD CARTON*

Plastics from fossil fuels release CO_2 that is outside of the natural carbon cycle loop, for being buried for millions of years. Plant-based plastic, on the other hand, is inside of this loop (Freinkel, 2011) for being made of renewable resources such as plant and wood biomass (Iwata, 2015). Due to this factor, the demand for plant-based products is expected to grow in the near future (Manda et al., 2016).

In 2007, Tetra Pak released their plant-based package completely derived from plants. The paperboard is from FSC-certified sources and the plastic is produced with Brazilian sugarcane, including the cap. The package has no visual difference from fossil-fuels derived packages, with exception from the logos in the back (Figure 14). These certifications used for the bio-based packaging state that the sugar cane is

Figure 14: Logos shown in the back of the plant-based carton certifying its source.

* In this report, packaging made with bio-plastics is referred to as bio-based and plant-based. In the consumer questionnaire the word plant-based was used to avoid consumers confusing it with bio-degradable.

planted in mainly degraded pasture lands and does not compete with food production. Bio-based plastic produced from sugarcane have the same configuration as polyethylene (PE), which is not biodegradable, but can be recycled, as fossil fuel based PE would be (Tokiwa, Calabia, Ugwu, & Aiba, 2009; Tsiropoulos et al., 2015).

4.2.4 BIO-DEGRADABLE PACKAGING

According to Freinkel (2011) there has to be caution when talking about biodegradable plastics. Plastic is considered biodegradable when polymer molecules are completely consumed by microorganisms that turn them back into carbon dioxide, methane, etc.. However, if it is not completely digested, it should not be considered biodegradable. That is the case with a lot of biodegradable plastics that are only partially consumed, while the rest will break into smaller pieces and pollute soil, water and oceans (Freinkel, 2011). According to Kuciel, Kuźniar and Nykiel (2018) composting biodegradable plastic is not easy outside of the laboratory. There must be special conditions such as waste sorting infrastructure, consumer knowledge and legislations, and if mixed with normal plastic waste it can have negatives effects on the recycled final product.

4.2.5 STUDIES ON PACKAGING IMPACTS RETRIEVED WITH TETRA PAK

Tetra Pak has LCA's performed by third party institutes comparing the environmental impact of different Tetra Pak packaging and alternative packaging as glass, HDPE and PET. The results vary depending on the packaging type and size. Overall, beverage carton has a lower impact compared to alternatives.

A study performed by Markwardt, Wellenreuther, Drescher, Harth, and Busch Heidelberg (2017) shows that beverage carton has a lower impact for all impact categories except for aquatic eutrophication compared to PET and ozone depletion compared to HDPE as shown in Figure 15.

segment JNSD (chilled), Sweden	The net results of **Tetra Rex OSO 34 1000mL** are lower (green)/ higher (orange) than those of		
	PET bottle 2 900 mL	PET bottle 3 1000 mL	HDPE bottle 3 1000 mL
Climate Change	-86%	-85%	-85%
Acidification	-59%	-56%	-46%
Summer Smog	-41%	-36%	-19%
Ozone Depletion Potential	-74%	-73%	482%
Terrestrial Eutrophication	-39%	-37%	-26%
Aquatic Eutrophication	11%	26%	-34%
Human Toxicity: PM 2.5	-54%	-51%	-43%
Total Primary Energy	-58%	-52%	-56%
Non-renewable Primary Energy	-71%	-66%	-71%

Figure 15: LCA comparing PET and HDPE to Tetra Rex packaging (Markwardt et al., 2017).

4.2.6 LIMITATIONS OF USAGE OF BEVERAGE/FOOD CARTON

The carton package currently has some limitations regarding which products it can pack. Carbonated drinks cannot be packed with carton packaging since they cannot stand the pressure and could break. Drinks with fruit pieces or particles bigger than 1mm also cannot be packed in beverage carton since when the carton is sealed below beverage level, the particles can get caught between the strips and cause leakages.

4.2.7 DISPOSING

In the Netherlands, beverage and food cartons can be disposed of in the PMD (plastic, metal, and drinking carton) container or in the plastic bin. More information on regarding different municipalities and can be found in Hedra (2018) also on how to unfold the carton before disposing. Belgium has one recycling system throughout the country which is the PMD (plastic, metal and drinking carton) bin. More information can be found at Fost Plus (2018b). Bio-based beverage cartons should also be disposed of as the regular beverage carton according to the country collection system for having the same molecular structure as other polyethylene plastic (Tokiwa et al., 2009; Tsiropoulos et al., 2015).

The logo displayed in Figure 16 is displayed in most Tetra Pak products in the Netherlands and Belgium, showing consumers how to correctly dispose Tetra Pak packaging. However, since the brand-owner decides the design and the information contained on the package, it is their decision whether include or not.

Figure 16: Logos of how to correctly dispose of packaging (KIDV, 2018).

It is important to note that the correct way to dispose beverage and food carton can varies depending on the referenced country or even municipality. In some countries for example. Beverage carton should be disposed of in the paper bin. This should be made clear for consumers to avoid confusion.

4.2.8 RECYCLING PROCESS

Beverage and food carton are recycled by putting them into a pulper that damages the packages and is then filled with water. The hydra pulping process drenches the fibers separating them from the other materials, aluminum and plastic. The fiber is then turned into pulp sheets that can be used to produce different types of paper, as envelopes and tissue

paper, and the plastic and aluminum is recovered and fully recycled into various items such as boards or roof sheets. More information can be found at Tetra Pak (2018c).

4.2.9 TETRA PAKs SUSTAINABILITY STRATEGY

Tetra Pak has a section on their website dedicated to sustainability. Their sustainability strategy has as base their brand promise: “Protect what’s good” which is divided into Protecting People, Food and Future. The sustainable development goals that are tackled in each of these three segments are specified in their sustainability report (Tetra Pak, 2017).

The company is currently investing in renewable energy and aims to source 100% of its electricity from renewable sources until 2030. The company also aims to cap their carbon impact as 2010 levels by 2020. They also want to reduce the operational greenhouse gas emissions by 42% compared to 2010 by 2030. Furthermore, Tetra Pak is actively engaging with stakeholders to develop solutions and create shared value. They have been working together with their stakeholders to minimize the impact from sourcing to disposal of the packages (Tetra Pak, 2017).

Aiming to tackle a sustainability issue of resource use, Tetra Pak started using in 2007, FSC labeled paper to produce the cartons. FSC or Forestry Stewardship Council is a standard that ensures that the production does not come from illegal harvesting. Today 100% of carton is produced with certified paper by FSC and other standards (Tetra Pak, 2017).

4.3 CONSUMERS

The consumer survey was answered by 403 Dutch and 411 Belgium people in less than a week. The complete results can be found in Appendix B2. Nevertheless, the most interesting results were the following:

“1. How important is for you that a food company acts environmentally friendly?"

In this question, consumers rated the relevance of a company being environmentally friendly variating from not important at all to very important. 53% of Dutch consumers answered that is was important and so did 46% of Belgians

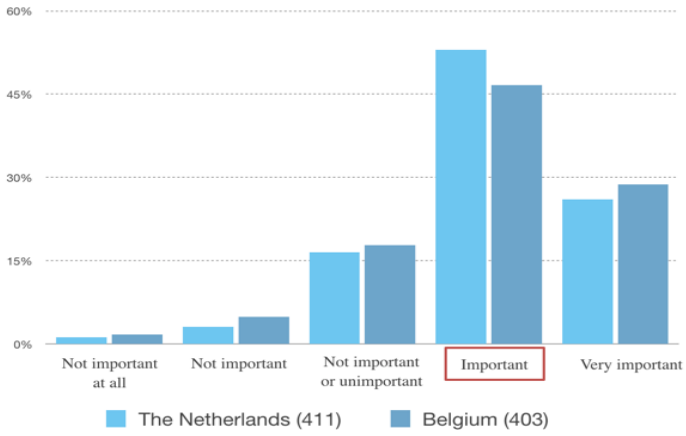

Figure 17: Consumers raking the importance of a companies to be environmentally friendly.

as shown in Figure 17. These results show that consumers expect companies to be environmentally conscious about their impacts.

"2. What are packages of the beverages you frequently buy?"

In this case, the graph is showing the answers by number of respondents, since in this case, they only had to tick the product if they frequently buy it. The beverages that could be chosen were milk, juice, and water since these are the most common beverages sold by Tetra Pak.

The results show that the most frequently bought packaging is carton followed by plastic. However, when it comes to the product, juice and milk are mostly packed in carton, while water if mostly bought in plastic.

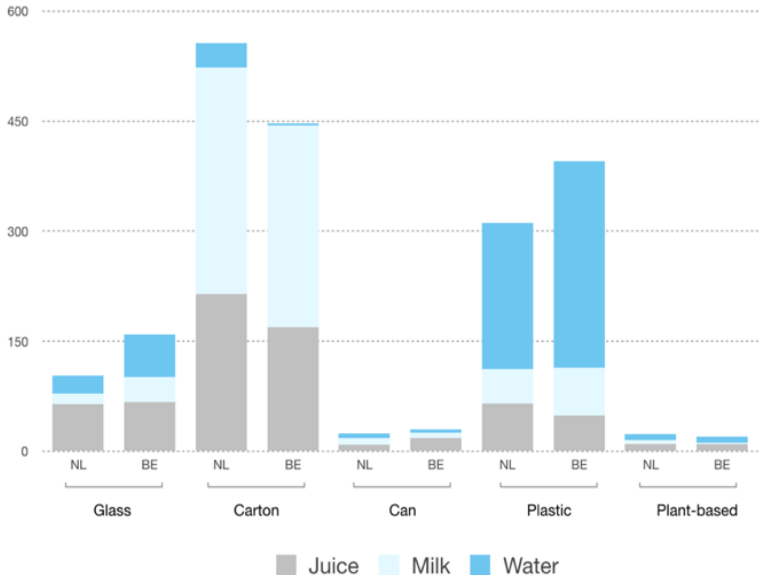

Figure 18: Consumers answer regarding the type of packages of frequently bought beverages. The values refer to the number of respondents.

Question 4 and 5 were the most important questions in the survey since the aim with these questions was to see if their opinion would change once they were correctly informed about the impacts of different packaging types. Question 4 was:

"4. Which packaging material do you think is more environmentally friendly?".

After consumers answered question 4, they would see a graph showing an LCA assessment* with the CO_2 emissions of plastic, carton, and glass. The following question was "5. Viewing these impacts which one would you prefer to buy?".

Figure 19 depicts the difference in answers before and after the impacts were observed. It is important to note that for question 4, consumers could choose between 5 packaging options (glass, carton, can, plastic and plant-based) and in question 5 there were only 3 options (glass, carton, and plastic) since those are the options shown at the image from the LCA. This was done like so because there was an aim to see their perception of plant-

* The image was retrieved and altered so that only the LCA results for plastic (HPDE 1L), carton (aseptic carton 1L) and glass (white glass 1L) would be shown to consumer to avoid graph's misinterpretation. The original graph from the LCA is as displayed on figure 8 or can be found at: Pasqualino et al., (2011) as "fig1. GWP indicator for different juice packaging alternatives".

based packaging compared to alternatives and on question 5 the aim was to retrieve their perception regarding only the 3 main packages used for beverages.

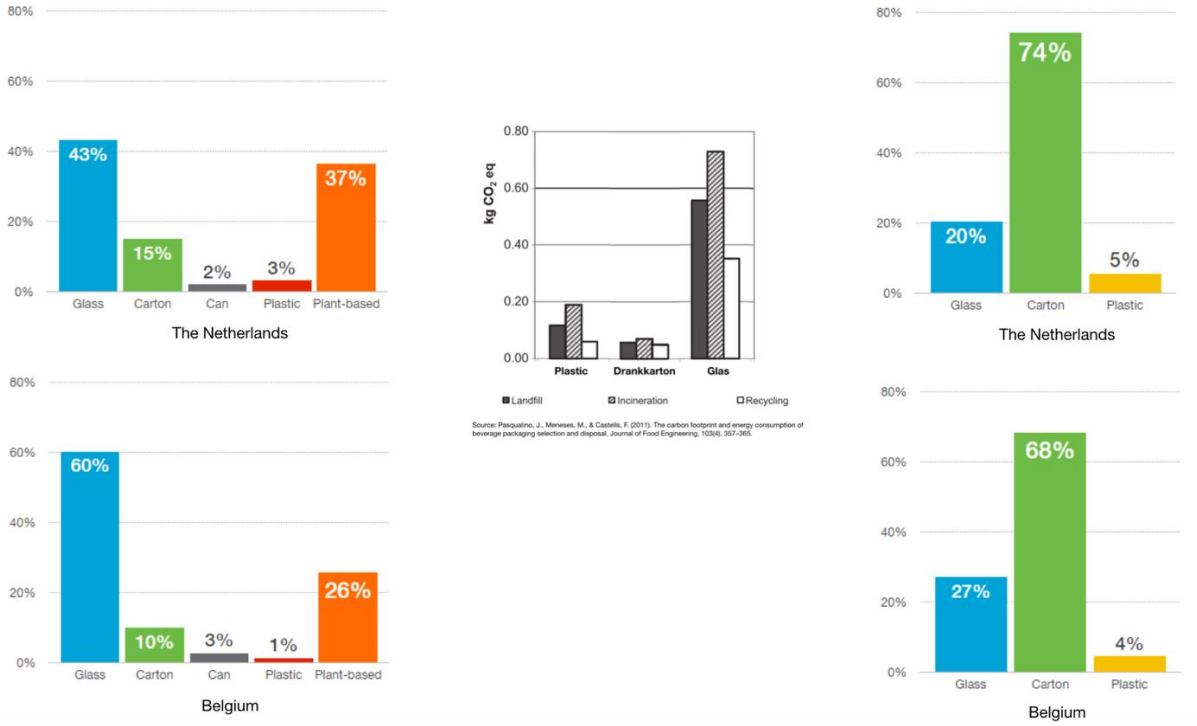

Figure 19: Consumers answer for question 4: "Which packaging material do you think is more environmentally friendly?" (on the left). Image used to show consumers the impact of different packaging options as used in the questionnaire (In the middle). Consumers answer to question 5: "Viewing these impacts which one would you prefer to buy?" (on the right).

Even though this results in a not very fair comparison between both results, it still becomes clear the increase in the preference for carton compared to plastic and especially glass which was first pointed by them as the most environmentally friendly option. This is in accordingly with the findings of Rokka and Uusitalo (2008), who state that 34% of consumers prefer the most environmentally friendly packaging option. Their research aim was to analyze to which extent consumer preference for environmentally friendly packaging would prevail over other products characteristics such as price, brand, and reseal-ability.

The aim with question 6 was to evaluate the relevance of price when purchasing beverage carton. It was asked: "Would you buy beverage carton if it was:" and consumers could choose between "Yes, if it is the same price", "Yes, even if it is slightly more expansive", "Yes, only if it is cheaper" or "No, I do not prefer beverage carton". The results as displayed in Figure 20 show that the majority of consumers, around 60% in both countries would buy carton if the price was the same and 20% and 30% (Belgium and the Netherlands respectively) would buy even if it was more expensive. This answer was later reinforced by question 14 in which around 50% of respondents said that price was one of the main barriers from taking

more environmentally friendly actions followed by “Limited options in the regular supermarket to buy products in other packaging” and “Limited options in the regular supermarkets to collect packaging”.

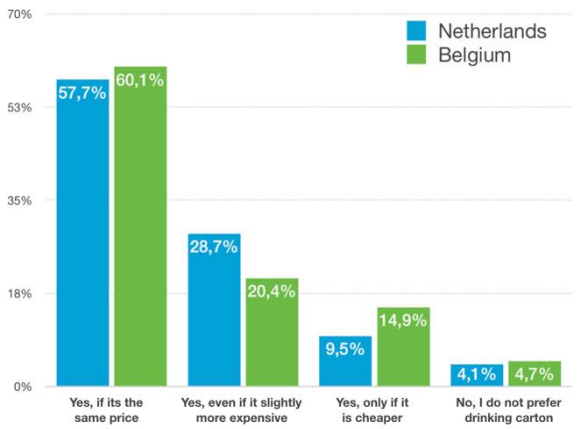

Figure 20: Consumers answers to relevance of price when purchasing a beverage carton.

Another question that provided interesting results was number 7: “How do you dispose of your waste?” depicted in Figure 21. The consumers had to choose how to dispose of different packaging materials (glass, carton, can, plastic and plant-based) in different disposal options (regular waste, glass bin, PMD, paper bin, return at the supermarket or compostable bin).

The great majority of glass is disposed of by respondents in the glass container, however, even though the option plastic container had the PMD acronym which stands for plastic, metal, and carton*, carton is still frequently disposed of in the paper container. Another interesting outcome was that plant-based packaging is disposed of in the compostable container (GFT - Groente, fruit en tuinafval or vegetables, fruits and garden waste in English) or paper container, showing that consumers probably think that plant-based packaging is fully compostable.

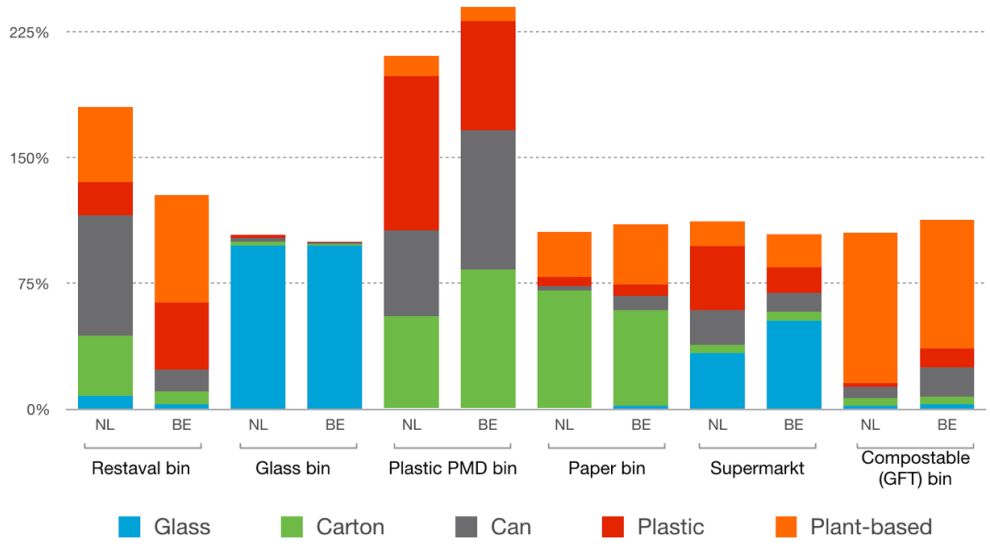

Figure 21: Consumers answer to how they dispose glass, carton, can, plastic and plant-based packaging with the options of Regular waste, glass bin, plastic PMD bin, Paper bin, return ant the supermarket and compostable "GFT" bin.

* Plastic, metal and drankkarton in Dutch.

After retrieving the results from this question (Figure 21), it was noticed that it could have been phrased differently since it might have caused misinterpretations from consumers. This is attributed to the fact that the word used was carton, instead of beverage carton even though the name of the survey was Environmental impacts of drinking packaging.

On question 10 “Which of the below actions have more positive impacts on the environment?” revealed the consumer perception regarding different actions.

The respondents affirm that between the three options: Choosing which product/packaging to buy, limiting food waste at home and recycling, the least important action was choosing the product/packaging and recycling and limiting food waste had close results as having the most beneficial impact in the environment. The result from Dutch consumers is displayed on figure 22, however, the result for Belgium had similar results and can be found in Appendix B2.

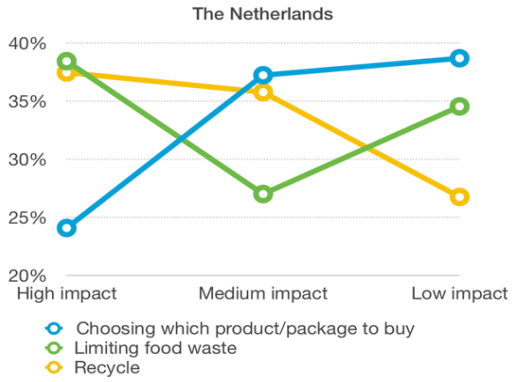

Figure 22: Dutch consumers answers to the level of impact the actions of choosing which products/package to buy, limiting food waste and recycling has on the environment.

4.4 PRODUCERS

During the PLMA event it was possible to retrieve some views of producers. The interviewees were in different positions in the company; including sales, export, administrative manager, etc). In total, 18 producers gave their point of views on beverage/food carton packaging.

From these 18 producers, 10 see beverage/food carton packaging as the most sustainable and have a good image of the product. However, 2 had a negative perception saying it was worse than plastic due to having different layers or for probably being more difficult to recycle. The other 6 producers were not sure about which was the most environmentally friendly option.

- Carton is cheaper

One-third of the producers interviewed pointed out that carton is cheaper, and many highlighted the fact that this was also due to the no refund value, which is different for plastic and glass.

- Carton packaging is chosen for kids because of the straw

Three producers emphasized the choice of carton packaging for products addressed to children because straws make it easier for them.

- Consumers prefer alternative packaging over carton

Three producers stated that consumers prefer plastic or glass. One of these highlighted that retailers know that carton is the best option, but at the end, it depends on consumer preference. Therefore, Tetra Pak should work on educating consumers to change their view.

- Who is the change-maker?

It was stated by most producers that they usually do according to what the retailers want, since they are the ones selling the products. However, one producer highlighted that once a brand changed to a plant-based packaging, which is an innovative measure, a retailer was interested and asked to also have this packaging option, showing that in this case, the producer was the change-maker.

- Plastic in carton packaging can be detrimental for Tetra Pak

Contrasting the previous perception, one producer stated that If consumers learn that there is plastic in the carton packaging, this can be a risk for Tetra Pak because of the growing awareness against plastic with the plastic soup issue.

- Beverage packaging visibility in the shelf

There were also contrasting views regarding carton packaging visibility in the shelf. While one consumer said that carton packaging is old-fashioned compared to plastic, another one stated that carton is more attractive to consumers.

One producer has a clear view of the environmental and cost benefits of carton packaging and desires that Tetra Pak pays more attention to food packaging.

Another producer even stated that they had their main and most famous product for years packed in cans and were worried to change to carton. However, they were surprised to see that this change not only did not affect the sales of the product but in a few years after the change, the sales actually increased, showing that consumers keep being loyal to the brand.

4.5 RETAILERS

The retailers Tetra Pak addressed in this report are Ahold Delhaize, Albert Heijn, Jumbo, Colruyt, Carrefour, Superunie, Ekoplaza, Lidl, and Aldi. The first step in setting up the questions for the interviews was to assess what was mentioned online regarding their sustainability efforts, especially on their websites. Albert Heijn and Jumbo are the biggest retailers in the Netherlands accounting together for more than half of the market share (Distrifood, 2017). A table summarizing the results and how this related to research questions and sub-questions can be found in the end of the results section.

4.5.1 AHOLD DELHAIZE

The interview with Ahold Delhaize was done by the phone due to the interviewee availability.

Delhaize was founded in 1867 as a grocery business in Belgium and has continuously expanded since then. In 2016 Ahold and Delhaize merged, being currently between the biggest retailers in the world with 21 brands. Some of their brands are Ethos, and Gall & Gall in the Netherlands, Delhaize in Belgium and Albert Heijn and Bol.com, present in both countries. Around the globe, it is present in Europe, the United States, and Indonesia (Ahold Delhaize, 2018a).

In 2015 Ahold Delhaize was included in the Dow Jones Sustainability Index, an Index that classifies benchmark sustainable businesses for investors that seek for long-term shareholder value (Dow Jones Sustainability Indices, 2018). Their sustainability strategy is divided into three categories: Governance Structure, Material Suitability Topics, and Sustainable retailing strategy. The section "Sustainable Retailing" explains the company's vision and strategy and how their efforts support the UN Sustainable Development Goals (SDGs) that are shown in figure 23.

Figure 23: Sustainable Development Goals that are being tackled by Ahold Delhaize in their sustainability strategy (Ahold Delhaize, 2018b).

Their main focus is divided into three areas: "Enable their brands' customers and associates to eat healthier food every day"; "Reduce food waste" and "Provide a healthy and inclusive work-space for its associates ". Their sustainable retailing strategy in five areas: Product safety and sustainability, climate impact, associate development, safety at work and

local community connection (Ahold Delhaize, 2018b). The company aims to reduce their CO_2 emissions to 30% by 2020 compared to 2008 (reducing the global warming potential of refrigerants to 2230 by 2020) and increase the recycling rate from 73% to 80% also by 2020 (Ahold Delhaize, 2017).

Ahold Delhaize supports the Consumer Goods Forum's (CGF), an organization that helps retailers and consumer goods manufacturers to collaborate, and the Global Food Safety Initiative (GFSI), a standard that improves food products' safety. The company is also a working group of Roundtable on Sustainable Palm Oil (RSPO), part of the Board of Global Sustainable Seafood Initiative (GSSI) and is a member of UTZ Standards Committee, amongst others. According to their website, their own brands are 100% GFSI-certified or compliant with another standard, 80% of their own brand suppliers are already audited by standards. The interviewee pointed out the importance of having standards to better control the supply chain of their own products. According to the interviewee, the main driver to improve the sustainability strategy and the environmental impact is risk. Risk that a product might not be available in the future.

Furthermore, in their website, Ahold Delhaize emphasized the importance of engaging with stakeholders to understand what social, economic, and environmental topics are important in their view (Ahold Delhaize, 2018b). This was mentioned during the interview when packaging was discussed. Ahold Delhaize wants to work together with producers to better understand their needs and the options they have. Even though they do not have a policy on packaging alone, the interviewee stated that a document is given to producers that works as a checklist that they can use to try to make packaging more sustainable. However, they do want to make a plastics policy in the coming months. It was also pointed out that there is pressure against plastics from different sides as plastic soup discussion, UK retailers, and consumers.

When asked about beverage and food carton in specific, the interviewee could not really explain why a type of packaging was chosen or what are the barriers to change to carton, but that packaging is decided depending on which option will better protect the product inside. Factors like cost, attractiveness to consumers, etc., are also taken into consideration.

It was pointed out that the part of the supply chain that they are most worried about is disposal and how consumers will discard the packaging. According to the interviewee, Tetra Pak should help consumers understand about the most sustainable option and how to dispose of it by explaining in a short sentence or putting a logo on the packaging. This was emphasized throughout the interview. When asked about bio-based packaging, the interviewee thinks that this has to be done cautiously, since the best use of land might not be to grow packaging.

Regarding change-makers, Ahold Delhaize wants to be a front-runner, but that working together with suppliers is essential, so they can better understand the packaging options and necessities. Since Albert Heijn is part of the Ahold Delhaize group, it was asked if the sustainability strategy of both are the same or aligned. The answer was yes, it is aligned, and that Albert Heijn has to use this as a base, going beyond if desired, but not doing less.

4.5.2 ALBERT HEIJN

Opened in 1887 and in 1952 had the first self-service supermarket. In 1973 Albert Heijn changed its holding name to Ahold, an abbreviation of Albert Heijn holding. Albert Heijn currently has 35,3% of Dutch market share (Distrifood, 2017).

The interview with Albert Heijn was done by phone. A lot of the interviewee's work revolves around packaging, so the answers were mainly focused on their packaging policies and aims for the future. The interviewee stated that regarding their packaging policy, they have been following the 4R guidelines, as pointed out during Ahold Delhaize interview, for several years now. However, last year they started working on the target of reducing they primary packaging by 15% until 2020. When the reduction reaches its limit, they would go to the second step, which is to reuse, which is not possible for food. For the third step, which is recycling, the interviewee mentioned two targets: introduce 50% of recycled content in PET bottles by 2020 and by 2025 have every packaging recyclable and as much as possible from recycled sources, which according to the interviewee is a common target of many companies. According to the interviewee, PP and PE (polypropylene and polyethylene), can be recycled but cannot be used for food packaging. The interviewee stated that this is not the case for PET, which is already composed 80% of their ready-to-eat salads and 95% of meat packaging and further stated that for beverage this percentage could rise to 100%, but not for carbonate drinks.

The interviewee highlighted throughout the interview that Albert Heijn wants to improve the relationship and communication with their suppliers regarding packaging communication. That suppliers have the knowledge and are aware of innovations regarding packaging, which many times might not be known by Albert Heijn. Therefore, it is important for them to not only communicate this, but also "push them back", as said by the interviewee, if the wrong choice of packaging is being done by the retailer. The respondent see that this may be intimidating for suppliers, who may be scared of compromising the business, but that is something they are currently trying to improve.

When asked about the reasons of choice of the different packaging alternatives, it was answered that they believe this depends on the supplier and the machine they have available. So that the product is firstly chosen by quality, then price and then the packaging, if possible to choose between options, will be chosen depending on the image they want to convey with this product. When it comes to their own brands, packaging is a way they have of differentiating between the brands. One brand is packed in carton, while another in plastic or glass, all depending on the products' characteristics. When talking about carton, the interviewee thinks that carton is not always the most environmentally friendly option, that this varies according to product, transport, shelf-life, etc.. and that maybe recycled PET would be a better option. However, in the interviewee's opinion, consumers see beverage carton as the most environmentally friendly option.

Regarding the deposit refund*, the interviewee explained that it is mandatory for soft drinks and water that have a content of 1 liter or larger and the packaging are plastic or glass. However, since a few years ago, these bottles can no longer be refilled and have to be recycled.

It was reinforced during the interview that Albert Heijn prefers mono packaging (made with only one material), and that for carton they are avoiding the carton with aluminum in the composition, for being, according to the interviewee, a scarce material. That some products they are changing to aluminum free carton, which shortens the shelf-life but is still inside the pattern of shelf-life desired by the company. In fact, when asked about what Tetra Pak could do to help them improve their sustainability strategy, the interviewee reinforced this saying that it would be ideal if Tetra Pak had a beverage carton without aluminum, but still maintain the properties of oxygen and light barrier.

The interviewee reminded of the fact that some years ago, beverage cartons did not have caps, but that today due to convenience and to avoid spillage and product waste, caps are preferred, however this brings a downside of adding more plastic to the package. Relating to this, it was said that Albert Heijn would like a carton package that the screw cap would stay with the packaging after use, since for being small, it can end up in the residual waste, which is incinerated in the Netherlands or even if in the recycling stream it can fall off and not get recycled. Another alternative pointed out by the interviewee was that Tetra Pak could develop a cap made of carton instead of plastic. It was also mentioned that they think Tetra Pak is doing a great job with the bio-based packs and that Albert Heijn is in favor of bio-based once recycled material is not feasible. For example, as said by the interviewee, in milk bottles or for

* The deposit refund is called statiegeld in Dutch.

the inner side of carton, when recycled plastic is not an option, bio-based plastic would be the best alternative.

4.5.3 EKOPLAZA

Ekoplaza started in 1980 in Amsterdam focused on natural products (Ekoplaza, 2018c). Almost two decades later, became the franchisor of Udea, a wholesaler of organic food (Udea, 2018). Ekoplaza has as main goal to supply organic, healthy food with an accessible price. Due to its concern about soil and Earth itself, Ekoplaza has been a front-runner in combating plastic.

The supermarket opened the first plastic free pop-up store this year, which was open from Feb until April. Nevertheless, all plastic free products were made available in all supermarkets. Working in collaboration with the Plastic Soup Foundation and Plastic Planet, the brand seems to be putting a lot of effort on its fight against plastic packaging and has been resorting to glass, paper and compostable bio-materials (Ekoplaza, 2018b).

The interview with Ekoplaza was done by email according to the interviewee preference. Due to their actions against plastic and knowing that Ekoplaza does not accept beverage/food carton packaging due to the existence of plastic in it, the questions were slightly altered and will be mentioned in the next paragraphs.

Knowing that Ekoplaza has been working to reduce its emissions and is concerned about its environmental impacts, it was asked how they see the fact that, comparing packaging options glass is the best option only if reused. If produced or even recycled, glass has the highest CO_2 emissions compared to plastic and carton, according to various LCA studies. So, taking this into consideration, how are the environmental impacts taken into consideration by Ekoplaza. The interviewee answered that Ekoplaza works in a long-term investment and therefore, do not want a material that comes from fossil fuels, that only a small amount gets recycled and is indestructible “It can never be that an indestructible material from an unsustainable source is the best option for the future”.

On their website, Ekoplaza explains that they make available the return and deposit of plastic bottles and cans in their supermarket. This deposit system is costly for supermarkets, which explains why some supermarkets may not do it. However for Ekoplaza the impact on the environment is heavier (Ekoplaza, 2018a). It was asked if they have plans to directly work with producers to reuse, instead of recycling the glass bottles used to pack their products. The interviewee confirmed what was already explained in the website regarding the return and

deposit for plastic bottles and cans and complemented saying that Ekoplaza wants to intensify the refund system in the Netherlands.

When asked about the main components of their sustainability strategy, the interviewee answered that the fundaments of their sustainability strategy are based on IFOAM but it is also inspired by the SDGs or by topics brought to them by NGOs. For their packaging strategy, they have been closely working with the Plastic Soup Foundation, as mentioned on their website. When asked if they use GRI or ISO, since it was not found in available documents, the interviewee stated that for being a business to consumers organization they use GRI and ISO as guidelines choosing topics relevant for consumers. Ekoplaza still wants to create a supermarket where consumers can shop without creating negative side effect on the environment, this relating to energy, biodiversity and materials. So, they want to work to become carbon free and be more transparent with their supply chain, having the correct packaging.

Ekoplaza reduced its CO_2 emissions by 66% in 2016 compared to 2014 and wants to reduce its energy consumption. The brand current aim is to become self-sufficient in energy generation. Today, Ekoplaza is supplied with 100% renewable energy, wind more specifically (Ekoplaza, 2016, 2018b). The interviewer also pointed out that the main drivers to improve the sustainability are: reducing CO_2 emissions, Plastic Soup, impact on biodiversity and reduce food waste, since they believe consumers do not want to contribute to these negative side effect.

When asked about their relationship with suppliers and which end has the biggest influence, the interviewer stated that both ways are possible and that they want to cooperate, so they achieve the best solution. When it comes to packaging, the decision often comes from the supplier. Ekoplaza at this point helps them choose the most sustainable option. They said that this cooperation throughout the supply chain was a main focus point, together with the raw material source and other aspects such as distance, avoiding unnecessary impacts.

Finally, the interviewee was asked about how Tetra Pak could help them in their sustainability strategy and answered that supplying a packaging that is plant-based from sustainable resource, recyclable in an easy way and compostable at the end of life, when it can no longer be recycled is the best option they see as packaging for the future.

4.5.4 ALDI NORTH GROUP

Aldi started in 1913 and Albrecht family opened the first store Albrecht Discount in 1914. The base concept of the company was to sell high quality products with low prices (Aldi,

2018). Today Aldi North Group has more than 4 thousand stores over 8 European countries including the Benelux region (Aldi, 2016) and is responsible for 6,7% of the Dutch market share (Distrifood, 2017).

On their Annual Report, the company specifies their actions on a responsible supply chain including increase their own products being RSPO certified palm oil, UTZ, Rainforest Alliance FSC or PEFC-certified and Fair-trade. In the interview it was stated that they use QR codes in the back of meat products which inform consumers about the meat, its origin, and how it was produced. In their annual report, specific targets and target dates, are stipulated, for example a 40% reduction of greenhouse gas emissions by 2021 compared to 2015.

This is also explained in their Climate Protection Policy report in which it is specified some other actions to reduce their emissions. Figure 24 shows the company's emissions in 2015. In their annual report, the actions being taken to reduce this footprint as including LED lights in stores and change those of existing stores, part of the energy used is generated by solar panels, CO_2 cooling systems will be used for refrigeration and heating systems will use waste heat during winter (Aldi North Group, 2017).

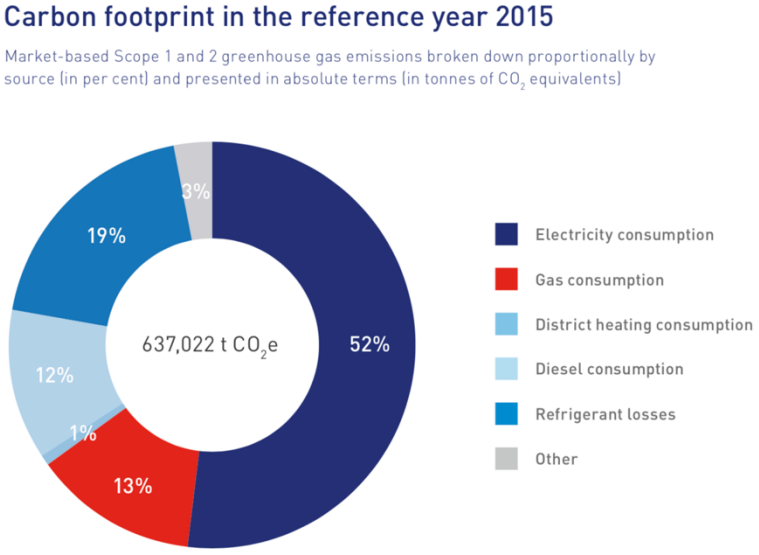

Figure 24: Aldi's Carbon Footprint in the reference year 2015 (Aldi North Group, 2017).

When asked about their sustainability strategy, the interviewee stated that it is based on the SDGs. In their annual report it is specified that goals 12 (responsible consumption and production), 13 (climate action), 8 (decent work and economic growth) and 15 (life on land) are tackled with company's practices (Aldi North Group, 2017).

Aldi's interviewee reinforced throughout the entire call that packaging is decided by producers and suppliers, not imposed by the retailer. According to the interviewee this is because producers have their own production line and know more about packaging than retailers. It was stated that Aldi do not have any internal policies or guidelines on packaging. However, Aldi sees that retailers also have responsibility in this sector, and for that reason,

they have been working together with Fost Plus* to tackle packaging issues in two ways. Firstly, by following eco-design by reducing overpackaging and making sure all packaging used is recyclable. Secondly, by doing workshops with buyers, which will start this year. This is because according to the interviewee, even though buyers are the ones who will close contracts, determine price and volume, and they are usually unaware of the technical aspect of packaging. By doing a workshop they want to inform the buyers about specific pointers and about eco-design aspects Aldi wants to follow.

The interviewee mentioned the importance of having a good communication with the supply chain upstream. This is due to the fact that since producers, suppliers and retailers have their own specifications to follow, as production line and distribution system, this must be clear to the other parties. The interviewee highlighted the importance of producers since for being at the start and for having more knowledge, producers can inform retailers of the latest innovations. The interviewee gave one example of the idea of using snap-click cap, which was given by the producers to retailers.

When asked bio-based packaging, the interviewee answered speaking about biodegradable, which may be a sign of misconception that bio-based packaging is the same as biodegradable. Nevertheless, the interviewee showed no opposition to biodegradable, only pointed out that there are no offers of applicable biodegradable packaging in the market and that they would be a good option as long as they still guarantee food waste prevention and transportation. It was then explained to the interviewee that bio-based and biodegradable are not necessarily the same and that there is still a lot of controversy regarding biodegradable packaging since a lot is still not completely degradable, polluting soil and water.

It was then asked if the interviewee knew about Tetra Pak's bio-based package, which is plant sourced, being inside of the carbon natural cycle, not degradable and fully recyclable. It was answered that if producers want to use it and it is a competitive price, there is no reason for them to be against it, especially if it is a more sustainable option.

Finally, it was asked how Tetra Pak could help in their sustainability strategy. The interviewee answered saying that it would be good if Tetra Pak came forward with innovative packaging options so that Aldi could inform their buyers who would then speak to producers. It was also pointed out that Tetra Pak should develop the most sustainable options and convince producers to use it. When asked if there are any particular changes they would like

* Fost Plus is a Belgian organization responsible for the collection, sorting and recycling of household packaging waste (Fost Plus, 2018a).

to be done, the interviewee answered that this is something that should be answered by producers.

4.6 RETAILERS NOT INTERVIEWED

4.6.1 CARREFOUR GROUP

Carrefour was founded in 1959 and opened its first supermarket one year later in Annecy, France. In 1985, their first brand products were launched. The company has been growing, acquiring and merging with supermarkets all over the world, being today present in more than 30 countries with more than 12 thousand stores (Carrefour, 2018a) and has now 22% of the Belgian market share (Syndy, 2015).

According to their website, Carrefour's aim is to become a World leader in food transition providing high-quality food for all without harming the environment. On its website protecting biodiversity, working together for solidarity, corporate social responsibility, and combating waste are shown as some of their commitments (Carrefour, 2018b).

In order to protect biodiversity, Carrefour has developed different actions such as sustainable fishing, protecting forests and tackling deforestation, Certified wood and paper by FSC and Pan European Forest Certification (PEFC), Rainforest Alliance certified beef from Brazil to tackle deforestation of the Amazon forest, 100% of RSPO certified palm oil in their products, a line of "reared without antibiotics" products and that by 2020 half of the fish sold must come from certified and responsibly sourced (Carrefour, 2018b).

Under Corporate social responsibility, Carrefour states that the group has incorporated objectives related to the Sustainable Development Goals including supporting suppliers to adopt a more responsible approach. Combating waste throughout the entire supply chain is stated as their main way of preventing global warming. Waste is for them linked not only to food, but to water, energy and packaging. The company also implements new technology to improve energy and resource use (Carrefour, 2018b).

In 2015 Carrefour committed to reduce its current CO_2 emissions by 40% by 2025 (Carrefour, 2018a). In their annual report, by 2050 the group aims to reduce its CO_2 emissions by 70% compared to 2010. A reduction of 30% compared to 2010 in energy consumption was set as goal, and they currently achieved a 15.4% reduction. Refrigeration is their leading source of energy consumption and the goal of 40% reduction (compared to 2010) by 2025 was achieved in 2016 (Carrefour, 2016, 2018b). Other goals can be found in their annual report.

4.6.2 C.I.V. SUPERUNIE B.A.

Superunie is a cooperative representing 13 retail organizations including PLUS, Sligro, Dirk, Boon's Markt and SPAR (in the Netherlands), deciding which products will be purchased and from which suppliers. In total it accounts for around 30% of the Dutch market share (Distrifood, 2017). In Superunie website there is a section dedicate to sustainability in which they explain they want to make the supply chain more transparent so that consumers can more easily choose sustainable products. Because of that, they are collaborating with RSPO, Round table for sustainable soy (RTRS), Covenant on Sustainable Fresh Fruit and Vegetables (Sustainable Trade Initiative) and Covenant responsible soy (Sustainable trade initiative). Their sustainability policy is established in combination with the members (Superunie, 2017). These are explained in more detail on their Annual Report Sustainable Trade 2017.

On the webpage they make it available their code of conduct where they specify for their suppliers demands that must be followed. These demands are according to the International Labour Organization (ILO), which cover human rights, working conditions, etc. (ILO, 2018).

However, not enough information regarding their aims on sustainability strategy, CO_2 emissions, or packaging reductions were found online. Superunie was, therefore, not considered for the discussion of this report due to lack of information.

4.6.3 COLRUYT GROUP

Colruyt opened in 1928 as a wholesale goods business in Brussels. In 1990 they started the Green Line charter and sold organic products for the first time (Colruyt, 2018b). In their annual report, Colruyt states that they are working to reduce their footprint. This has been done in different areas such as refrigeration and transport.

The company has been showing interest in renewable energy since 1999 when it constructed its first wind turbine in Halle, Germany. Today, 25% of the energy used by Colruyt group is supplied by Eoly a sustainable energy producer. In the future they aim to all energy used by Colruyt Group. The remaining 75% is bought from green wholesale market. Colruyt also invests in wind farms Belwind, Nothwind and Nobelwind, all part of Parkwind on the Belgian coast and aims to reduce their CO_2 emissions by 20% compared to 2008 by 2020 (Colruyt, 2017). On their website and on their sustainability report, Colruyt states that they base their sustainability strategy on the 17 Sustainable Development Goals (Colruyt, 2018c). Furthermore, Colruyt became and ambassador for the UN Sustainable Development Goals.

Colruyt consist of over 40 brands including Spar in Belgium (Colruyt, 2018a). The company currently accounts for 31,7% of Belgian market share (Colruyt, 2017).

4.6.4 JUMBO

Founded in 1921 as a wholesale trade, Jumbo has stores all around The Netherlands. Jumbo alone has a significant share of 18,7% of the Dutch market share (Distrifood, 2017).

Jumbo publishes annually a sustainability report. In it, it is stated their sustainability principal (Duurzaamheidsprincipes) that also for being a family business, they focus on being not only successful today, but in the future, giving importance to generations to come, choosing the best and not the easiest solution (Jumbo, 2016). Products that have certification as UTZ, RTRS (Round Table Sustainable Soy), Rainforest Alliance, MSC (Maritime Stewardship Council), amongst others. A list of sustainable products sold by the company is available on their website.

In 2016, Jumbo open as they call in their Annual Report, the most sustainable and energy efficient store in the Netherlands, which is energy neutral. The company also states they have a partnership with WeCycle, who collects and recycles electrical waste, and in case of Jumbo, appliances and lamps brought by consumers (Jumbo, 2016)

Jumbo's CO_2 emission was reduced by 16% compared to 2012. This decrease was due to energy savings and refrigeration substitutions. It is also said that Jumbo is working with their own brand suppliers to reduce packaging materials and how to make them more sustainable. However, it its highlighted that due to food safety and expiration date, it is not possible to completely forbid packaging since it guarantees a longer product life and reduces food waste. At the end of the report, Jumbo makes available some specifications according to GRI such as material, energy and emissions (Jumbo, 2016).

4.6.5 LIDL

Lidl started in the 1930s as a grocery wholesale in Germany and after the 90's the store started opening in other countries in Europe as France and UK (Lidl, 2018a).Today, Lidl is responsible for 10,5 of the Dutch market share (Distrifood, 2017).

In their website, under Responsibility (Verantwoordelijkheid in Dutch); Assortment (Assortiment in Dutch), Lidl explains that it makes use of certifications as UTZ, Fairtrade and Rainforest Alliance for a variety of products sold at their stores (Lidl, 2018b). Further information on certification and quality of products sold can be found on their website.

RESULTS

On their annual report 2015-2016 Lidl states that they have a Corporate Social Responsibility team working with the Sustainable Development Goals and testing them through questionnaire with their stakeholders (Lidl, 2015). Under the section climate (klimaat in Dutch), Lidl describes other actions taken related to sustainability as sustainable building, energy and packaging. They state they have the most sustainable distribution center in the Netherlands, part of the energy used is supplied by solar panels installed in 23 facilities. Regarding packaging, Lidl aims to reduce the plastic consumption by 20% until 2025 and by 2025 all plastic packaging must be recycled (Lidl, 2018b).

4.7 SUMMARY OF THE INTERVIEW WITH THE RETAILERS ANSWERING THE SUB-QUESTIONS AND RESEARCH QUESTION

SQ1: Sustainability concepts used by retailers						
Retailer		Sustainability Concept	How is it measured?	Policies to reduce		
				CO_2 emissions	Energy Use	Packaging use
Interviewed	Ahold Delhaize	Sustainable Development. Specifies which SDGs are being tackled. Talks about CSR but as a part of SD.	Uses GRI, ISO and SDGs. 80% of their own brand suppliers are already audited.	Reduce by 30% by 2020 compared to 2008.	Is improving energy efficiency by reducing refrigerants leakage. Were able to reduce the energy consumption compared to 2016.	Increase recycling rate from 73% to 80% by 2020. Want to make a plastic policy this year.
	Albert Heijn	Has their sustainability strategy aligned with Ahold Delhaize.	Uses GRI, ISO and SDGs.	Working to further reduce the CO_2 emissions. Have a CO_2 neutral building.	Is improving energy efficiency by using energy efficient cooling and climate systems.	Want to reduce primary packaging by 15% until 2020.Reach 50% recycle in 2020.Use the 4R policy to help suppliers.
	Aldi	Sustainable Development. Specifies which SDGs are being tackled.	Uses GRI, ISO and SDGs.	Wants to reduce CO_2 by 40% by 2021 compared to 2015.	Is installing solar panels in stores around Europe. Are including energy efficiency technologies specially for refrigeration and lighting.	Don't really have a packaging policy, but is working with Fost Plus on eco-design reducing overpackaging and increasing recyclability.
	Ekoplaza	The sustainability strategy is based on SDGs and IFOAM. NGO's and Plastic Soup Foundation work with them to improve the sustainability strategy.	Use GRI and ISO as a guideline for being a business to consumer organization, focusing on topics interesting for consumers.	Was able to reduce their emissions by 66% compared to 2014.	Ekoplaza energy is provided from 100% renewable energy. Uses LED lights in the stores saving energy.	Is creating plastic free aisle supermarkets.
Not interviewed	Jumbo	Uses CSR divided into different themes of relevance for industry, business and stakeholders.	Uses GRI as indicators for material, energy, emissions,..	CO_2 emission were reduced by 16% compared to 2012.	In 2016 the energy consumption decreased by 6.3% compared to 2015. They are aiming to reduce the consumption of gas and electricity focusing on increasing the share of renewables.	Is working with their own brand suppliers to reduce packaging materials and how to make them more sustainable.
	Carrefour	Uses CSR dividing the website in areas of commitment as waste, biodiversity, etc.	Refers to 2 sustainable development goals being tackled by the company.	Wants to reduce the CO_2 emissions by 40% compared to 2010.	A reduction of 30% compared to 2010 in energy consumption was set as goal. Refrigeration is their leading source of energy consumption and the goal of 40% reduction by 2025 was achieved in 2016.	Their commitment to reduce waste also refers to packaging waste. Their aim is 100% reusable, recyclable or compostable packaging.
	Colruyt	Base their sustainability strategy in the SDGs. Works with the UN as an ambassador of the SDGs.	Their practices are divided in their sustainability report according to the SDGs.	Wants to reduce their CO_2 emissions by 20% compared to 2008 by 2020.	25% of the energy used is supplied a sustainable energy producer. The remaining 75% is bought from green wholesale market. Colruyt also invests in wind farms.	Created a recyclable tray for delicatessen products.
	Lidl	Has a CSR team working with the SDGs and their stakeholders.	Uses the SDGs and GRI.	They are working to reduce the CO_2 emissions with measures on transportation, energy,	The energy used by Lidl is partly supplied by solar power in many stores and for customers to recharge electric cars. They also trained their employees to be more energy conscious.	Aims to reduce the plastic consumption by 20% until 2025 and by 2025 all plastic packaging must be recycled.

		SQ1 and 2. Sustainability in the supply chain and knowledge gaps on packaging		SQ2. Knowledge gaps on packaging		RQ. How Tetra Pak can improve the sustainability strategy
	Retailer	Reasons to improve sustainability	Relationship with upstream/ deciding packaging	Knowledge on the environmental impacts of packaging	View on bio-based packaging	Recommendations for Tetra Pak
Interviewed	**Ahold Delhaize**	Risk. Pressure from plastic soup discussion, UK retailers and consumers.	Wants to engage with stakeholders to improve sustainability and understand their perception. Wants to work together with suppliers to understand better the options on packaging. See producers and suppliers as packaging experts in the chain. Does not know how packaging is decided, but the main reason is to protect the product	Sees that consumers have glass as the most sustainable option but knows that the environmental impacts of plastic is lower than glass.	Have to be cautious that producing plastic is the right use of land.	Is worried about how consumers dispose packaging. Wants Tetra Pak to make it easier for consumer to know how to do it.
	Albert Heijn	The commercial director is engaged in reducing plastic waste. They try to consider the entire chain when working on packaging. They cannot reduce weight if it will damage the pack during transport.	Wants to encourage suppliers to come with proposals and warn if a bad decision is being made. Packaging is decided by producers depending on the production line and machine they have available.	Does not think carton is always the best option, it depends on the cycle. Carton has aluminum which is rare. They prefer mono packaging. They use packaging to differ between product lines.	Bio-based is a good option when recycled packaging cannot be used. Are not in favor of biodegradable.	Wants a packaging without aluminum and the same proprieties. Wants a cap that stays with the pack when disposed of. Is open to receive LCAs on packaging impact.
	Aldi	Make packaging as eco-designed as possible.	Aldi has 97% of own brand products. Producers decide on the packaging. There has to be mutual agreement, but a lot depends on producers' production line. Gives the examples of snap-click caps given by producers.	Producers know more about packaging and is their responsibility to point and use the best packaging.	Confused bio-based with biodegradable. But if producers want to use it and it is in a competitive price, they wouldn't oppose to using it.	Tetra Pak could keep them updated on innovations on sustainable packaging. Would like to see results on consumer perspective on carton and alternative packaging.
	Ekoplaza	Create a supermarket where consumers do not have to worry about generating negative impact.	The relationship works both ways. The decision is with producers, however Ekoplaza instruct them is a better option is available.	Packaging from fossil fuels that is indestructible is not a good choice. They want packaging that fits circular economy and is compostable.	Plant-based packaging is a good option as long as the source is verified.	They would lie a blan-based from a sustainable source, easily recyclable and compostable at the end of life.

5 DISCUSSION

5.1 SUSTAINABILITY AND LEGISLATIONS

Sustainability is continuously changing since it is a reflection of a changing environment (Willard & Hitchcock, 2009). Companies must, therefore, understand their impacts, keep pace with trends and incorporate practices as long-term strategies (Unctad, 2017). Most companies interviewed state that their sustainability strategy is based on the Sustainable Development Goals, most of them addressed in their reports or websites which goals are being tackled in their business strategy. All retailers interviewed make use of international guidelines as GRI and ISO, as well as product standards. However, more time and cooperation with retailers would be necessary to evaluate if their statements are congruent with their practices and how they could further make use of the Sustainable Development Goals and other guidelines to improve their sustainability strategy. Nevertheless, the use of standards, international guidelines, efforts to reduce CO_2 emissions, energy and packaging used by retailers show they are working to improve their sustainability strategy and reduce their environmental impact.

There is a lack of national and international regulations which, when present are not very strict when it comes to delimitating indicators and measurements that should be taken by retailers (Kolk & van Tulder, 2010). Even though there are packaging regulations in Europe, for the Netherlands they lost its efficiency after the 2000s as shown by Rouw and Worrell (2011). The lack of efficient regulations also on unsustainable products prevents the government from playing what could be a decisive role in vetting or delimiting such products (Akenji & Bengtsson, 2010). This makes it acceptable for companies to make sustainability targets and agreements that suit their business and still be compliant with vague legislations. On top of that, if these targets are not reached, there are no recriminatory measures. The next action is solely the creation of new targets. This coupled with the fact that sustainability measures are not legally binding, gives retailers the liberty to approach sustainability issues as best fit their business, directing it only to issues that they see as relevant. It can also lead to not enough efforts or even greenwashing measures (Dahlsrud, 2008).

5.2 RETAILERS AND RELATIONSHIP WITH THE UPSTREAM OF THE SUPPLY CHAIN

Retailers can be the front-runners and rule-setters, pressuring other retailers to incorporate more sustainable practices. Prominent retailers can refuse to sell products that are not according to their specifications. This is a powerful influence in the market. Retailers that have their own brands have an even more influential role since they affect the market and other producers (Akenji & Bengtsson, 2010). Consequently, if retailers are genuinely engaged in doing their part and reducing the emissions, their actions will not only pressure stakeholders in the supply chain but will influence the market to follow their steps (Akenji & Bengtsson, 2010; Dauvergne & Lister, 2012).

Two retailers' practices were viewed as front-runner. Ekoplaza who aims to become a plastic-free supermarket is innovating the way retailers deal with plastic. Their practice will constantly adjust to new trends and push them to choose the most sustainable alternatives not only for packaging but also for other measures as renewable energy use, for example. When it comes to renewable energy, Colruyt, even if not interviewed, seems to be concentrating a lot of focus not only in investing in wind energy but also in completely relying on green energy usage.

Apart from these and even though literature has been pointing multinationals as regulators of sustainability, truly change-making actions were not found during the research, with some rare exceptions. The companies interviewed do not seem to be taking measures that exceed the required by legislation to be seen as change-makers. Some practices as reducing CO_2 emissions, using energy efficient refrigerators, getting informed about packaging impacts, reducing packaging use, getting the company informed about the sustainability practices are necessary measures, but seem to be first steps towards sustainability. Adding to this, the fact that most retailers think that packaging is a producers' choice, reduces retailers' responsibility towards sustainable packaging. Passing this responsibility upstream of the supply chain annuls the power and influence of retailers as intermediaries in the supply chain and as change-makers.

This is not necessarily a bad change of scene, on the contrary. When the relationship is established, and producers are used to following retailers demands, they may find it difficult to take the initiative to present an alternative. In cases like this, adopting new sustainable initiatives can hit barriers and delay change (Chkanikova & Mont, 2015). This was mentioned by the Albert Heijn interviewee who stated that they recognize that some suppliers and producers can be scared of suggesting changes since they think this could result in losing the

client. If producers and suppliers have the space to be more proactive, the initiative on moving towards a more sustainable path is no longer strained and centralized solely with retailers but can also come from the upstream of the supply chain. For this reason, cooperation and clear communication between stakeholders are crucial to better understand in which steps of the supply chain there is space for improvements. This is especially important regarding knowledge on packaging environmental impacts, since lack of communication between stakeholders can result in barriers to optimize this process (Van Sluisveld & Worrell, 2013). This was pointed out by all retailers, highlighting the importance of working together with suppliers and producers to understand which the best packaging option is. This was especially emphasized in Aldi's interview indicating producers and suppliers as most responsible for packaging choice. One producer exemplified how innovative measures taken by stakeholders can trigger retailers to do the same. Therefore, pressure to improve has to come from upstream in the supply chain as well.

5.3 BEVERAGE/FOOD CARTON AND ALTERNATIVES

As shown by life cycle assessment studies and Tetra Pak reports, the use of beverage/food cartons instead of alternative packaging is a less impactful option and can lead to a reduction in the carbon emissions and environmental impacts throughout the supply chain. This is attributed to weight, size of the package and type of resource used, being around 75% renewable resource, which reduces cost in transportation in every stage of the life cycle. Another factor is that the producer can also change to the aseptic carton which means that this product no longer needs to be refrigerated in the supermarket, reducing cooling energy requirements. This has not been taken into consideration by most LCA studies, probably due to the fact that it is hard to determine the amount of time that the product will remain in the supermarket before being purchased and how this would translate into energy use for each package.

This lower environmental impact is considering the packaging alternatives available in the market today. This outcome may change with the development of new packaging options or distribution concepts, such as concentrated juice or bulk purchasing, for example. Therefore, Tetra Pak should keep themselves ahead of the market and keep looking for innovative options, such as their bio-based packaging.

5.3.1 USE OF RECYCLED PLASTIC IN FOOD AND BEVERAGE PACKAGING

Some retailers mention the use of recycled plastic in primary packaging. Even though a limited number of studies have evaluated the safety of using recycled plastic for food and

beverage packaging the results are not conclusive and recommend further and careful study. Contaminations of the packaging happen in an unpredictable way due to misuse of consumers or due to the collection and recycling process. Furthermore, contaminants can be in the packaging or migrating to the beverage/food contained (Palkopoulou, Joly, Feigenbaum, Papaspyrides, & Dole, 2016). Therefore, there is still uncertainty in this application and the use of recycled plastic should be carefully analyzed by retailers, so it is not a threat to its consumers.

Again, Tetra Pak should consider how the packaging market may evolve in the future. If the use of recycled packaging grows as assumed by some retailers, Tetra Pak will need to analyze the consequences this shift in the market may cause for their business, footprint and image as one-way, non-recycled plastic beverage/food carton. Since Tetra Pak seems to oppose to recycled plastic use for beverage/food packaging, what actions could be taken in product composition, design or recycling to ensure offering a competitive and more sustainable product.

5.4 PERCEPTIONS OF BEVERAGE/FOOD CARTON AND ALTERNATIVE PACKAGING

The misconception of consumers on the impacts of beverage packaging is a relevant factor against a more conscious consumption. This misconception was verified in the survey results in which the majority of consumers consider glass as the less environmentally impactful option. This is added to the fact that, consumers see recycling as a more relevant practice than purchasing when it comes to reducing negative impacts on the environment, as shown by the survey results. If consumers are aware of the impacts of the products they buy and understand the impact they have in the market when purchasing a product, they would pressure retailers to act and sell more sustainable products (Akenji & Bengtsson, 2010).

Often, and especially with the current discussion on plastics, business, as consumers, are focusing on the end of life of a product and are worried about recycling. This was exemplified by Ahold Delhaize interviewee who stated that the stage of the supply chain they are more worried about is disposal. Recycling is crucial, and Tetra Pak could develop or improve the product design that facilitates recycling, resulting in a material with higher recycled quality. However, not neglecting the relevance of recycling, companies need to prioritize reduction and modification of the design to move towards a more sustainable path (Akenji & Bengtsson, 2010). The focus on recycling can again be a sign that the influence retailers have is not being fully used to demand better packaging options for the market.

The results from question 2 of the consumer survey, regarding the type of package of frequently bought beverages, showed that even though juice and milk are frequently bought in carton, water is mostly bought in plastic. This might be a matter of availability in the supermarket, as pointed out by consumers as one of the main reasons preventing them from acting more sustainably. However, no clear conclusions can be drawn from it, since it can also be related to different factors, as prejudice, habit, or convenience for example. Further research is recommended to analyze consumers perception on water sold in beverage carton.

Price was chosen by consumers, as the main barrier preventing them from choosing the most sustainable product (Figure 20 and question 14 of consumer survey). If sustainable products are more expensive, the majority of consumers will choose other options. Consumers not purchasing sustainable products can prevent retailers from engaging in specific sustainability strategies (Chkanikova & Mont, 2015).

However, the burden cannot be put upon the consumer (Akenji & Bengtsson, 2010). The knowledge gap expected at the beginning of this research regarding the limited knowledge on the impacts of beverage packaging was confirmed for some of the retailers interviewed. This lack of knowledge represents a significant barrier against the availability of beverage cartons in the supermarkets. This is also coupled with the fact that today, packaging goes beyond its function and is seen as a product on its own (Akenji & Bengtsson, 2010). This was the case of one retailer that stated they use different packaging options to differentiate between their product lines. This shows that retailers are not worried about the environmental impact of the packaging but using it as a sales strategy. If producers and retailers avoid unsustainable options, consumers will not find them on the shelf (Akenji & Bengtsson, 2010). Nonetheless, this may also be obstructed by the retailers themselves, since they might not want to jeopardize other packaging alternatives by showing the environmental benefits of beverage/food carton. Another factor is that retailers will avoid the possibility of losing consumers for removing unsustainable products from their stores (Chkanikova & Mont, 2015).

5.4.1 PLANT-BASED PACKAGING

The remarks on Tetra Pak plant-based packaging were divergent. When asked if plant-based package will be demanded in the future, the interviewee from Ahold Delhaize showed no clear opinion but highlighted that it should be dealt with caution due to debates on land use. Aldi's interviewee was not aware of the packaging but stated that if producers are willing to use it and the price is competitive, there was no reason to oppose it, especially if it is a more sustainable alternative. The interviewee from Albert Heijn had a clearer view stating that plant-

based is the best option, in case recycled plastic cannot be used in packaging as is the case for various drinking packaging.

5.5 RECOMMENDATION FOR TETRA PAK

5.5.1 COMMUNICATE WITH STAKEHOLDERS

During the interviews, some retailers asked for more information on the environmental impacts of beverage/food packaging, recycling process and innovations of Tetra Pak packaging options. Many retailers said that producers and Tetra Pak know more about packaging than they do; thus, they should intervene and bring innovations to the supply chains. This shows that the retailers are open to conversation and Tetra Pak could therefore, act more proactively also when communicating to producers and suppliers about the packaging options and their impacts. Furthermore, improving communication with stakeholders can point areas in which Tetra Pak could improve not only the business but also their product design and composition.

5.5.2 TETRA PAKs PLANT-BASED PACKAGING

The communication could also be enhanced when it comes to Tetra Pak's plant-based packaging. Not only so that retailers and producers learn about its benefits, for not deriving from fossil fuels, and being inside of the natural carbon cycle, but also to erase possible misconceptions. This was evidenced by Aldi's interviewee who talked about biodegradable after being asked about bio-based, which may be an indicator that there is still confusion regarding both definitions. Apparently, when retailers are aware that bio-degradable plastic is not always fully degradable, polluting soil and water, there is a preference for recyclable or other options. This was exemplified by the Albert Heijn interviewee that, knowing the impacts of biodegradable, stated that it was not an option for them. Tetra Pak could use this in their favor when explaining about the bio-based packaging, since it is not biodegradable and is fully recyclable.

Tetra Pak has been proactive by making plant-based packaging available, which is pointed out by some authors as a growing market demand (Risch, 2009). This shows that the company is focusing on the beginning of the value chain worried about the materials used. However, the company could be considered reactive when it comes to offering as an alternative to producers and retailers. This is indicated by one retailer that would like Tetra Pak to be more assertive with their product towards producers if it is a more sustainable option.

5.5.3 FOCUS MORE ON PRODUCERS

As identified in the interviews, most retailers see producers and packaging suppliers as the key responsible for choosing the packaging options. This shows that Tetra Pak should broaden the focus from retailers (in this report), to also include the upstream stakeholders in the supply chain, specifically beverage producers.

5.5.4 EDUCATE CONSUMERS

One recommendation mentioned by retailers and producers was that Tetra Pak can further work in educating consumers on the impacts of beverage/food carton compared to alternative packaging. This necessity was confirmed with the results of questions 4 and 5 of the consumer survey, which showed that once consumers understand the impacts, they prefer the most sustainable option. It was also shown the necessity to better inform consumers about the recycling process and make it clearer on how the packaging should be disposed of. The logo, however, shows consumers that it should be disposed of in the drinking carton bin. In case PMD (Plastic, Metal and Drinking carton) bins are not available, it could be made clearer that it should be disposed of in the plastic bin. This is, however, dependent on if producers want to include it in the packaging design or not. Tetra Pak can, therefore, be more incisive, highlighting the importance of facilitating this information to its consumers to reduce the environmental impacts and increase recyclability.

To do so, Tetra Pak could work with retailers and producers to analyze how they could join efforts to improve the communication with consumers. This could be done for example, by increasing information in the packaging itself or by increasing the information at the supermarkets. Tetra Pak Brazil for example, has done some campaigns at supermarkets to educate consumers regarding the recycling process by having information stands (Tetra Pak, 2018b). It would be valuable to analyze what other countries have been doing to increase the availability of information in the supply chain and which could be incorporated by Dutch and Belgian Tetra Pak. Using social media or professional media channels could also be helpful to increase the spread of information, however, analysis would necessary to find an approach that brings effective results. However, to educate consumers, the knowledge gap on packaging impacts of producers and retailers should be removed. If not, wrong information will be passed on to the consumers.

5.5.5 HELP IMPROVE LEGISLATION

Tetra Pak could also use its influence to help regulatory offices improve the legislations, especially on packaging production, disposal and recycling. If legislations become stricter, retailers are more likely to obey them and direct more efforts in their sustainability practices.

5.5.6 CONTINUE WITH THE AIM TO BECOME 100% RENEWABLE ENERGY

To further reduce its environmental impacts and footprint, Tetra Pak should continue to work on their aim to become 100% renewable. This will put them ahead of legislations that may come in the future while adding value to the company and its product.

5.6 LIMITATIONS

The main research limitation was the difficulty in getting in contact with retailers. Even though the email used to contact the interviewers was a Tetra Pak email and these contacts were already acquainted by Tetra Pak retailers' manager, many of them did not answer the emails or the phone calls. In addition, it is important to highlight that one interview might not reflect the holistic view of the company regarding the business practices and aims on sustainability. The same is valid for their knowledge on packaging impacts, policies and goals. The results are likely to vary depending on the interviewees, therefore, a higher number of interviews with personnel from different sectors of the company would be required to generate a more holistic picture.

5.7 FUTURE RESEARCH

In order to improve the sustainability strategy in the supply chain, further research is recommended with the retailers, but also direct more attention to producers' perspectives and knowledge. Deepening their knowledge on the impacts of beverage/food package is essential to eliminate misconceptions and better understand their needs and better understand how Tetra Pak can help.

Further research is also recommended to evaluate how Tetra Pak can improve the education of consumers regarding impacts, purchasing responsibility and the correct way to dispose of the waste. This can be done by incorporating a variety of strategies to assess how Tetra Pak in other countries is dealing with communication and marketing to incorporate feasible tactics in Belgium and The Netherlands. Aligning with NGOs could also help evaluate

how Tetra Pak could improve not only the communication, but the product and current practices. Join efforts with stakeholders and combine this with literature on communication and marketing play a decisive role in improving the communication with consumers while avoiding green marketing.

The packaging market, especially regarding plastic packaging is rapidly changing. This trend may bring a shift in the way goods are sold in the future. Reusable bottles, circular economy or a more circular supply chain are some trends that can gain force in the upcoming years. In order to be resilient and keep themselves ahead of possible outcomes, Tetra Pak could analyze how they could better prepare now for future scenarios as such. This can be done alongside with retailers and producers to have a wider perspective on what topics are seen as future trends, but also to understand what the stakeholders would be willing to do to prepare themselves and have more unified actions in the supply chain.

6 CONCLUSIONS

In this report, the most significant barriers in improving sustainability throughout the supply chain were insufficient communication between stakeholders, misconceptions of packaging impacts, broadness of sustainability concepts, and vaguely defined legislation. The broadness of sustainability coupled with non-binding and vaguely defined legislation could be the main barrier why sustainability is not completely integrated into the business strategy. This can lead to companies devoting attention only to urgent matters, in order to comply with legislation, or react to societal and media pressure. Without a long-term strategy that neither incorporates all business impacts nor involves all employees required, companies miss the opportunity of truly generating value creation. A slow pace towards sustainable development, may not be enough to keep up with future sustainability pressures.

This is aggravated by the fact that actors in supply chains are usually focusing on their part of the puzzle, disregarding the entire supply chain. Improving this relationship and broadening the value creation in the supply chain can bring long-term benefits. On the other side, even though consumers expect companies to be more sustainable, they are badly informed about the environmental impacts of their choices, wasting their purchase power.

For Tetra Pak to improve the sustainability strategy of its supply chain, it is imperative to have a more proactive communication towards retailers, producers and consumers. Better informed stakeholders are more likely to make better decisions when it comes to packaging and will, in their turn, help Tetra Pak improve their own actions while developing products that better fulfil its stakeholders needs when it comes to design, innovation and environmental impact.

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APPENDIX

A: LITERATURE REVIEW COMPARISON

Impact Categories	Bertolini, et al., (2013)			Meneses, M., Pasqualino, J., & Castells, F. (2012)	Simon, B., Amor, M. Ben, & Földényi, R. (2016)	Pasqualino (2011)	Von Falkenstein (2010)
Packaging Types/ Unit considered	PET	HDPE	Multi-layer Carton	Milk packaging. Aseptic carton (0,2L; 1L; 1,5L; 2L); HDPE (1L and 1,5L); PET (1,5L)	Aluminum cans (0,5; 0,33L); PET (0,5; 1; 1,5 and 2L); PLA (1,5L); Glass (0,33; 0,5)	Aseptic Carton (0,2; 0,33; 1; 1,5L), Aluminum can (0,33; 0,5L), glass (0,33; 1L), Plastic HDPE (0,2; 1; 1,5L) PET (0,33; 1,5; 5; 8L)	Milk, Juice Carton, Plastic (HDPE and PET), glass.
Global Warming Potential. (GWP) (kg CO2 eq.)	0,265	0,275	0,17	Aseptic carton shows lower emissions compared to HDPE and PET. Exact values were not given but shown in graph.	Carton and PLA show the lowest CO_2 emissions.	Carton showed the lowest impact for juice compared to glass and HDPE.	Carton has the lowest impact in almost all studies. One study with opposite result compared carton to multi-use glass bottle.
Acidification Potential (AP) (g SO_2 eq.)	0,001046	0,000892	0,000596	Aseptic carton shows lower emissions compared to HDPE and PET. Exact values were not given but shown in graph.	Not included	Not included	Carton has the lowest impact in all studies for milk. The same for juice with one exception that attributed a smaller impact for PET due to assuming higher recycling rate.
Cumulated Energy Demand (CED)/fossil resource consumption	4.86MJ	5.16MJ	3.65 MJ	Not included	Not included	Carton showed the lowest impact for juice compared to glass and HDPE.	Carton has the lowest impact in all studies, except one that compared carton to multi-use glass bottle.
Land use (forestry)	Not included			Not included	Not included	Not included	Higher for carton since 75% of carton is composed by

						paper from wood fiber
Summer smog	Not included			Not included	Different reverse logistic routes were analyzed. Carton is between the lowest impact in all routes.	Not included	Over half of the studies point carton as the lowest impact for milk. For juice 3 out of 6 studies attributed a smaller impact for PET due to assuming higher recycling rate.
Terrestrial eutrophication or Eutrophication Potential (EP)	0,000325	0,000351	0,000223	Not included	Not included	Not included	Carton has the lowest impact in all studies for juice.
Stratospheric ozone depletion (SOD)	3.23E-08	3.7E-08	1.64E-08	Not included	Not included	Not included	Not included
Photochemical Ozone Formation (POF)	5.32E-05	4.93E-05	3.15E-05	Not included	Different reverse logistic routes were analyzed. Carton is between the lowest impact in all routes.	Not included	Not included
Nutrient Enrichment	Not included			Not included	Not included	Not included	Not included
Human Toxicity Potential (HTP) (kg 1,4-DB eq)	0,055	0,0805	0,111	Not included	Similar results from GWP with larger differences between collection systems	Not included	Only three studies include this category but use different indicators.
Ecotoxicity	Not included			Not included	Not included	Not included	Only three studies included this category. All pointed carton as having the lowest impact.

B: CONSUMER SURVEY

B1. CONSUMER SURVEY QUESTIONNAIRE

1. How important is it for you that a food company acts environmentally friendly? (Scale from 1 to 5 as Not important at all, not important, not unimportant and not important, important, very important)

2. What do you see as an environmentally friendly company? (Single Choice)

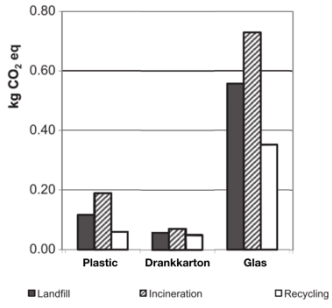
❏ Low production carbon footprint
❏ Uses certified materials (ex. FSC)
❏ Uses less chemicals
❏ Uses less resources
❏ You can return packaging after use
❏ Packaging is made of recyclable material
❏ Packaging is made of plant-based material
❏ Other (specify)

3. What are the beverages and food you frequently buy packaged in? (e.g. juice, milk & water) (Single Choice)

❏ Glass
❏ Beverage carton
❏ Can
❏ Plastic
❏ Plant-based packaging
❏ I don't buy this product

4. Which packaging material do you think is more environmentally impactful? (Single Choice)

❏ Glass
❏ Beverage carton
❏ Can
❏ Plastic
❏ Plant-based



5. Viewing these impacts, which one would you prefer to buy? (considering the price is the same) (Single Choice)

❏ Plastic
❏ Beverage carton
❏ Glass

6. Would you buy beverage carton if it was: (Single Choice)

❑ Yes, if it is the same price
❑ Yes, even if it slightly more expensive
❑ Yes, but only if it is cheaper
❑ No, I do not prefer drinking carton

7. How do you throw away your waste? (Single Choice, one for each category)

	Regular bin	Glass bin	Plastic bin (PMD)	Paper bin	Return at supermarket	Organic bin (GFT)	Other
Glass							
Beverage Carton							
Can							
Plastic							
Plant-based							

8. How would you prefer to dispose of beverage packaging? (Single Choice)

❑ Regular bin
❑ Glass bin
❑ Plastic bin (PMD)
❑ Paper bin
❑ Return at supermarket
❑ Organic waste
❑ Other

9. If you had the option to return beverage carton to the supermarket, with a deposit like it can be done with some glass and plastic bottles, would you prefer that? (Single Choice)

❑ Yes
❑ No

10. Which of the below actions have more positive impacts on the environment? (Put in order)

❑ Choosing which product/packaging to buy
❑ Limiting food waste at home
❑ Recycling

11. Do you consider yourself as environmentally friendly and cares about sustainability? (Single Choice)

Yes 12. What do you do? (Multiple Choice)

- ❑ Buy organic and biological products
- ❑ Buy fair-trade products
- ❑ Buy bigger volumes to avoid packaging
- ❑ Buy less product to avoid (food) waste
- ❑ Buy less plastic packaging
- ❑ Buy recyclable packaging
- ❑ Prefer plant-based packaging

No 13. What would make you interested? (Single Choice)

- ❑ Understand current impacts of product/packaging choice
- ❑ Understand the consequences for the future
- ❑ Understand how my actions impact the environment
- ❑ Other (specify)

14. What limits your actions from being more environmentally friendly? (Multiple Choice)

- ❑ Limited options in regular supermarkets to collect packaging
- ❑ Limited options in regular supermarket to buy products in other packaging
- ❑ I prefer the brand or product, no matter the packaging
- ❑ Price
- ❑ I don't think about environmental impacts all the time
- ❑ Other (specify)

15. What changes would you like to be done in packaging? (Single Choice)

- ❑ Less plastic options
- ❑ Less plastic bottles
- ❑ More beverage carton
- ❑ More glass
- ❑ More can
- ❑ More plant-based packaging
- ❑ No packaging
- ❑ More returnable packaging
- ❑ Other (specify)

B2: CONSUMER SURVEY RESULTS

1. How important is it for you that a Food Company acts environmentally friendly?		NL Total 100% (411)		BE Total 100% (403)	
Not important at all		1.22%	5	1.74%	7
Not important		3.16%	13	4.96%	20
Not unimportant and not important		16.55%	68	17.87%	72
Important		53.04%	218	46.65%	188
Very important		26.03%	107	28.78%	116
Total		100%	411	100%	403
2. What do you see as an environmentally friendly company?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Low production carbon footprint		61.56%	253	68.49%	276
Uses certified materials (ex. FSC)		54.5%	224	42.93%	173
Uses less chemicals		77.86%	320	78.16%	315
Uses less resources		44.04%	181	31.76%	128
You can return packaging after use		59.12%	243	59.31%	239
Packaging is made of recyclable material		76.4%	314	72.7%	293
Packaging is made of plant-based material		41.12%	169	35.48%	143
Others (specify)*		3.41%	14	3.47%	14
3. What are the beverages and food you frequently buy packaged in? (e.g. juice, milk & water)		**NL Total 100% (411)**		**BE Total 100% (403)**	
Glass	Juice	80%	64	59.82%	67
	Milk	18.75%	15	30.36%	34
	Water	30%	24	51.79%	58
	Total	100%	80	100%	112
Beverage carton	Juice	58.79%	214	52.65%	169
	Milk	84.89%	309	85.67%	275
	Water	9.34%	34	0.93%	3
	Total	100%	364	100%	321
Can	Juice	39.13%	9	69.23%	18
	Milk	39.13%	9	26.92%	7
	Water	26.09%	6	19.23%	5
	Total	100%	23	100%	26
Plastic	Juice	25.59%	65	16.12%	49
	Milk	18.5%	47	21.38%	65
	Water	78.35%	199	92.43%	281
	Total	100%	254	100%	304
Plant-based packaging	Juice	47.62%	10	52.63%	10
	Milk	23.81%	5	10.53%	2
	Water	38.1%	8	42.11%	8
	Total	100%	21	100%	19
I don't buy this product	Juice	28.49%	49	70.87%	90
	Milk	15.12%	26	15.75%	20

* The answers given in the Other (specify) options were not relevant and therefore not used in this report. They can be obtained upon request with the researcher.

	Water	81.4%	140	37.8%	48
	Total	100%	172	100%	127
4. Which packaging material do you think is more environmentally impactful?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Glass		43.31%		60.3%	
Carton		15.09%		9.93%	
Can		1.95%		2.73%	
Plastic		3.16%		1.24%	
Plant-based packaging		36.5%		25.81%	
5. Viewing these impacts, which one would you prefer to buy? (considering the price is the same)		**NL Total 100% (411)**		**BE Total 100% (403)**	
Glass		20.44%		27.05%	
Carton		74.21%		68.49%	
Plastic		5.35%		4.47%	
6. Would you buy beverage carton if it was:		**NL Total 100% (411)**		**BE Total 100% (403)**	
Yes, if it is the same price		57.66%	237	60.05%	242
Yes, even if it slightly more expensive		28.71%	118	20.35%	82
Yes, but only if it is cheaper		9.49%	39	14.89%	60
No, I do not prefer drinking carton		4.14%	17	4.71%	19
7. How do you throw away your waste?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Regular bin	Glass	8%	20	3.07%	7
	Carton	36%	90	7.46%	17
	Can	71.6%	179	13.16%	30
	Plastic	19.6%	49	39.91%	91
	Plant-based packaging	44.8%	112	64.04%	146
	Total	100%	250	100%	228
Glass bin	Glass	97.47%	347	97.67%	335
	Carton	2.25%	8	0.87%	3
	Can	2.53%	9	0.87%	3
	Plastic	1.69%	6	0.58%	2
	Plant-based packaging	0.28%	1	0.29%	1
	Total	100%	356	100%	343
Plastic bin (PMD)	Glass	0.61%	2	0.8%	3
	Carton	54.74%	179	82.49%	311
	Can	51.38%	168	83.02%	313
	Plastic	91.74%	300	64.99%	245
	Plant-based packaging	12.23%	40	8.75%	33
	Total	100%	327	100%	377
Papier bin	Glass	0.62%	1	2.22%	2
	Carton	70.19%	113	56.67%	51
	Can	2.48%	4	8.89%	8
	Plastic	5.59%	9	6.67%	6
	Plant-based packaging	26.71%	43	35.56%	32
	Total	100%	161	100%	90
Return at supermarket	Glass	33.33%	34	52.75%	48
	Carton	4.9%	5	5.49%	5

	Can	20.59%	21	10.99%	10
	Plastic	38.24%	39	15.38%	14
	Plant-based packaging	14.71%	15	19.78%	18
	Total	100%	102	100%	91
Organic bin (GFT)	Glass	1.91%	4	2.81%	5
	Carton	4.78%	10	4.49%	8
	Can	6.7%	14	17.42%	31
	Plastic	1.91%	4	11.24%	20
	Plant-based packaging	89.95%	188	76.97%	137
	Total	100%	209	100%	178
Others (specify)	Glass	10.34%	3	5.56%	3
	Carton	20.69%	6	14.81%	8
	Can	55.17%	16	14.81%	8
	Plastic	13.79%	4	46.3%	25
	Plant-based packaging	41.38%	12	66.67%	36
	Total	100%	29	100%	54
8. How would you prefer to dispose of beverage packaging?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Regular bin		12.9%	53	5.71%	23
Glass bin		0.97%	4	0.25%	1
Plastic bin (PMD)		37.71%	155	61.79%	249
Papier bin		41.12%	169	20.84%	84
Return at the supermarket		3.41%	14	7.94%	32
Organic bin (GFT)		1.46%	6	1.74%	7
Others (specify)*		2.43%	10	1.74%	7
9. If you had the option to return beverage carton to the supermarket, with a deposit like it can be done with some glass and plastic bottles, would you prefer that?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Yes		53.53%	220	57.07%	230
No		46.47%	191	42.93%	173
			411		403
10. Which of the below actions have more positive impacts on the environment?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Choosing which product/packaging to buy	High impact	24.09%	99	22.33%	90
	Medium impact	37.23%	153	38.46%	155
	Low impact	38.69%	159	39.21%	158
	Total	100%	411	100%	403
Limiting food waste at home	High impact	38.44%	158	38.46%	155
	Medium impact	27.01%	111	27.79%	112
	Low impact	34.55%	142	33.75%	136
	Total	100%	411	100%	403
Recycling	High impact	37.47%	154	39.21%	158
	Medium impact	35.77%	147	33.75%	136
	Low impact	26.76%	110	27.05%	109

* The answers given in the Other (specify) options were not relevant and therefore not used in this report. They can be obtained upon request with the researcher.

	Total	100%	411	100%	403
11. Do you consider yourself as environmentally friendly and cares about sustainability?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Yes		79.56%	327	82.63%	333
No		20.44%	84	17.37%	70
12. You are environmentally conscious and consider sustainability important. What are you doing about this?		**NL Total 100% (327)**		**BE Total 100% (333)**	
Buy organic and biological products		34.86%	114	30.93%	103
Buy fair-trade products		43.73%	143	28.53%	95
Buy bigger volumes to avoid packaging		32.42%	106	39.34%	131
Buy less products to avoid food waste		65.44%	214	55.56%	185
Buy less plastic packaging		56.88%	186	59.76%	199
Buy recyclable packaging		62.69%	205	69.37%	231
Prefer plant-based packaging		21.41%	70	19.52%	65
13. You do not find yourself environmentally conscious or sustainable, what would you be interested in?		**NL Total 100% (84)**		**BE Total 100% (70)**	
Understand current impacts of product/packaging choice		27.38%	23	27.14%	19
Understand the consequences for the future		30.95%	26	25.71%	18
Understand how my actions impact the environment		22.62%	19	30%	21
Others (specify)*		19.05%	16	17.14%	12
14. What limits your actions from being more environmentally friendly?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Limited options in the regular supermarkets to collect packaging		36.01%	148	47.15%	190
Limited options in the regular supermarket to buy products in other packaging		37.23%	153	44.17%	178
I prefer the brand or product, no matter the packaging		19.22%	79	20.1%	81
Price		48.42%	199	52.61%	212
I don't think about environmental impacts all the time		21.41%	88	16.87%	68
Others (specify)		3.89%	16	2.48%	10
15. What changes would you like to be done in packaging?		**NL Total 100% (411)**		**BE Total 100% (403)**	
Less plastic option		14.11%	58	11.17%	45
Less plastic bottles		9%	37	8.93%	36
More carton beverage packaging		11.44%	47	10.67%	43
More glass		3.65%	15	7.94%	32
More can		1.22%	5	1.49%	6
More biodegradable packaging		17.52%	72	16.13%	65
No packaging		7.06%	29	12.9%	52
More recyclable packaging		17.52%	72	14.64%	59
More returnable packaging		17.27%	71	15.14%	61
Other (specify)		1.22%	5	0.99%	4

* The answers given in the Other (specify) options were not relevant and therefore not used in this report. They can be obtained upon request with the researcher.

C: RETAILERS INTERVIEWS

C1. COMMON QUESTIONS FOR ALL RETAILERS' INTERVIEWS.

Questions	Answer should mention
1. What are the main components of your sustainability strategy and how does packaging fit in?	SDG, CSR, energy and CO_2 impacts, standards, labels. Is packaging included?
2. What does the company still want to improve in the sustainability strategy?	Energy, environmental impact,..
3. What are the drivers to work on sustainability and/or improve the environmental impact of the company?	Consumer, plastic soup, green marketing, are they working with producers to improve?
4. What are the reasons to choose carton and what barriers do you see for products to not be packed in carton?	Consumer view, not feasible for beverage option. This will show their perspective on carton.
5. What do you think is the perspective of consumers on beverage carton?	Show survey results if the opinion is different
6. How is the packaging choice decided?	Who decides, what matters - cost, consumers, refrigeration, bio based
7. Do you change the packaging depending on producers, consumers or do you think this change has to come from you?	Who influences who? Are they working with producers to improve sustainability?
8. With which part of the supply chain are you more worried regarding sustainability?	Raw material, production, transport, store - shelf -, consumer, disposal. Do you have deposit money for plastic, glass and can (statiegeld)?
9. What current trends in sustainability have influenced your current sustainability strategy and what future trends do you see?	Online sales increasing, bio based, less plastic,..
10. What can Tetra Pak do to help your sustainability strategy?	