Maturity level assessment of green reverse logistics in the European cosmetics industry

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MATURITY LEVEL ASSESSMENT OF GREEN REVERSE LOGISTICS IN THE EUROPEAN COSMETICS INDUSTRY

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List of Abbreviations

3PL: Third-party logistics

CE: Circular Economy

CLSC: Closed-Loop Supply Chain

CSR: Corporate Social Responsibility

CTPA: Cosmetic, Toiletry and Perfumery Association

EOL: End-of-Life

EU: European Union

FEBEA: Fédération des Entreprises de la BeAuté

GRL: Green Reverse Logistics

GrSCM: Green Supply Chain Management

LCA: Life Cycle Analysis/Life Cycle Assessment

MM: Maturity Model

MVT: Marginal Value of Time

PCR: Post Consumer Resin/Recycled

PRRM: Product Recovery Management/Product Return Management

RL: Reverse Logistics

RRL: Retail Reverse Logistics

RSC: Reverse Supply Chain

SCM: Supply Chain Management

SDGs: Sustainable Development Goals

SMEs: Small and Medium-sized Enterprises

SPICE: Sustainable Packaging Initiative for CosmEtics

SPOT: Sustainable Product Optimization Tool

UN: United Nations

1. INTRODUCTION

1.1 Context

The European cosmetics and personal care market is the largest in the world because of its high consumption value. In 2019, the market was valued at 79.84 billion euros, representing a growth of 6% in the past seven years (Statista, 2020). Through manufacture and supply chain activities, the beauty industry brings an added value of at least 29 billion euros every year to the European economy. Providing a total value of 53.7 billion euros, Germany, France, the United Kingdom, Italy and Spain are the largest national cosmetics markets in Europe. In addition, in 2019, the cosmetics exports of France and Germany accounted for 50% of the total global cosmetics exports, reaching 23.44 billion euros (Cosmetics Europe, 2021).

The driver of the economic growth of the cosmetic industry is a mix of small and big companies within the European market. Small and medium enterprises (SMEs) represent a strength for the entrepreneurial beauty care market thanks to innovation and dynamic business models. In 2019, over 5,900 SMEs were involved in cosmetics manufacture in Europe. Italy is surpassing the chart with 814 SMEs and followed by the United Kingdom and France, accounting respectively for 652 and 607 SMEs (CTPA, 2021).

Leading competitors are an adequate representation of the personal care industry in Europe with the combination of high-end, drugstore brands and mass-market retailers. A reduced number of brands were leading the European cosmetics market in 2020. Figure 1 shows the ranking of leading brands in terms of brand value. It illustrates the significant place held by L'Oréal which appears twice in the ranking through two different brands.

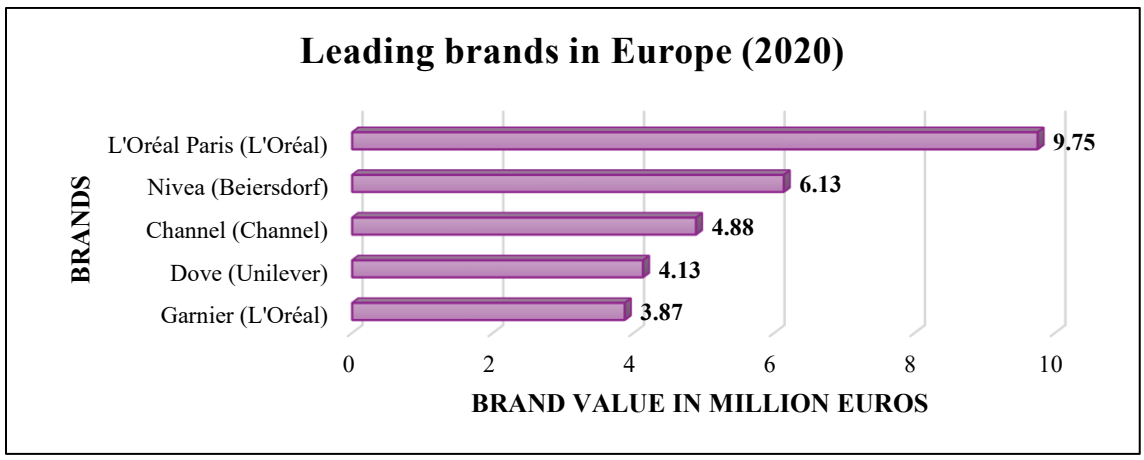

Figure 1. Brand value of leading European cosmetic brands 2020. Source: Statista (2021).

Major beauty retailers also represent accurately the different segments of the European market. Figure 2 demonstrates the importance of the German and French markets through a ranking of the most prominent cosmetics retailers.

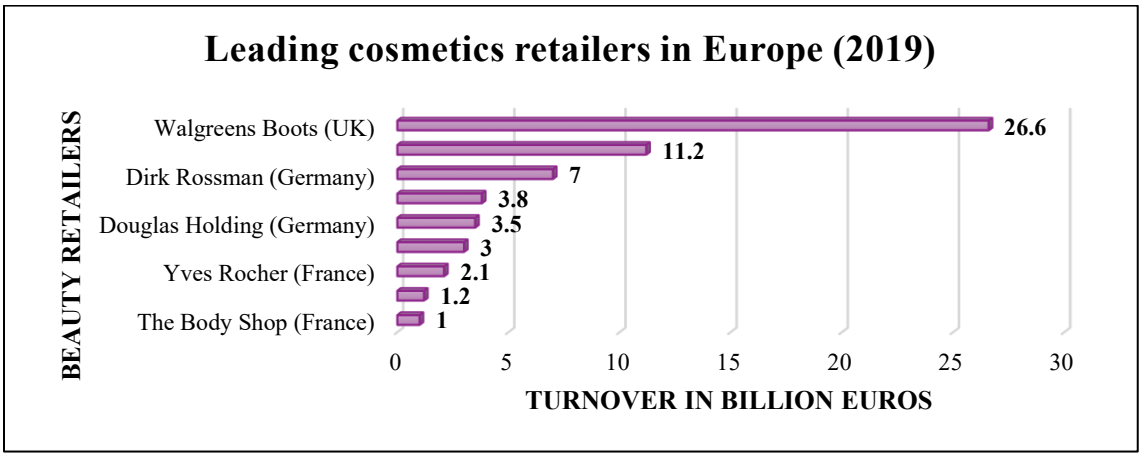

Figure 2. Turnover of leading European cosmetics retailers 2019. Source: Statista (2021).

Over the years, concerns have been rising about environmental damages because of cosmetics products. Academics and mainstream media have broadly discussed the pollution of marine life as a consequence of microplastics in cosmetics formulations (Guerranti et al., 2019; Neal, 2015; Vidal, 2016). This led the European Commission (2019b) to pledge to ban the intentional use of microplastics. However, cosmetics packaging also contributes significantly to plastic waste and pollution. Forbes (Sherriff, 2017) reported that the global industry produces over 120 billion units of packaging every year and contributes to the loss of 18 million acres of forest annually. The luxury beauty market is designated as the worst end in terms of packaging, as it often uses multiple layers of packaging for aesthetic purposes (Borunda, 2019).

Because of the growing concern and interest in sustainability among consumers and organisations, the personal care industry committed to improving the environmental sustainability of its products and activities. Partnering with various non-profit organisations, cosmetics companies are changing their ways of operating and setting new objectives to diminish their carbon footprint and waste throughout the life cycle of their products. As a large portion of the ecological footprint of beauty products is due to the use and post-use phase, companies are implementing new strategies and processes to lessen their ecological impact by designing recyclable packaging, starting packaging returns programs and providing refillable containers (Cosmetics Europe, 2019b). In Europe, all companies already have a legal obligation to recycle and recover packaging waste, which is usually performed by a specialized company

(Cosmetics Europe, 2021). However, a large volume of products still ends up in landfills or incinerators (Bernard et al., 2020).

In 2009, the Stockholm Resilience Centre defined the concept of the nine Planetary Boundaries (Figure 3). These boundaries represent the limits that humanity must not cross, otherwise, it will irreversibly damage the Earth. The research centre identified nine processes to stabilize and regulate the Earth's system. In 2011, the United Nations (UN) adopted this concept, which led to the development of the 17 Sustainable Development Goals in 2015 (Stockholm Resilience Centre, 2021).

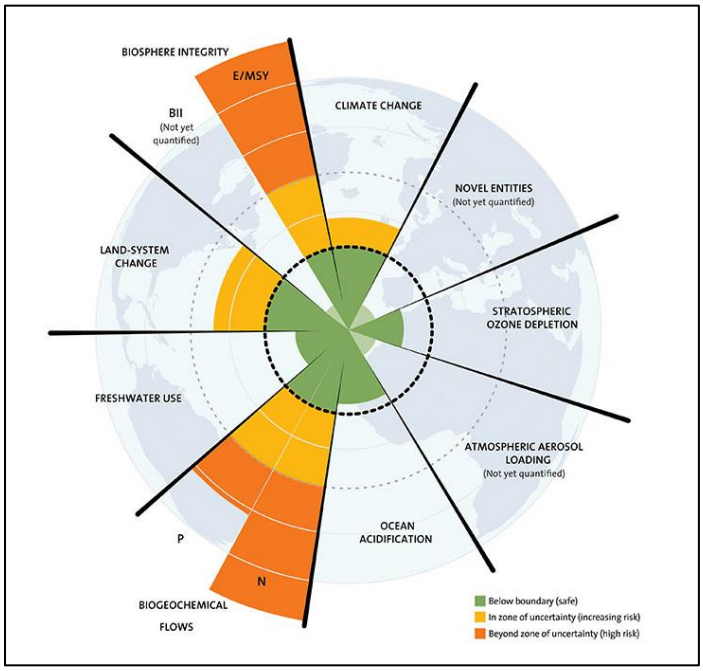

Figure 3. The Nine Planetary Boundaries. Source: European Environment Agency (2019)

The UN 17 Sustainable Development Goals, provided in Appendix 1, comprise a series of objectives to tackle climate change by 2030. The development of these goals directed the sustainability agenda of the European Union (EU). Launching the European Green Deal, which aims at a climate-neutral economy and sustainable growth (European Commission, 2019a), the EU is gradually updating its Circular Economy Action Plan. This plan represents a set of initiatives to achieve a cleaner and more competitive Europe and promote circularity. It addresses key products' value chains, including packaging and plastics (European Commission, 2020). The EU committed to ensuring that by 2030, all plastic waste from the European market is reusable or recyclable, which affects greatly the cosmetics industry and drives most of its initiatives (Cosmetics Europe, 2019a).

1.2 Research Motivation

This section will put forward the managerial motivation of this thesis based on information about the industry and the academic motivation by addressing the current state of research in the academic literature.

1.2.1 Managerial motivation

Aiming at helping firms to reduce their footprint through products design and processes, Cosmetics Europe and the Fédération des Entreprises de la Beauté (FEBEA) have published guides of good sustainability practices. Those guides comprise achievements, tools and requirements to move towards sustainable production and supply chain.

In the cosmetics industry, life cycle assessments and other life-cycle thinking approaches are used to identify and prioritise critical processes in the hope to improve environmental effects (Cosmetics Europe, 2019a). A large portion of the focus is put on product design and formulation, as they determine a significant part of the environmental footprint of a product. Among other guidelines, cosmetics companies are encouraged to develop collection and recovery systems to reduce the environmental impact of the post-use phase. Packaging waste is perceived as a critical issue as its treatment depends on customer habits, infrastructures and waste management techniques. Thus, firms should encourage customers to bring back empty packaging by providing incentives and raising awareness. In addition, using refillable/reusable packaging saves raw materials, therefore reducing sourcing costs. (Cosmetics Europe, 2012; Fédération des entreprises de la beauté, 2018).

Furthermore, different cosmetics products have different life cycles. Some products stay on the market for a reduced time (usually three months) whereas others will last longer thanks to increased marketing. Because the personal care industry is very competitive, the life cycle of its products rapidly decreases with time (Kumar et al., 2006). As products' life cycles shorten, more products become obsolete and must be replaced or upgraded, leading to unsold inventory.

Cosmetics manufacturers and retailers have already taken multiple initiatives to diminish the beauty care industry's environmental impact.

The case of Estée Lauder, the US-based cosmetics manufacturer, is the most famous in terms of reverse logistics implementation. The company used to dump into landfills each year over

60 million dollars of products because of returns from its retailers. To reduce the financial and environmental impact, Estée Lauder developed automatic sorting of products to evaluate products' conditions and redistribute them. The system also allowed the company to understand why products are returned. Since implementing the reverse processes, the manufacturer has lowered the production and inventory levels, the volume of destroyed products and the expenses associated with landfill space (Jayaraman & Luo, 2007; Meyer, 1999).

Garnier, one of L'Oréal Group's brands, recovers unsold sun-protection products at the end of summer. Garnier redistributes the products, either in the primary or the secondary market, to avoid waste (Flapper et al., 2005). Moreover, the Group developed the Sustainable Product Optimization Tool (SPOT) to measure the environmental impact of products, make simulation and find improvements (L'Oréal, 2021b). In 2018, L'Oréal launched the Sustainable Packaging Initiative for Cosmetics (SPICE) to help the industry commit to more responsible packaging. SPICE unites companies and organisations from the beauty sector to develop methodologies for environmentally conscious decision-making to improve the ecological performance of the packaging value chain. L'Oréal Group has also taken an enormous step towards the circular economy by developing processes to transform its factories into "waterloop factories"(Cosmetics Europe, 2019a; SPICE, 2021).

Achieving creativity and agility, Lush expanded its packaging-free range by reformulating products into solid products. Leveraging the advantage of reusing, recycling, and reducing packaging, Lush also saves costs by promoting reusable containers and gift wraps. In 2008, Lush launched the "Black Pot program", encouraging customers to bring back their empty pots. They then ship the pots back to the factories where they are remoulded into new ones. Other reuse and reduction of packaging programs have been put in place with suppliers to cut down waste upstream (Shum, 2020). Other producers and retailers launched similar empty packaging collection programs to recycle containers by offering incentives or rewarding sustainable behaviours (Cîme Skincare, 2021; L'Occitane en Provence, 2021; oOlution, 2021; Sephora, 2021a; The Body Shop, 2021).

The shift towards CE and sustainable management of packaging and products makes up a challenge that the industry has been facing for years. Companies must constantly innovate and find alternative solutions to reduce waste and environmental impact. To this end, obtaining an overview of the maturity of the cosmetics industry in terms of products and packaging recovery will determine whether companies consider reverse logistics as a viable solution for closing the

loop. It will also establish if the guidelines of Cosmetics Europe and FEBEA regarding packaging recovery are likely to be followed by manufacturers and retailers.

1.2.2 Academic motivation

Reverse logistics (RL) and closed-loop supply chain (CLSC) have been discussed widely in the literature as a way towards circular economy (CE) regarding specific industries and types of products. Previous research focused mainly on the opportunity offered by remanufacturing and refurbishing durable products such as automobile, equipment, or home appliances (Atabaki et al., 2020; Jeihoonian et al., 2017; Savaskan et al., 2004; Shimada & Van Wassenhove, 2019; Xiong et al., 2016). CLSC has also been considered for fast-moving consumer goods (Abbey et al., 2015; Mishra et al., 2018; Stewart & Niero, 2018) and pharmaceutical products (de Campos et al., 2017; Kabir, 2013). Research has been conducted in the agri-food industry, aiming at reducing the environmental impact of transportation (Roghanian & Cheraghalipour, 2019), reducing resource waste (Banasik et al., 2017), fostering the use of reusable food packaging (Accorsi et al., 2020) or improving food waste recovery (Bottani et al., 2019). A growing part of the literature is also turning towards sustainability opportunities in the fashion industry considering optimal return window for online clothing orders and refurbishing (Difrancesco et al., 2018), rent-based supply chain (Hu et al., 2014) or comprehensive optimization of the CLSC network (Oh & Jeong, 2014).

Few studies have been conducted to analyse the sustainability level of the cosmetics industry and the perspectives for circular economy in this industry or the current reverse logistics practices. Research concentrates on product or packaging eco-design and case studies of large corporations (Bom et al., 2019; Cinelli et al., 2019; Fortunati et al., 2020; Kumar et al., 2006; Li et al., 2010). Some papers are focused on life cycle assessments for cosmetics formulation and others analyze the impact of sustainable practices on the organization (Cardoso De Oliveira et al., 2019) or the social aspect of sustainable development (Civancik-Uslu et al., 2019; Morais & Silvestre, 2018; Secchi et al., 2016). Hence, it makes sense to investigate the aspects of reverse flows and environmentally conscious practices of the cosmetics sector. Furthermore, as mentioned by Meherishi et al. (2019), there is a need for more industry-specific studies around sustainable packaging supply chain management.

Maturity models have been adapted to different fields and situations, including supply chain management and sustainable logistics (Battista & Schiraldi, 2013; Reefke et al., 2014). A

reduced number of papers examine reverse supply chains in maturity analysis but researchers focus on durable products by referring to the electronic sector or solid waste management (Janse et al., 2010; Peña-Montoya et al., 2020). In the light of the available literature, there is evidence that considering the evaluation of RL for consumer goods should provide valuable knowledge.

1.3 Problem Statement and Contribution

As established in the previous section, cosmetics companies are forced to modify their business models in order to comply with the regulations of the EU. Achieving circularity in terms of packaging and waste management is at the core of the strategies currently implemented by the industry.

Aiming at investigating the current practices undertaken by beauty firms to close the loop, this work pursues the objective to assess the level of maturity of the personal care sector in terms of green management of unsold inventory and empty packaging recovery. Two research questions were set out to achieve the purpose of this thesis.

The first explorative question to be answered beforehand can be expressed as follows:

"Q1: What is the maturity level of the reverse supply chains of European cosmetics companies?"

With this first research question, the objective is to evaluate the current reverse logistics operations of European cosmetics companies. It should allow drawing conclusions on the type of return flows encountered and the maturity of the firms' reverse supply chains. It is crucial to start by assessing the maturity level of reverse logistics before considering green operations to understand the state of the reverse network and obtain insights on general barriers.

The second and final research question may be defined as follows:

"Q2: What is the maturity level of operational environmental sustainability in the European cosmetics industry in terms of product recovery and empty packaging returns management?"

This research question will allow determining the compliance of those reverse supply chains with GRL principles and product recovery management. The research focuses on the management of damaged, obsolete, seasonal, overstock and outdated items. In the context of

this thesis, those products are referred to as unsold products. They are characterized by the fact that they cannot be sold in their current state, are unlikely to sell in the future or cannot be marketed at all because of their condition. Moreover, this research will be focusing on empty packaging recovery. The types of packaging addressed in this study are primary (bottles, jars, containers, tubes...) and secondary (usually paper box) packaging.

Most studies and cosmetics firms put the emphasis on eco-design and innovative design to reduce the carbon footprint of cosmetics packaging. Similarly, there seems to be a gap in the literature around closing the loop and recovering packaging after-use and a lack of information related to the management of overstock within the cosmetics sector. This thesis aims at exploring those areas and highlighting the operational issues and constraints of the beauty care sector, which affect the recovery processes and returns management. Furthermore, it will allow identifying differences between the practices of brands and retailers in terms of unsold products management. It will also underline the divergence in terms of strategy of large corporations and smaller enterprises.

The findings of this study shall serve companies to evaluate their reverse supply chains in relation with environmental sustainability by the development of a suitable maturity model. The results will provide insights on the barriers to overcome to implement efficient green reverse logistics.

1.4 Thesis Structure

This research thesis comprises six chapters. The first chapter includes an **introduction** to the sustainability engagements of the European Union and a description of the European cosmetics industry. It also presents the objectives of this thesis and the research questions.

The second chapter details the **literature review**. The first sub-section defines the concept of environmental sustainability and delivers insights into the state of research in the field of sustainable cosmetics. The following sub-section elaborates on the principles of green supply chain management, leading to the theory behind green reverse logistics. The third sub-section focuses on the concepts of reverse supply chain and reverse logistics, introducing product recovery management and retail reverse logistics. Finally, the last sub-section provides a theoretical framework for closed-loop supply chains and the circular economy.

The third chapter is devoted to the **research design**. This chapter describes the data collection methods through an online survey, interviews, and secondary data analysis of sustainability reports. It also introduces the maturity model which was tailored to answer the research questions.

In the fourth chapter, the **results** of the survey and the interviews are presented as well as the conclusions drawn from the analysis of the sustainability reports. It also shows the adapted maturity model and the diagnostic of the European cosmetics industry by considering four market leaders and the surveyed companies.

The fifth chapter explores the findings with more details. The **discussion** offers further explanations for the results and their implications. It also provides conclusions about the diagnostic of the European cosmetics industry.

Finally, the sixth chapter **concludes** the research with a summary of the findings as well as limitations and a proposal for further research.

2. LITERATURE REVIEW

2.1 Sustainability in the Cosmetics Industry

The following sub-sections will explore the concept of environmental sustainability as well as the relationship between cosmetics and sustainability in the academic literature.

2.1.1 Definition of sustainability

The concept of sustainability is very broad and defined differently depending on the field of research. In 2005, the World Commission on Environmental and Development defined sustainability as the "reconciliation of environmental, social, and economic demands" (Thomsen, 2013).

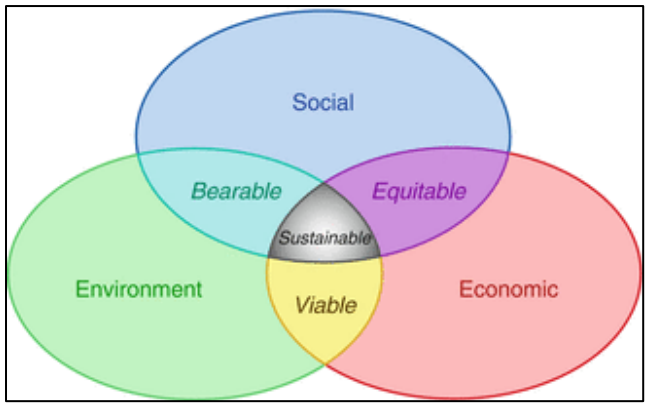

Figure 4. Pillars of sustainability. Source: Thomsen (2013)

When focusing on one dimension of sustainability (Figure 4), other definitions arise. Social sustainability relates to how a company contributes to the overall welfare and quality of the community. It is often closely defined along with ethical production and transparency. Economic sustainability refers to the achievement of economic growth by improving the environment and the quality of life. Environmental sustainability describes actions, initiatives and processes developed by organizations and people to address concerns regarding climate change and resource scarcity. It comprises strategies to protect raw materials sources and minimise waste while improving human wellbeing (Danso et al., 2020; Thomsen, 2013). Environmental sustainability management is considered key for operations strategy, as it often increases performance. Additionally, the introduction of environmental policies can lead to competitive advantages and increased efficiency (Danso et al., 2020).

2.1.2 Relation between sustainability and the cosmetics industry

The definition of cosmetics is provided by the European regulation on cosmetics. It emphasises the breadth of the cosmetics industry and all the markets associated with that industry:

> "any substance or mixture intended to be placed in contact with the external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition or correcting body odours." (Article 2, Regulation 1223/2009 on cosmetic products, 2009).

The cosmetics sector plays an important role in society and it must align with the change in consumers' habits due to environmental and social expectations. There is an increasing need for companies, from SMEs to multinationals, to innovate and encounter sustainable processes and products to stay competitively relevant in a fast-paced market (Bom et al., 2019; Fortunati et al., 2020; Sahota, 2013). As this industry is highly innovative and constantly searching for ways to differentiate from competitors, companies wish to act as innovation inductors for their supply chains. This point was investigated by Pereira De Carvalho & Barbieri (2012) in the case study of the Brazilian company, Natura.

Various research is led around sustainability and its connection to the cosmetics industry. A large portion of the literature regarding sustainable alternatives in the personal care market focuses on packaging eco-design. This sector is very brand-sensitive, thus, brands choose to associate themselves with sustainability through the first element perceived by their customers: the packaging (Coelho et al., 2020).

In the optic to analyse the importance of the circular economy within the beauty sector, Fortunati et al. (2020) showed that cosmetics multinational concentrate most of their efforts on the design of their packaging because they consider that packaging material or refillable containers are most likely to reduce their ecological impact. Additionally, companies underline the importance of recycling, the reduction of waste in landfills and intend to decrease their CO_2 emissions and water use.

Alongside environmental damage caused by ingredients, the packaging is described as one of the main harms to the ecosystem. Excess layers and materials used are the biggest concerns

around cosmetics packaging. Plastics are often the first choice because of their flexibility and lightweight but do not biodegrade in landfills (Sahota, 2013). There has been a significant increase in using Post-Consumer Resin (PCR) plastics, thus, companies incorporate recycled plastics into their packaging instead of virgin plastic. There has also been a higher demand for bio-plastics and bio-based materials for packaging, to tackle the challenge of packaging waste (Bom et al., 2019; Cinelli et al., 2019). The 3R's strategy is a popular practice for packaging management: reduce, reuse and recycle. However, in practice, reuse of packaging is rarely applied, and chemical or mechanical recycling is not easily achievable. The main issue resides in the necessity of collecting packaging after the use phase of the consumer (Cinelli et al., 2019) but this does not prevent beauty companies from starting to implement more reusable packaging for shampoo, lipstick or fragrance (Coelho et al., 2020).

Likewise, life cycle assessment (LCA) is a widespread practice in the cosmetics sector. Due to the diversity of product ingredients and packaging, the complexity of cosmetics makes it difficult to establish a clear LCA, which leads to a plethora of possibilities for further research (Sahota, 2013). Glew & Lovett (2014) put forward the environmental issues related to the use of shea butter in cosmetic products by evaluating the greenhouse gas emissions of shea processing until it reached the retail shelves. Similarly, Secchi et al. (2016) evaluated the benefits of bio-based ingredients and the ecological effect of cosmetic ingredients. A sustainability tool calculator was developed by Bom et al. (2020) to evaluate the sustainability of cosmetic products following life-cycle thinking. Civancik-Uslu et al. (2019) investigated how cosmetic tubes could become environmentally sustainable by applying LCA and eco-design strategies.

Sahota (2013) presented the most common drivers for sustainability in the cosmetics industry. The study revealed that supply chain partners, like retailers, are increasingly putting pressure on their suppliers to become more sustainable. Due to the change in consumers' expectations, retailers encourage the change in behaviours further up in the supply chain. Bom et al. (2019) added that motivations also include ethical decisions, competitiveness, the necessity to find new raw materials resources and the regulations in place. Moreover, it cannot be neglected that environmental standards and guidelines are required to drive cosmetics companies into adopting green practices (Cardoso De Oliveira et al., 2019).

2.2 Green Supply Chain Management

The following sub-sections address the concept of green supply chain and dig into the characteristics of life cycle assessments. It also explains the connection between green reverse logistics and green supply chain management.

2.2.1 Definition of green supply chain management

The term green supply chain management (GrSCM) refers to both environmental management and supply chain management (SCM). Depending on the goal of the company, the scope of GrSCM will differ. It involves all activities throughout a supply chain, including green purchasing and reverse logistics. GrSCM can be defined as follows:

> "integrating environmental thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life." (Srivastava, 2007, p. 55).

The impact of green supply chain management on the performance of manufacturing organisations was addressed by Green et al. (2012). Investments in recovery activities directly affect the environmental performance, resulting in significant improvements and indirect influence on economic performance. Thus, environmental sustainability helps manufacturers improve their overall performance. Vachon & Klassen (2008) added that collaboration with suppliers and customers is crucial to find the best solution to environmental challenges and positively influence environmental performance. By combining knowledge and expertise gained through collaboration, firms are able to gain competitive advantages and cut down costs. Therefore, environmental collaboration enhances the entire supply chain's performance.

As shown by Srivastava (2008), trends in GrSCM can be categorised depending on the process it focuses on (Figure 5). Green operations refer to supply chain activities, including manufacturing, logistics and waste management. Often, companies focus on forward supply chain operations; however, reverse operations also affect greening up the supply chain. Academicians came up with the term green reverse logistics (GRL) to refer to activities of the RL which also benefit GrSCM (Hazen et al., 2011). This aspect will be addressed in Section 2.2.3.

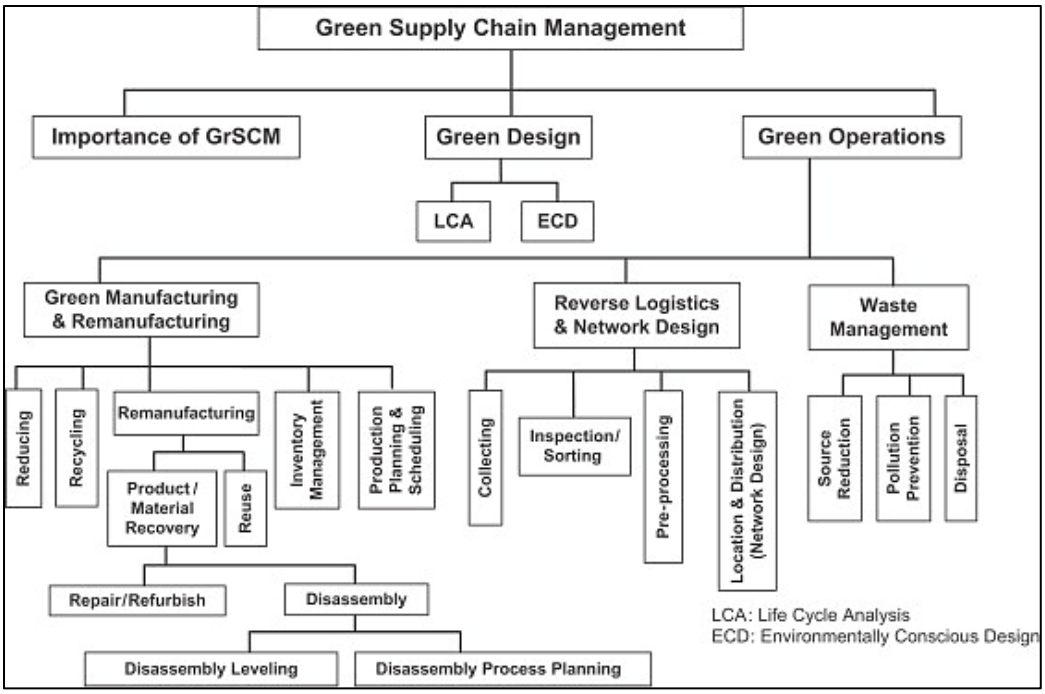

Figure 5. Classification and categorization of GrSCM literature. Source: Srivastava (2008)

However, Van Hoek (1999) argued that reverse logistics is not enough to green up a supply chain. The paper confirms that in GrSCM, all partners must be involved. After collecting products at the end of their life cycle by downstream partners, upstream suppliers can recycle and reuse parts of the products in future production. Besides, the ecologic footprint should be evaluated at different stages of the supply chain using different indicators to set performance measures to be ecologically responsible.

2.2.2 Life cycle assessment

Product life cycle analysis is part of the foundation of a GrSCM since different phases will most likely impact the environmental performance of the logistics activities. Packaging is strongly related to all stages of the supply chain and improving packaging management can lead to better environmental performance. It allows a reduction of material usage, space utilisation, and waste (Sarkis, 2003).

Life cycle assessment focuses on the environmental dimension of sustainability. LCA refers to a method, and its results, to quantify and assess the inputs, outputs and potential environmental impact of a product, process or service. Thus, LCA can support managers' decision-making process. The framework of life cycle analysis is based on a series of standards and reports proposed by the ISO 14040 series (Bouchery et al., 2017).

The concept of LCA has been evolving throughout the years, which led to the development of other life cycle thinking approaches such as life-cycle costing, social life-cycle analysis, or life cycle sustainable analysis. The latter is still at its premises among academicians and aims at broadening the scope of LCA to include all dimensions (economic, environmental and social) of sustainability (Clift & Druckman, 2016).

2.2.3 Green Reverse Logistics

End-of-life (EOL) product management is one of the primary strategies that is implemented to operationalize GrSCM. In GRL, activities are ordered from the most desirable to the least desirable: reusing, recycling and remanufacturing. As products require less work to be put back in the market, customers are more likely to perceive them as new in terms of quality, which also has a positive impact on the firm's costs. The option of reusing products refers either to customer returns of unused products to the retailer or the utilization of reusable packaging and shipping materials. Product reuse is characterized by the fact that it can instantly be reused at the retailer level without requiring to go further up the supply chain. Remanufacturing refers to all activities allowing to extend the life cycle of a product before sending it back. Finally, the last process to recover any value of a returned products by extracting materials is recycling (Hazen et al., 2011).

Hazen et al. (2012) showed that a firm that adopts GRL tends to gain competitive advantages. As sustainability and going green are popular topics in practice and research, customers are more likely to be satisfied by the environmental commitment of the company, leading to a higher willingness to pay and an increase in loyalty. The findings suggested that the adoption of GRL does not directly lead to competitive advantages but rather that the boost of loyalty might lead to this advantage. By building loyalty through GRL, firms might be able to charge for a premium that loyal customers will be more inclined to pay which leads to higher profitability in the longer term.

2.3 Reverse Logistics

This section focuses on reverse logistics operations and their relationship with recovery processes. It also highlights the main enablers and barriers in RL management. Then, it concentrates on products returns and recovery management before addressing retail reverse logistics activities.

2.3.1 Definition of reverse logistics

Throughout the years, the definition of reverse logistics has evolved. The terms "reverse channels" and "reverse flows" were mentioned in the scientific literature since the 1970s with regards to recycling (Dekker et al., 2004). The most widely used definition in academic research is the one provided by Rogers and Tibben-Lembke (1999):

> "The process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin for the purpose of recapturing or creating value or proper disposal." (Rogers & Tibben-Lembke, 2001, p. 130).

However, to allow the inclusion of product returns that were not consumed or that might be recovered differently than the consumed product, Dekker et al., 2004 advise using the following definition provided by the European Working Group on Reverse Logistics, REVLOG (1998):

> "The process of planning, implementing and controlling backward flows of raw materials, in process inventory, packaging and finished goods, from a manufacturing, distribution or use point, to a point of recovery or point of proper disposal." (Dekker et al., 2004, p. 5).

Reverse logistics is one of the key activities leading to reverse supply chains (RSC), even if those terms are used interchangeably in the literature, and include network design for product collection and recovery (Srivastava, 2008).

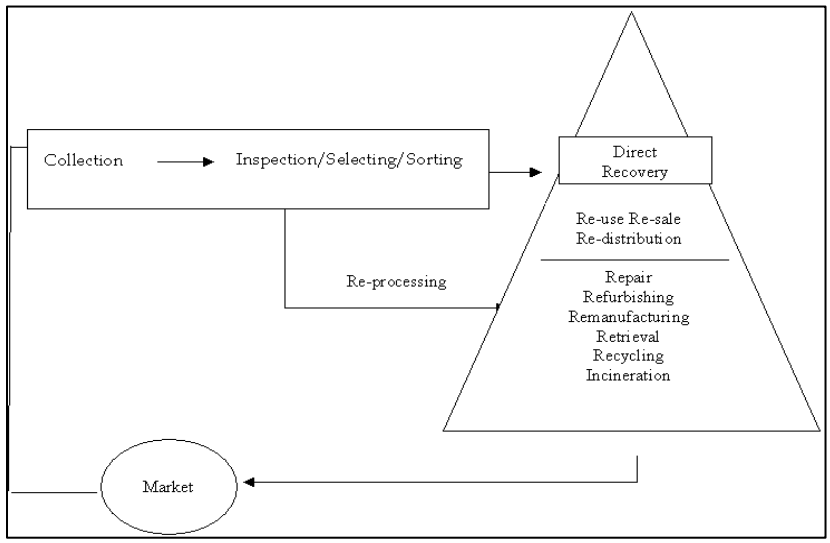

Figure 6. Reverse logistics processes. Source: Dekker et al. (2004)

Reverse logistics operations are not to be mistaken with waste management, RL refers to flows from which companies can still recover value. Figure 6 presents the succession of processes starting with collection from the market to bring products to the point of recovery and ending by the different possible types of recovery. The recovery options are ordered such that the top of the pyramid is the preferable option, and the bottom requires the most processes and is the least desirable option. If none of these recovery processes occurs, products will end up in landfills (Dekker et al., 2004).

Depending on whether the reverse streams concern products or packaging, reverse logistics activities will differ. There are various reasons for products to flow back upstream from customers and retailers returns to remanufacturing and refurbishing, passing by safety and quality recalls. Packaging is in the reverse flow generally because it is reusable or because it is required by the regulations (Rogers & Tibben-Lembke, 2001).

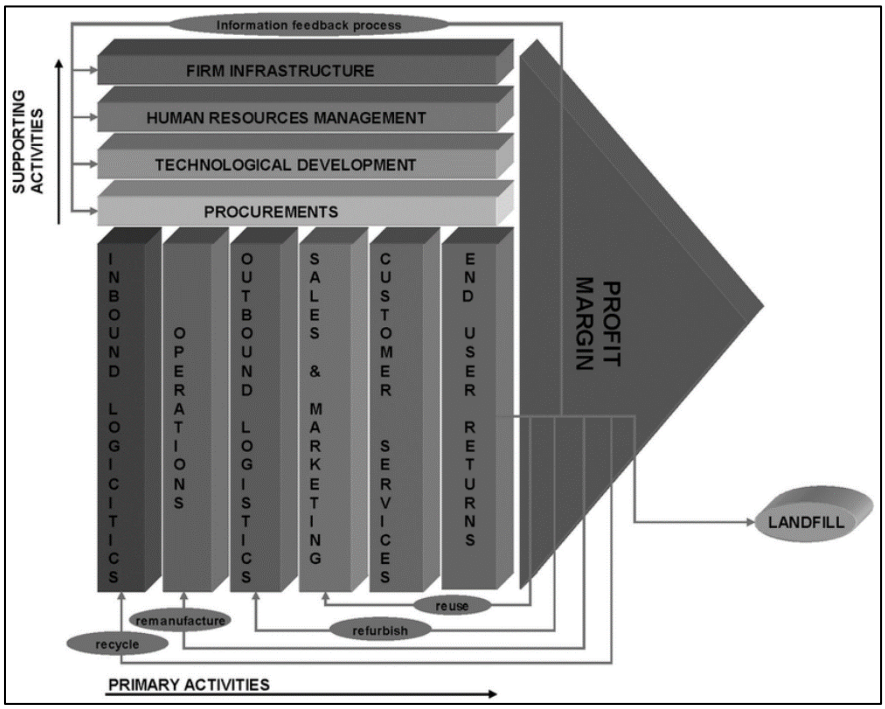

Figure 7. A process of reverse value chain. Source: (Jayaraman & Luo, 2007)

One characteristic of RL is that the reverse network operates independently from the forward supply chain (Blumberg, 2005). The value chain and activities involved in the process are also different from regular supply chains, as presented in Figure 7, since it involves end-user returns, recovery activities and disposal. The reverse process will vary depending on the recovery systems selected by the company.

As put forward by Jayaraman & Luo (2007), to encounter profitability in the long-term through RL, network design and recovery system must thoroughly be thought through. Efficient and correctly executed RL can significantly affect the firms' performance and must not be ignored. Strategic decisions include the choice of a collection method, the location and capacity of the sorting and remanufacturing operations as well as the transportation links (modes, capacities). Additionally, reverse logistics are characterized by supply uncertainty, hence matching demand and supply is a difficult challenge. Centralization of inspection is a consequence of this uncertainty, a trade-off between sorting closer to one end or the other of the reverse chain may impact the transportation needs and capacity (Dekker et al., 2004).

The dilemma between centralized and decentralized networks, the need for adequate performance evaluation and outsourcing opportunities was investigated by Olorunniwo & Li (2008). Likewise, Srivastava (2008) addressed the strategic and operational issues of setting up RL centres under constraints such as customer convenience and maximum distance. Those constraints are especially crucial for low returns volumes. The research also showed that disposition decisions are largely affected by processing costs and are the response to a trade-off between costs and value recovery.

2.3.2 Drivers and barriers to reverse logistics

Govindan & Bouzon (2018) carried an extensive literature review to summarize all the barriers and drivers for reverse logistics. Table 1 presents a list of recurring drivers and enablers category defined by scholars for the development and execution of RL. An extensive record of the barriers and motivations defining each category and the stakeholders involved is available in Appendix 2.

Table 1. Barriers and drivers to reverse logistics. Source: Govindan & Bouzon (2018)

Barriers/Drivers category	*Description*
1– Technology and infrastructure	Technology and infrastructure as a barrier refer to technological, technical and adequate facility issues. As an enabler, it refers to innovative technologies and information systems.
2– Governance and SC process	Governance and SC process reflect coordination and planning issues. It emphasizes cooperation and support between value chain partners.
3– Economic related issues	This category relates to lack of funds and uncertainty against costs, but as an enabler, this category highlights the economic benefits of value recovery and second-hand markets.
4– Knowledge related issues	Knowledge related issues are self-explanatory as they describe the need for expertise and performance data.
5– Policy related issue	Policy-related issues expose the necessity for motivational laws and government pressure to encourage recovery and returns practices. This category also underlines the difficulties to implement RL because of company policies.
6– Market and competitors related issues	This category puts forward the perception of the customer on recovered products and the lack of recovery marketplaces. It also encompasses green marketing and pressure to adopt green initiatives.
7– Management related issues	Management-related issues focus on the implication of top managers and resources support as well as the priority of RL among other issues.
8– Social related issues	Social related issues portray positive side-effects of RL activities, which aim at a greater goal than economic benefit for the firm but social profit.

2.3.3 Product returns and recovery management

Because of environmental concerns and resource utilisation, the management of EOL products has gained increasing attention among academicians and managers. Product returns and recovery management (PRRM) involve managing all product returns, including customer returns, reclaim, warranty, end-of-life collection and other return practices (Shaharudin et al., 2015). PRRM is an approach particularly popular for durable products (Um et al., 2008).

Product returns are usually grouped according to the phase in which they occur: manufacturing, distribution and customer use. EOL returns occur at the last stage, customer use, whereas returns for obsolescence or damage arise from the distribution (Shaharudin et al., 2015). The

six major product recovery options put forward by (Thierry et al., 1995) are displayed in Figure 8. Managers should follow the path of this inverted pyramid to consider the best recovery options for each product, meaning that repairing should be the preferred option while upcycling should be the last.

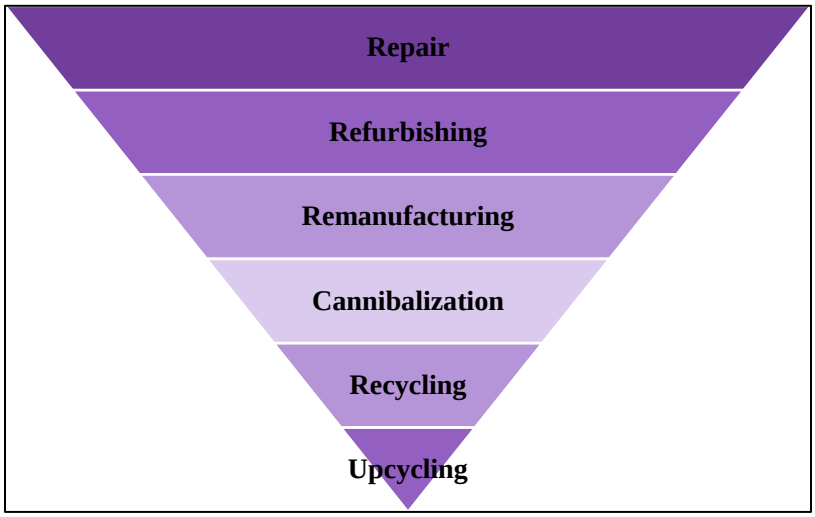

Figure 8. Product recovery options

PRRM aims at recovering as much of the economic (and ecological) value as possible, ultimately reducing waste. Most recovery activities require product redesign to ensure maximum value recovery at the end of the product's life cycle. Therefore, product recovery also implies changes in operations, productions, and supply chain structure. Companies will reduce the used products' environmental influences only if enough value can be recovered whereas the profitability of product recovery for a company depends on its ability to recover the maximum economic value (Thierry et al., 1995).

A common belief standing is that PRRM costs should not exceed its benefits. Therefore, most manufacturers concentrate on the forward flows and neglect reverse flows of the used products (Grant et al., 2017). Because PRRM is rarely considered as a business activity, the main management issue of product recovery is the struggle to get information along the value chain. Thus, adequate information systems are required to manage returns efficiently (Thierry et al., 1995). Stock & Mulki (2009) showed that even if the importance of product returns activities is increasing, most organisations do not consider returns management as one of the primary functions of executives. This leads to a lack of infrastructure investments and thus, companies do not have dedicated return processing facilities. Hence, firms usually carry operations within the warehouse of their distribution centre. Typically, the lack of dedicated infrastructure is due

to the low volume of returns and the simplicity of the recovery methods: sending a portion of their products back into their inventory (directly or after repackaging) and destroying returned items.

Lack of responsiveness of reverse supply chains delays the reuse or remanufacture of returned products, decreasing the recoverable value and reuse options. Likewise, the dynamics of the market can lead returned products to quickly become obsolete and, thus, lose value. The concept of the marginal value of time for product recovery developed by Blackburn et al. (2004) addressed this issue. Consequently, if a product has a high marginal value of time (MVT), it requires responsive RSC. As different reverse supply chain will deliver different effectiveness and costs. If products have low MVT, they should follow a centralised RSC, which is cost-efficient, since firms can benefit from economies of scale. However, products with higher MVT might rather want to follow a decentralised RSC which offers better responsiveness at a higher cost.

Nevertheless, Wang et al. (2020) proved that even if product recovery increases economic performance, it does not necessarily improve the firm's environmental impact depending on the product portfolio. Similarly, there is a high risk of product cannibalization, especially for electronic products, if manufacturers decide to remanufacture. Thus, the recovery strategy could negatively impact the profitability of existing products (Jayaraman & Luo, 2007).

A critic that could be made towards return policies is that it might lead retailers to carry more inventories and send the excess back after a while. Thus, a chain reaction could be triggered by the overstock, leading to overproduction. However, returns policies are an asset to the manufacturer as it allows the brand to get information about the products' popularity and give an insight into the market need. Therefore, product returns should not be seen by manufacturers as an issue but as an opportunity to improve quality and better management in the future. It can also safeguard the reputation of the brand as retailers will not try to sell expired or obsolete products in order not to carry the financial loss (Jayaraman & Luo, 2007; Padmanabhan & Png, 1995).

2.3.4 Retail reverse logistics

The growth of online shopping has significantly increased the volume of products returned to retailers. Because of online shopping, customers can return products via multiple channels, including post offices and specific drop-off locations (Bernon et al., 2018). A growing amount

of papers are focusing on retail reverse logistics (RRL) and customer returns. RRL is defined as the return of goods with a focus on retailers (Bernon et al., 2011). Return policies offered by manufacturers to their retailers have been widely discussed in the literature, describing mostly the effect of those policies in terms of retail competition (Padmanabhan & Png, 1997; Son & Enstroem, 2021; H. Wang, 2004).

From a marketing point of view, product returns from customers to retailers is part of the customer journey (see Appendix 3), making it easier for customers to cycle back into earlier stages of the journey. In various cases, product returns are used by customers as a strategy to gather information towards future purchases and it might also become a marketing channel due to word of mouth. Nonetheless, retail returns are often the source of conflict and coordination issues between retailers and suppliers, due to the domino effect which could occur by relaying returned products upstream or increasing retail inventory (Robertson et al., 2020).

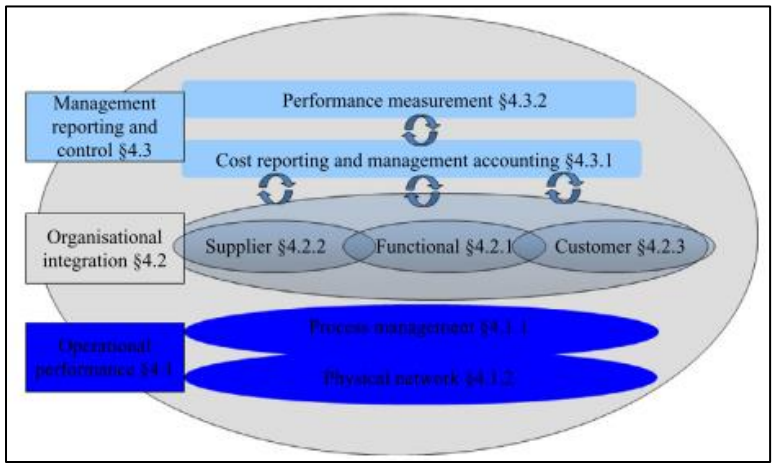

Figure 9. Framework for managing retail reverse logistics. Source: Bernon et al. (2011)

Figure 9 presents the relevant dimensions of RRL management which retailers must consider obtaining at least a suboptimal result in their reverse flows management. Operational performance refers to process management and network design. Organisational integration concentrates on internal coordination between functions, value chain partners and customers. Management reporting and control refer to cost reporting and performance indicators (Bernon et al., 2011). It has also been shown that supply chain integration could be a key asset for better product returns management at the retail level. Poor integration may drive significant cost in retail return processes (Bernon et al., 2013).

Further research aiming at aligning circular economy objectives and RRL was conducted by Bernon et al. (2018). The results enhanced the necessity for organizations to introduce sustainability in RRL within their vision. Incorporating CE into the corporate strategy of the company affects products design and material selection, which impact the durability of the products and recovery options. This means that an interdisciplinary approach is necessary to align forward and reverse supply chains activities. Moreover, collaboration is required to facilitate circularity of returned products. Finally, performance measurements are crucial to evaluate the RRL operations against sustainability and assess the evolution from linear to circular network.

2.4 Closed-Loop Supply Chain

The following sections highlight the link between closed-loop supply chains and reverse logistics. It also puts forward CLSC and sustainable supply chains as the operating strategy to achieve circular economy.

2.4.1 Definition of closed-loop supply chain

When the forward and reverse supply chains are considered simultaneously, the network results in a closed-loop supply chain. A popular business definition of CLSC has emerged from the literature. It states that CLSC management can be described as:

> "The design, control, and operation of a system to maximize value creation over the entire life cycle of a product with dynamic recovery of value from different types and volumes of returns over time." (Guide & Van Wassenhove, 2009, p. 10)

Figure 10 provides a generic form of the combination of forward and reverse logistics. In practice, closed-loop supply chains can be classified into different categories depending on the life cycle of a product in the industrial sector: production phase, distribution phase, use phase and end-of-life phase. Depending on the phase, companies will decide whether to create a loop in the supply chain or not. During the production phase, companies might face obsolete materials or equipment, production scrap and defective products. The distribution phase includes commercial returns, wrong deliveries and recalls. Regarding the use phase, it relates usually to warranty or end-of-lease returns. Finally, at the end-of-life, products can be returned because their components or materials might be reused in other products (Flapper et al., 2005).

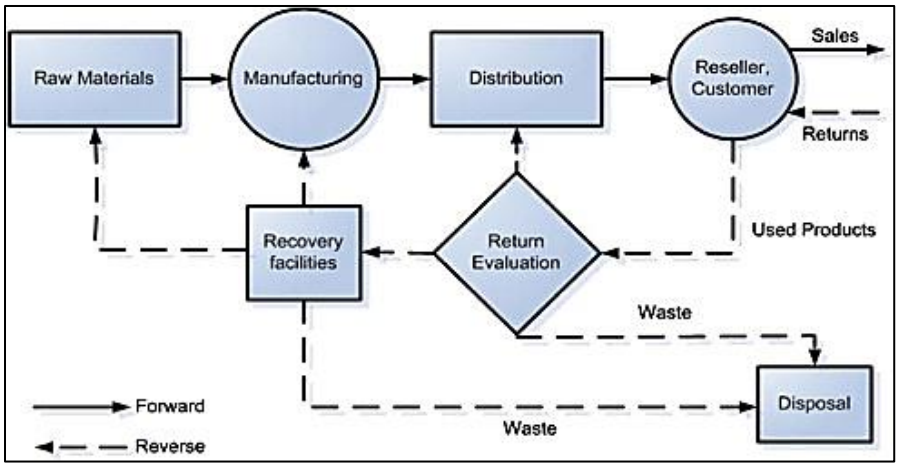

Figure 10. Combination of forward and reverse logistics. Source: Govindan et al. (2015)

To understand the trade-offs in determining the reverse channel choice in competitive retail markets, Savaskan & Van Wassenhove (2006) compared centralised and decentralised closed-loop supply chain (CLSC) models. The paper investigated the scenarios of manufacturers collecting products directly from consumers or via retailers. The study demonstrated that when manufacturers directly collect items, the aim is to save remanufacturing costs. However, entrusting retailers with product collection allows saving investment cost of collection. The results of the study suggested that the retailer collection system is the best channel structure when referring to consumer goods. When products cannot be remanufactured and must be scrapped or recycled, the indirect collection system through retailers is also the most beneficial. It allows economies of scale and permits avoiding useless transportation if value cannot be recovered.

Atabaki et al. (2020) proved that increasing the volume of returned products collected and improving recovery activities such as remanufacturing and refurbishing rates can lead to an improvement of the CLSC performance. Likewise, the model of Özkir & Başligil (2012) highlighted that high-quality returns reduce the number of reverse-centre operations and ease the selection of recovery option, thus allowing economic benefits. Though, a change in the return quantity has a higher impact on the profitability and the design of the network than on quality. Govindan et al. (2016) confirmed that encouraging returns allows economies of scale, which has a positive impact on the profit function through a model sensitivity. Increasing the return rate allows cost savings through the reduction of harmful environmental effects and increase of the social value.

The study conducted by Shaharudin et al. (2017) confirmed that RSC becomes more effective if manufacturers adopt CLSC activities. Combining reverse and forward logistics offers cost savings in operations, support in production capacity, lower cost of raw materials, reduction of waste disposal and increase of after-sale service revenue. Hence, implementing CLSC activities strongly depends on product returns. As a result, maintaining the continuity of returns is necessary to ensure profitability in a CLSC network. Thus, if a company closes the loop, the performance of the return flow should be at its best for the entire supply chain to be efficient.

2.4.2 Circular economy

The circular economy is pictured in contrast to the dominant linear model that is "take-make-waste". This linear model assumes resources are available in unlimited quantities, easy to source and cheap to dispose of. However, this model leads to exceeding the Planetary Boundaries (Figure 1) (Reichel et al., 2016).

As pointed out by De Angelis et al. (2018), different definitions of the circular economy (CE) have been proposed by practitioners and political entities. Frequently, the definition of the CE provided by The Ellen MacArthur Foundation (2021) is adopted: "a systemic approach to economic development designed to benefit businesses, society, and the environment". The goal of the circular economy is to extend products' life cycles through value-recovery and reduction of waste by coming up with new production and consumption practices such as sharing, reusing, repairing or recycling (European Parliament, 2015).

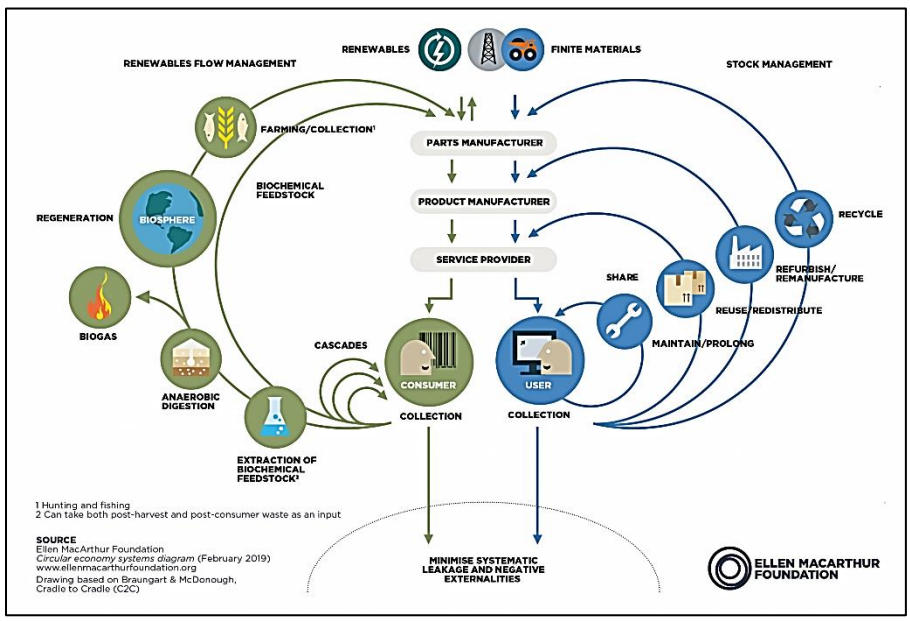

Figure 11. Circular economy system diagram. Source: Ellen MacArthur Foundation (2019)

The Ellen MacArthur Foundation (2019) came up with the famous "butterfly diagram" which illustrates the continuous flows of materials through the circle of value (Figure 11). This diagram was inspired by the cradle-to-cradle model and demonstrates the adjustments and solutions to smooth the transition towards CE for renewable and finite materials.

An intermediate model between traditional and circular supply chains can be defined: sustainable supply chains, which include GrSCM (De Angelis et al., 2018). Sustainable business models are halfway through to obtain circular value chains. Furthermore, circular supply chains incorporate characteristics of sustainable models (Geissdoerfer et al., 2018). Figure 12 illustrates the major difference between traditional, sustainable and circular supply chains. The cascaded use of the recovery schemes, the difference in landfill quantity and the number of recovery options are put forward within this figure.

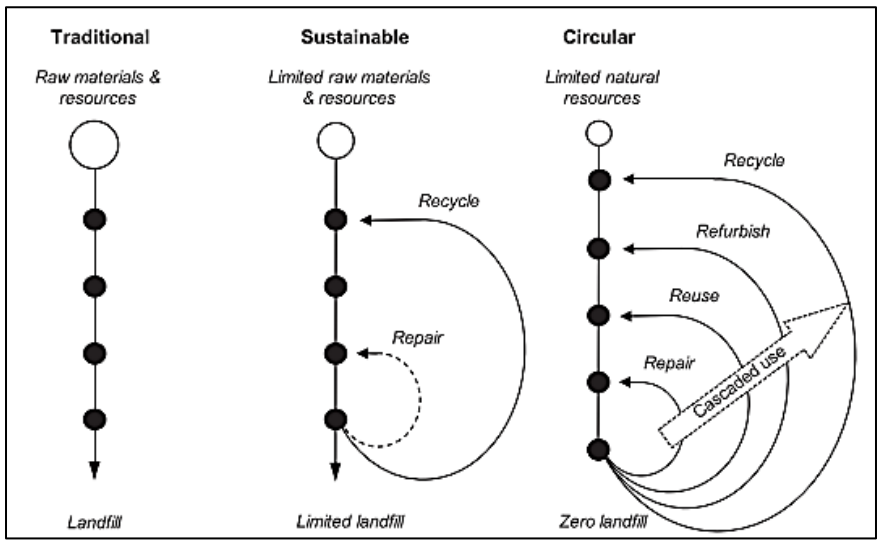

Figure 12. Traditional, sustainable and circular supply chains. Source : De Angelis et al. (2018)

The shift from the linear economy to the circular economy is characterized by the need to find new techniques to meet increasing demands for natural resources while also reducing waste, diminishing greenhouse gas emissions and increasing the use of renewable energy. The interest in the CE framework has grown over the years. Governments are pushing companies to adopt circular business models because, alongside the environmental benefits, they can provide jobs, thus improving the social structure. Additionally, society and consumers are pressuring firms to become more sustainable in the hope of a better future (Govindan & Hasanagic, 2018). Circular economy also leads to better performance in terms of resource utilisation, emissions

and energy consumption and businesses can directly gain profit from circularity through value-recovery processes (Atabaki et al., 2020; Tahu et al., 2020).

Even if the cradle-to-cradle model provides its lot of advantages, Hopkinson et al. (2018) highlighted that the main issue in a circular system is how remanufactured or reused products should be marketed. Marketers have led customers to believe that the best products are the new products. Even if some people are more inclined to buy second-hand goods, this constitutes a niche. Furthermore, the cost of the RL activities is critical and constitutes one of the biggest barriers to closing the loop. Thus, developing capabilities in reverse flows management is key before moving towards circularity. It is also very tricky to coordinate flows among the value chain, especially when retailers are involved, which makes circularity difficult to achieve among various sectors. Finally, performance monitoring and integration between forward and reverse supply chains is the most challenging part of circular models (Mishra et al., 2018).

2.5 Maturity Assessment

In the late 1970s, the concept of maturity assessment was first applied in the quality management field. Later, maturity models evolved to become the foundation of the Capability Maturity Model in Software Engineering. Due to the success of this type of modelling, maturity models were developed for different industries and contexts as a method of continuous improvement, benchmarking and self-assessment (de Almeida Santos et al., 2020; Mejia et al., 2016).

Maturity models are diagnostic tools that describe the development of an entity, they comprise "a set of elements arranged in an evolutionary path with measurable transitions between levels" (Mejia et al., 2016, p. 34). Maturity models are characterized by various levels, a description of each level, different dimensions to be evaluated which comprise various activities and a description of these activities (Mejia et al., 2016).

Maturity models are descriptive as they offer an assessment of the current situation of an entity. They can also serve a prescriptive purpose by identifying the target level of maturity and provide standards to improve the results. Finally, maturity models allow benchmarking and comparing entities that serve a similar purpose (Poeppelbuss & Roeglinger, 2011; Sehnem et al., 2019).

3. RESEARCH DESIGN

3.1 Methodology

The overall aim of this chapter is to describe the methodological approach for the development of the diagnostic model to classify and evaluate the European cosmetics sector in terms of product and empty packaging recovery management.

The research approach of this thesis consisted of an exploratory analysis of the European personal care industry. This analysis was divided into three phases. To begin with, an extensive evaluation of major companies' sustainability reports and websites was carried out to determine major trends in terms of environmental sustainability among the cosmetics sector. Moreover, field data were gathered by addressing electronic surveys to cosmetics producers and distributors. Finally, interviews were conducted to identify the specific barriers of GRL activities within the industry and gather further details on the situation of a company.

Mirroring the theoretical framework and the results of the exploratory investigation led to the development of a classification model. This model was then empirically tested against field data.

3.2 Data Collection

The following sub-sections describe the three methods used to obtain the relevant data to answer the research questions of this thesis.

3.2.1 Secondary data

In order to collect information on the current environmental practices of European cosmetics companies, secondary data was analysed. Secondary data refers to data that was not collected by the user but rather by another researcher or another organization. The main limitation of the use of secondary data is that the user lacks control over this data (Davis-Kean & Jager, 2017). Thus, there is a risk that the company depicts an altered reality within its communication reports for green-washing purposes. However, as the goal is to identify general trends and information about environmental sustainability in operations, this risk is minimized.

The secondary data considered for this research include the websites of the companies that answered the survey as well as different types of reports of larger cosmetics companies: financial reports, CSR reports, sustainability reports and market reports.

The utility of secondary data was to understand the context of the cosmetics industry and prepare the questionnaires for the survey and the interviews. In addition, it provided new knowledge on the research topic and the current situation of the personal care sector with regards to GRL and product recovery.

3.2.2 Online survey

The choice of these data gathering methods arises from the exploratory aspect of the research topic. An electronic survey was addressed to European brands (referred to as producers) and distribution channels (retailers, distributors and wholesalers). The respondents were selected randomly without restriction regarding the size of the company or its segment of the cosmetics market. Providing an electronic survey facilitates the possibilities to reach companies from different countries. It also allows the respondents to take time to consider their answer, but it limits the diversity of responses through closed questions. The major limitation resides in the possibility of greenwashing in the answers provided by the company. However, due to the closed questions and multiplication of data collection methods, the risk of altered data can be considered relatively low.

The main topics and questions are presented in Appendix 4. General information about the research question, the objectives of the thesis and the research ethics were included in the first part of the questionnaire. While explaining the research topic, the respondents were provided with definitions of reverse logistics, environmental sustainability and unsold products categories. The second part, the questions section, was separated into seven blocks. Throughout the questionnaire, respondents' answers triggered, or not, a follow-up question.

The first questions aimed at identifying the company, its profile, its segment of the cosmetics market, its partnerships, and sustainability practices. The next part differed depending on whether the respondents identified as retailers or producers to gather additional information about the supply chain structure of the manufacturers. For both questionnaires, the second part involved determining how familiar companies were with reverse flows and defining those flows. This section also included a classification of barriers and enablers to reverse supply chain development within the company, which seemed to be relevant for this thesis (Luthra et al.,

2014). Besides, respondents were asked to determine potential reasons for the appearance of unsold inventories. The third block was focused on the main economic and environmental performance indicators of reverse logistics, identified by the Global Reporting Initiative (Nikolaou et al., 2013). The next four sections were focused respectively on the management of damaged, obsolete, and expired products and empty packaging management.

3.2.3 Interviews

After a brief analysis of the collected data, two firms were chosen due to the low implication but high interest in GRL activities to highlight the cause of the lack of actions. The main goal was to obtain further details on the responses provided in the survey. The interviews also aimed at grasping an overview of the issues related to the size of the business and underlining the contrast between their practices and strategy. Furthermore, they permitted to establish whether reverse flows were considered entirely as a liability by the corporate strategy.

The starting point of the interviews were questions about the general engagement of the company in terms of sustainability and the answers provided in the survey. The interview developed around the main topics of this thesis: returns management, empty packaging and unsold inventory. Then, it was followed by questions to grasp an idea of the barriers and drivers to GRL in the focal company. Finally, the interview ended with questions about the company's perspectives in terms of environmental and sustainability management. The interview guide can be found in Appendix 5.

Interviews were carried out with small businesses from Belgium and Denmark. Additional information on the interviews and the respondents' profiles are provided in Appendix 6.

One of the interviews was carried following a semi-structured questionnaire. This method allowed to address a certain number of topics but still provided flexibility in the answers and the questions. It also allowed getting personal insights from the respondents (Wilson, 2014). The interview was held over videoconferencing and on May 5th, 2021. It was conducted with the founder of a Belgian skincare business.

The second interview was carried out through email exchanges by the wish of the respondent over the first week of May 2021. It was conducted with the co-founder and Chief Footprint Officer of a Danish skincare company. This email interview method has its drawbacks as the data collected is restricted since the form of communication and the reactions, as well as

interactions, are limited. However, email interviews are still valid methods to facilitate the process and gather specific information (Kazmer & Xie, 2008).

Similarly to the limitations encountered with secondary data and survey, there is a possibility that the interviewee attempts to depict a green-washed reality. However, because of the explorative and descriptive aspect of this study, this concern can be minimised since various data collection techniques were selected and the overall aim is to analyse the European beauty industry altogether.

3.3 Maturity Model Development

In this research, the maturity model (MM) of Janse et al. (2010) was first adapted to diagnose the performance of RL operations in the cosmetics industry. Then, the obtained model was further developed to evaluate the maturity of GRL operations. For this second model, the emphasis was put on empty packaging returns and unsold inventory recovery.

As a reminder, unsold inventory refers, for this thesis, to damaged, seasonal, obsolete, expired and overstocked products. Packaging or empty packaging refers to primary and secondary packaging (paper box, bottles, jars, containers, tubes...).

3.3.1 Scope of the maturity model

The first step to develop the maturity model was to determine its scope and target (Manthey & Pietsch, 2014). The developed MM is specific to the domain of green reverse logistics in the cosmetics industry. The model aims at describing the situation “as-is” of the beauty industry in order to provide practitioners with an accurate diagnostic of the European market. This model shall enable comparative benchmarking with leaders in the personal care sector and provide leads for progress.

3.3.2 Comparison of existing maturity models

Because the recovery activities are part of the reverse logistics, the theoretical foundation of the model is the RL diagnostic tool provided by Janse et al. (2010). This model was chosen because it is one of the few models that propose to assess the maturity level of RL operations and, as most of the MM, is based on qualitative data.

First, this MM was adapted to diagnose the performance of reverse logistics of cosmetics companies in Europe and answer the first research question (Q1). Later, to answer the key research question (Q2) the very same model was tailored by referring to maturity models of sustainability and circular business models (Machado et al., 2017; Peña-Montoya et al., 2020; Sehnem et al., 2019).

3.3.3 Maturity model adaptations

The original model is available in Appendix 7. The first step was to remove the part related to spare parts and remanufacturing, as it does not apply to the case of the cosmetics industry. The dimensions regarding remarketing and secondary markets were modified to be relevant to the case of interest. Thus, remarketing refers to changing the packaging of the product, sending it back on the market and changing the distribution channels for this specific product. Secondary market refers to selling or donating items from which no value can be recovered to an organization active in another market. According to Mejia et al. (2016), the number of maturity levels typically varies from 2 to 6. For this thesis, the number of the four levels was not altered to keep their definition clear enough: 1– immature, 2– naïve mature, 3– semi-mature and 4– mature.

3.3.3.1 Model for reverse logistics assessment

Table 2 shows the adapted model for diagnosing the RL maturity state in the cosmetics industry. The model focuses on three aspects: business strategy, reverse supply chain management and goals, secondary markets and remarketing and process recovery. It also covers 8 specific dimensions.

For each dimension, the maturity state must be assessed according to the current performance of the company. A mature level reveals that RL is integrated into the business strategy, resources are adequately attributed and RL operations bring value to the firm. In contrast, an immature level states that RL activities are poorly considered and perceived as a burden for the company, leading to higher costs and inadequate distribution of resources.

Table 2. Adapted maturity model: Maturity level of RL. Source: Adapted from Janse et al. (2010)

Business aspect	***Dimension***	***State 1: Immature***	***State 2: Naïve mature***	***State 3: Semi-mature***	***State 4: Mature***
Business strategy	Integration of RL in SCM strategy	RL is vaguely considered as part of the SCM strategy	RL is secondary to the SCM strategy	RL is semi-integrated to SCM strategy	RL is fully integrated into SCM strategy
Reverse supply chain strategy and goals	Managing RL as a core business process	RL is perceived as irrelevant and a liability	RL operations are important but lack of awareness on their management	Strategic approach to RL, perceived as valuable and a liability	RL is a core business process generating value
	Holistic supply chain approach	RL is isolated from the supply chain	Cross-functional approach to managing RL	RL is partially integrated into SCM	RL is fully integrated SCM
	Clear RL goals for the end-to-end process	No RL goals	Some RL objectives are defined	Most RL objectives are defined	RL goals are defined for all processes
	Alignment with business objective	RL is not aligned with business objectives	RL is adapted to business objectives	RL is fully aligned with business objectives	RL is aligned with business objectives and market developments
Secondary markets and remarketing	Knowledge of secondary markets	Knowledge about secondary markets is considered irrelevant	Knowledge about secondary markets is available	Knowledge for secondary markets is used in return processes	Advanced knowledge of secondary markets is integrated to handle reverse flows
	Remarketing	Excess products are treated like faulty products	Secondary markets are considered for some types of excess products	Secondary markets are identified for all excess products	Primary markets are identified for excess products

Business aspect	*Dimension*	*State 1: Immature*	*State 2: Naïve mature*	*State 3: Semi-mature*	*State 4: Mature*
Process recovery	Aligned asset recovery strategy	No clear recovery strategy	Clear recovery strategy based on economic and technical feasibility	Clear recovery strategy is aligned with RL and business strategy	Recovery strategy is fully aligned with the business and RL strategy and is based on economic, technical and environmental feasibility

3.3.3.2 Model for green reverse logistics assessment

Table 3 shows the adapted model for diagnosing GRL maturity level in the cosmetics industry. The model is an extension of the previous table. The first two aspects are similar to the RL maturity model, that is to say, business strategy and green RSC management and goals. The dimensions related to these aspects also remain unchanged. However, the following two aspects of Table 2 (secondary markets and remarketing and process recovery) are expanded. The additional aspects provided in the GRL maturity model cover product recovery by referring to unsold inventory and packaging management. The secondary markets aspect of the initial model is integrated into those extra dimensions. Finally, an additional aspect, referring to environmental sustainability, was added to consider dimensions such as monitoring of performance, infrastructure and partnerships.

Comparably to the RL maturity model, the mature level reveals that GRL is integrated into the business strategy and GRL operations add value to the firm. On the other side, an immature level states that GRL activities are perceived as a burden or inexistent.

Table 3. Adapted maturity model: Maturity level of GRL. Source: Adapted from Janse et al. (2010)

Business aspect	*Dimension*	*State 1: Immature*	*State 2: Naïve mature*	*State 3: Semi-mature*	*State 4: Mature*
Business strategy	Integration of GRL in supply chain strategy	GRL is adopted to comply with regulations	Some voluntary practices of GRL are adopted	GRL is semi-integrated into the supply chain strategy	GRL is fully integrated to supply chain strategy, the company operates in closed-loop
Green reverse supply chain strategy and goals	Managing GRL as a core business process	GRL is perceived as irrelevant and a liability	GRL operations are important but lack of awareness their management	Strategic approach to GRL aiming at continuous improvement	GRL is a core business process generating value
	Holistic supply chain approach	GRL is isolated from the supply chain	Cross-functional approach to managing GRL	GRL is partially integrated into SCM	GRL is fully integrated into SCM
	Clear green reverse logistics goals for end-to-end process	No GRL goals	Some GRL objectives are defined	Most GRL objectives are defined	GRL goals are fully defined for all processes
	Alignment with business objective	GRL is not aligned with business objectives	GRL is adapted to business objectives	GRL is fully aligned with business objectives	GRL is aligned with business objectives and market trends
Packaging management	Packaging design	Design for recycling	Eco-design	Design for reusing	Design for refilling
	Empty packaging returns management	No return strategy	Return strategy through partnerships with specialized companies	Return strategy coordinated by distribution partners	Return strategy is integrated into the business and GRL strategy

Business aspect	*Dimension*	*State 1: Immature*	*State 2: Naïve mature*	*State 3: Semi-mature*	*State 4: Mature*
Product recovery management	Damaged products management	No recovery strategy.	Recovery strategy based on economic and technical feasibility	Recovery strategy aligned with GRL and business strategy	Recovery strategy fully aligned with the business and GRL strategy, based on economic, technical and environmental feasibility
	Obsolete, overstock and seasonal products management	No recovery strategy exists	Recovery strategy based on economic and technical feasibility	Recovery strategy aligned with GRL and business strategy	Recovery strategy fully aligned with the business and GRL strategy, based on economic, technical and environmental feasibility
	Expired products management	No recovery strategy	Recovery strategy based on economic and technical feasibility	Recovery strategy aligned with GRL and business strategy	Recovery strategy fully aligned with the business and GRL strategy, based on economic, technical and environmental feasibility
Environmental sustainability	Infrastructure and equipment	No suitable infrastructure	Dedicated equipment and resources to handle GRL	Dedicated facility, equipment and resources for GRL	Advanced technology and dedicated resources for facility improvements for GRL activities
	Performance monitoring and LCA	No environmental performance indicator in	A few environmental performance indicators in place, LCA	Environmental performance indicators in	Environmental performance indicators in place and

Business aspect	*Dimension*	*State 1: Immature*	*State 2: Naïve mature*	*State 3: Semi-mature*	*State 4: Mature*
		place, no LCA	for a few products or no LCA	place and LCA for all products	LCA performed for all products from design to EOL
	Partnerships	No partnership for GRL	Temporary partnerships for GRL	Long-term partnerships for GRL	Partnerships for GRL and integration of initiatives in the business

4. RESULTS

4.1 General Commitments towards Sustainability and GRL

The cosmetics industry is characterized by a large variety of segments and company profiles. The market is segmented by product category, but it is also segmented by gender and distribution channels. To represent both the higher and the lower end of the market, the following section presents general sustainability practices undertaken by major players in the European market.

4.1.1 L'Oréal

In 2013, the Group set a series of sustainability commitments to be accomplished by 2020. Those commitments addressed and engaged the entire value chain of the company. Emphasizing product design and innovation, L'Oréal aimed at reducing the environmental footprint of its formulas, prioritizing the use of renewable materials and optimizing its packaging. In 2017, L'Oréal implemented the Sustainable Product Optimisation Tool (SPOT) across all its brands to evaluate the social and environmental profile of its products. In 2018, this tool was shared with the market thanks to the SPICE initiative. The interest in eco-design led the luxury brand Yves Saint Laurent to launch a new range of skincare designed to be refilled. The product is presented in the form of a compact and practical bottle, into which slides a cartridge, enabling economies of water, carbon footprint reduction and diminishing the packaging weight for transport (L'Oréal, 2020).

Since then, the Group has expressed its wish to ensure its operations are respectful of the Planetary Boundaries. L'Oréal wants to go beyond the transformation of its business model by becoming part of the solution to environmental and social challenges. The Group committed to achieving carbon neutrality by 2025 as well as recycling or reusing 100% of waste and reducing by 25% the greenhouse gas emissions of the use of its products by 2030. Seeking to join and promote CE, L'Oréal wishes to go one step further by creating an investment fund to finance innovative projects in the field of recycling and the management of plastic waste and develop responsible solutions (L'Oréal, 2021a).

Through waste recovery and reduction at the source, L'Oréal achieved its zero waste to landfill objective in 2018. The Group committed to reducing waste generated by its production and

distribution centres by 60% by the end of 2020. Focusing on water use, L'Oréal is trying to reduce consumption as much as possible. In this matter, the Group is gradually converting its factories into "waterloop factories". This is already the case of the Belgian factory in Libramont. (L'Oréal, 2020).

L'Oréal has put up various pilot projects to ensure the best recovery method for unavoidable waste. Even if the Group's focus is eco-design, solutions have risen to reduce waste in the post-use phase of its products. In the United Kingdom, Maybelline New York launched the "Make Up, Not Make Waste" project. The goal of the initiative is to encourage customers to bring their old makeup containers into points of sale for recycling. The drop-off locations throughout the UK were managed by TerraCycle, an innovative recycling company specialized in hard-to-recycle waste. Similarly, L'Oréal Luxe sites in France have partnered with Cèdre to implement recycling for damaged, obsolete, or unsold perfumes. Cèdre is an organization that breaks up perfumes and transforms the recovered materials into secondary raw materials. The recovered glass is sent to one of the Group's bottle suppliers to be incorporated within new bottles (L'Oréal, 2020, 2021a).

4.1.2 Nivea (Beiersdorf)

In 2020, Beiersdorf, the German-based company, launched "Care Beyond Skin" which comprise a series of objectives the Group commits to achieve along with its sustainability agenda. As plastic waste is the primary concern of the sector, Beiersdorf wishes to align its practices with the CE. Setting targets to the horizon of 2025, the Group commits to providing 100% refillable, reusable or recyclable packaging (Beiersdorf, 2021).

The Group committed to reducing the volume of waste of its production sites by 2025. To tackle this challenge, Beiersdorf pursues four goals: avoid, reduce, reuse and recycle. The first two goals are at the core of the objective as they refer to sustainable manufacturing initiatives. Reuse refers mainly to find a second life for overstocked products that have become obsolete and cannot reach shelves anymore. When products are still usable, Nivea is donating overstock products to German and European charities instead of destroying them. Donations contribute to both protecting the environment and social objectives. When overstocks are not suitable for donations, the Group will rely on recycling. Waste that cannot be avoided will be disposed of responsibly, meaning that Beiersdorf is completely abolishing landfilling and searching for alternatives (Beiersdorf, 2021)

Recyclable materials and refillable bottles are popular solutions chosen by cosmetics brands to support the circular economy. Recently, in Germany, Nivea Refill Stations have been tested in DM drugstores for shower gel. Customers buy their product with refillable packaging and refill their bottles the next time. This initiative obtained the Design MUSE Award and Sustainability Reader Award 2020 from Packaging Europe. Nivea also promoted circularity with the "Make New From Old" project, partnering with Budni drugstores in Hamburg, to encourage customers to drop off their empty containers to be recycled by the manufacturer (Beiersdorf, 2021).

4.1.3 Dove (Unilever)

Unilever's sustainability agenda is guided by the "Less plastics, better plastic, no plastic" framework. The Group is investing in better infrastructures to improve recycling and recovery to halve the waste associated with its products. Unilever has been trialling refill projects along with supermarkets in France and the United Kingdom (Unilever, 2021).

To go further in its waste management strategy, Unilever wants to have an impact on the household. In Europe, the parent company of Dove works with Ceflex to develop a better collection, sorting and reprocessing of recyclable packaging. Ceflex is a European collaborative initiative that represents the value chain of flexible packaging and aims at collecting flexible packaging for recycling and replacing virgin materials (Ceflex, 2021). Unilever also partnered with TerraCycle's Loop purchasing platform which provides products with reusable packaging. After consumption, the product is picked up from the customer's home, for free, to be cleaned and refilled for another customer (Dove, 2021).

4.1.4 LVMH

In its 2019 CSR report, LVMH emphasizes the necessity to encourage reuse and adequate recycling operations with environmental management systems in stores and sites. The Group states that waste management is constantly improved to limit production and increase recovery or recycling. In 2019, the Group reached a recovery/recycling rate of 91%. The "Maisons" are working towards a closed-loop model by encouraging waste collection and recycling. The organization Cèdre is a crucial partner in helping them achieve this objective. The partnership between the brand Sephora and Cèdre has allowed over 5 million perfume bottles to be recycled since 2014. LVMH is thoroughly working on solutions to handle unsold items. Solutions include staff sales and donations to non-profits organizations. In addition, obsolete, damaged and overstock products started to be collected from the other brands to be sorted or taken apart

and given a second life. In 2019, Cèdre recovered 62% of the waste delivered by LVMH by selling it to specialized recycling centres. Likewise, since 2018, the brand Bvlgari has been working with an Italian company to recycle its perfume and cosmetics products locally (LVMH, 2020).

Following the trends on the market, Parfums Christian Dior developed rechargeable containers for their perfumes and cosmetics. In France, Guerlain designs refillable in-store perfume bottles (LVMH, 2020).

The latest step taken by LVMH to promote circularity was in 2020. Sephora now encourages customers to handle empty skincare containers for recycling whereas empty make-up packaging can be brought back to the store to be transformed into energy (Sephora, 2021b).

4.2 Survey Results

In order to obtain indications of practices among the European cosmetics producers and retailers, the survey was sent out to companies with very different profiles from different countries. Figure 13 highlights the countries in which the headquarters of each company is located and the number of answers per country.

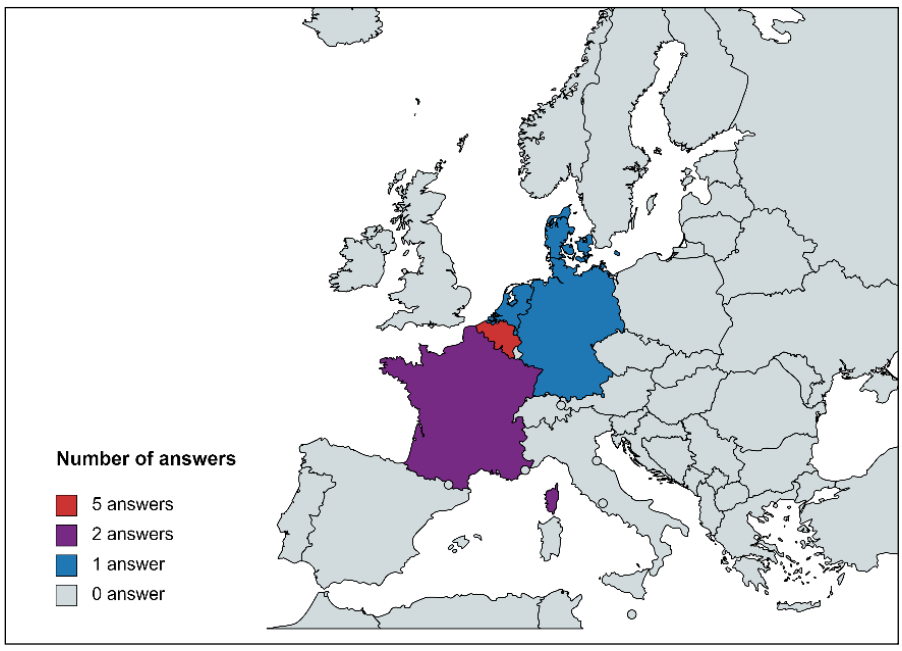

Figure 13. Location of respondents' headquarters

In total, there were ten answers to the online questionnaire, six of these answers came from brands (or producers) and the remaining four answers were from retailers. The configuration of the forward flows of the respondents is very simple in most cases, due to the small size of the producing company. The producer does not have an intermediary and plays the role of the distribution channel. Only two producers sell through wholesalers and retailers as well as independently.

Moreover, to reflect the variety of the product category and market segments, companies specialised in different cosmetics products were contacted in the hope to represent get an accurate picture of the industry. Most companies (9) are SMEs, as they are very prominent in the European cosmetics industry, and one company is considered as a microenterprise. Figure 14 illustrates the different segments in which the surveyed companies are active. The category named "Other" refers to dietary complements and personal hygiene products such as toothpaste, toothbrush, razors, and any other hygiene or beauty related products.

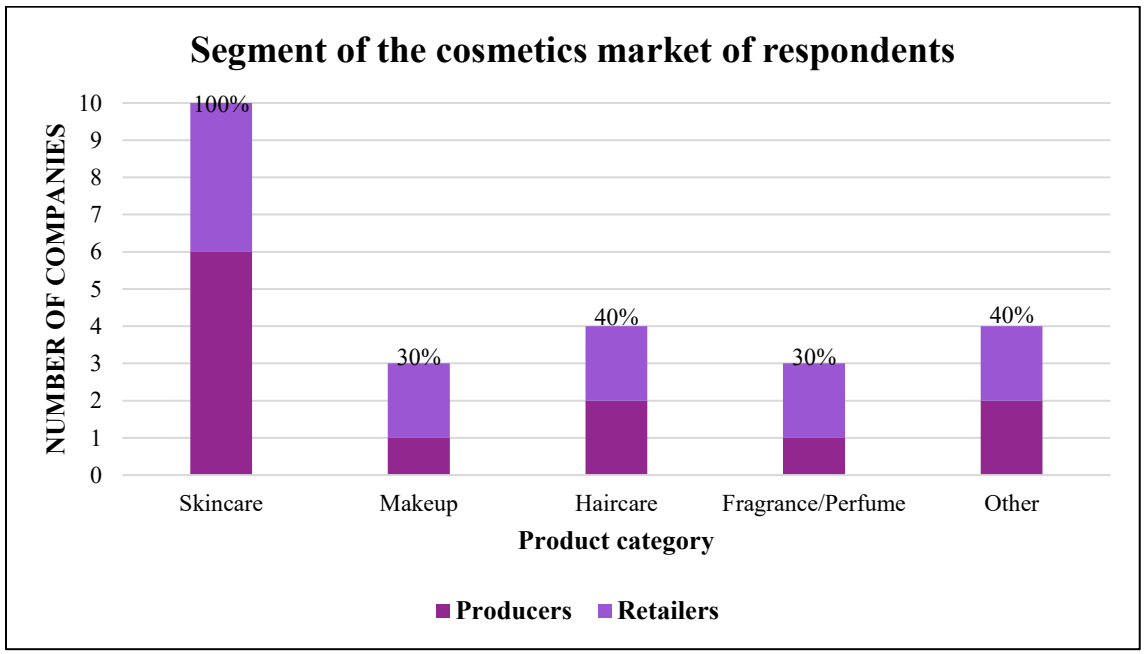

Figure 14. Companies by product category

When asked whether the company had a sustainability report or displayed sustainability information on their website to inform their stakeholders, three firms responded negatively. Those companies have diverse profiles as they are a micro-business, one small enterprise and a brand from a Group company with a larger brand portfolio. Regarding the establishment of a life cycle analysis of their products, no surveyed firm answered positively. This could be the consequence of the lack of knowledge of this technique or resources.

Regarding the existence of partnerships with a company promoting sustainability behaviours, half of the answers from the 10 surveyed companies were positive. A description of the mentioned organisations and their purpose is available in Appendix 8. The majority of these organisations promote a strong environmental objective, social challenges drive others.

To the question of investigating the cause of unsold inventory in the cosmetics industry, the tendency showed that the high number of product types and the large variety of substitutes were the main causes, as established in Figure 15. Companies added two additional factors to determine the causes: the minimum order quantity of the manufacturer is higher than the demand and an increasing number of stock-keeping units per product.

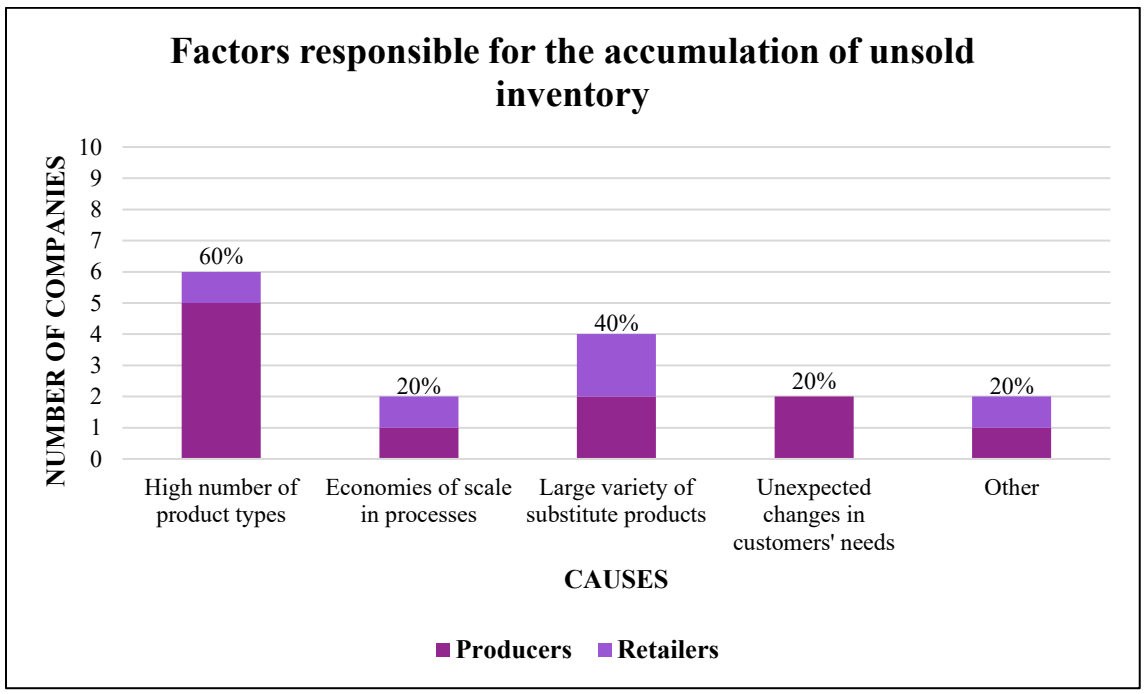

Figure 15. Causes of unsold inventory in the cosmetics industry

Furthermore, the section of the survey focused on reverse logistics activities reveals that the occurrence of reverse flows differs a lot on the firm. It seems that the bigger the company, the higher the probability they will have to deal with RSC activities. Customer returns are without a doubt the most encountered situation for all companies (Figure 16). Only two companies have mentioned additional reasons for their reverse flows, which are distributor returns and replacement of obsolete products. Interestingly enough, the company mentioning renewal of the inventory is the only company that, at least virtually, follows closely the inventory of their retailers.

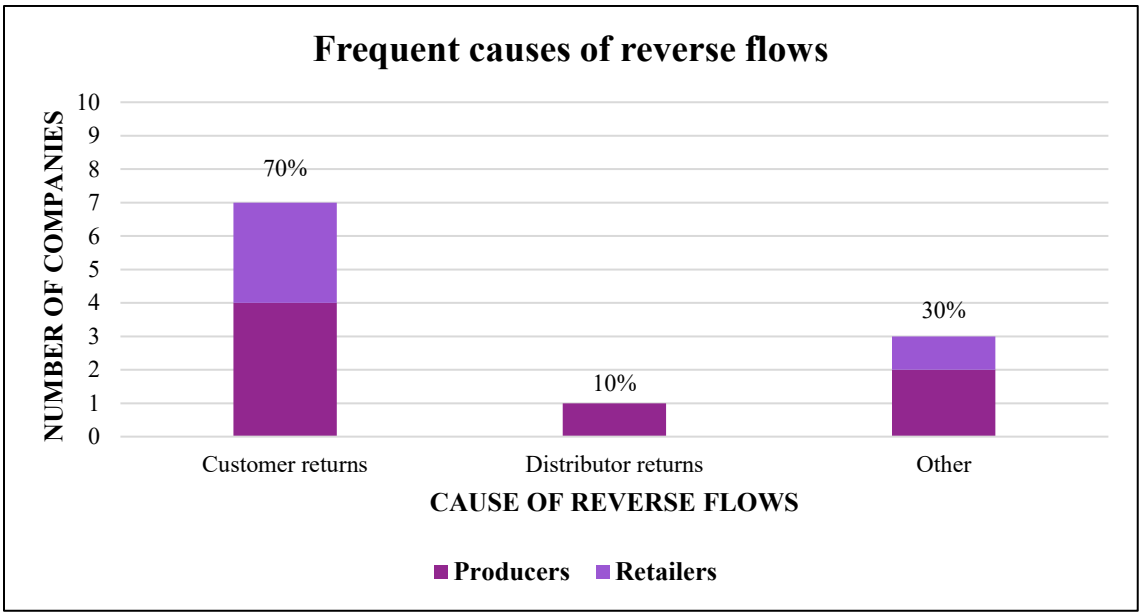

Figure 16. Frequent causes of reverse flows

Focusing on reverse flows related to unsold inventory and packaging collection, the answers to the survey indicate that product recovery and empty packaging returns appear to be rare in practice among retailers and producers. As demonstrated in Figure 17, most of the surveyed companies are not familiar with returning (or collecting) obsolete products, including overstock and season products, to their producers or with collecting empty packaging from customers. For half of the respondents, damaged and expired products are not returned to the manufacturing brand but handled by the retailer.

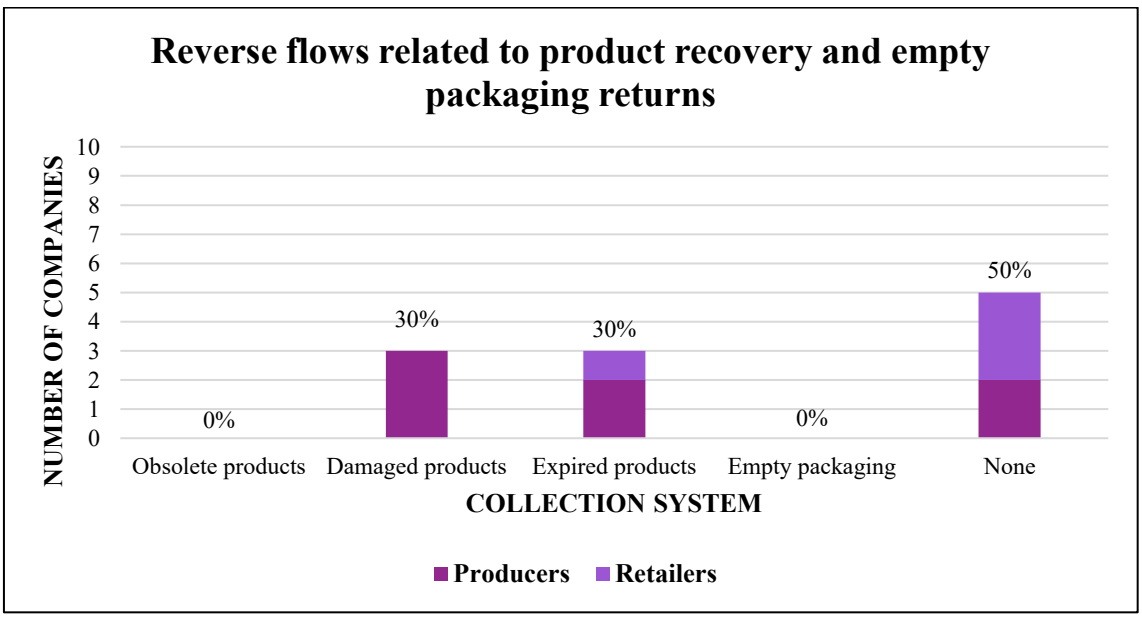

Figure 17. Product recovery and empty packaging returns

Management of obsolete, expired and damaged products varies greatly from a company to another. Figure 18 states the percentage of companies using a specific recovery method for each case. For example, 40% of the surveyed companies indicated that expired products are donated. This figure illustrates the fact that the diversity of the market leads to different strategies. Besides, for one company and the same category, various methods can be used. That is to say that the same firm can redistribute, repackage and donate damaged products depending on their condition. It is interesting to point out that obsolete products, including seasonal and overstock, benefits from the highest number of recovery methods.

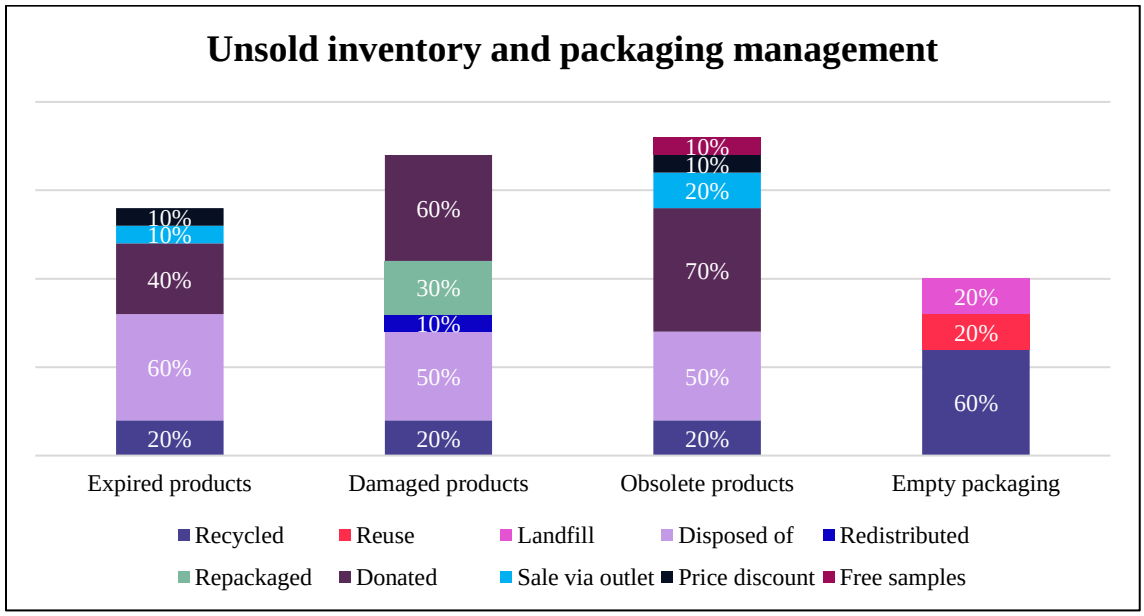

Figure 18. Unsold inventory and packaging management

The respondents have been asked to classify a reduced number of barriers and motives identified in the literature from most important to least important within their company. Table 4 puts forward the final ranking of the barriers. This classification reveals that as firms are active in an innovative industry, resistance to change is not considered as a major barrier and neither are the company's policies. On the other hand, training and adequate information systems to manage reverse flows are considered critical.

Table 4. Ranking of the barriers for RL in the cosmetics industry

Rank	*Barriers*
1	Lack of training
2	Lack of information and technological systems
3	Financial constraints
4	Lack of performance metrics
5	Lack of awareness about reverse logistics
6	Lack of strategic planning related to reverse logistics
7	Reluctance of the support of dealers, distributors, retailers
8	Lack of coordination in the supply chain
9	Company policies
10	Resistance to change and innovation

Similarly, the ranking of the drivers indicates that meeting regulations requirements are not the primary reason for implementing conscious RL operations. The reduction of capacity in landfill is not considered as one of the main motives. The drivers (Table 5) which ranked the highest are the improvement of the brand image and customer satisfaction. This is not surprising considering that the cosmetics industry is very brand sensitive.

Table 5. Ranking of the drivers for RL in the cosmetics industry

Rank	**Drivers**
1	Improvement of corporate image
2	Improvement of customer satisfaction
3	Recapturing value from returned products
4	Financial and economic advantages (reduction of costs)
5	Decrease resource investment levels
6	Minimization of waste
7	Competitive pressure
8	Clean channel
9	Reduction of landfill capacities
10	Regulations

4.3 Interviews Results

The key concern in the cosmetics industry is the packaging, due to the negative impact of the sector in terms of plastic waste. Thus, determining which packaging material is one of the biggest challenges as it requires trade-offs. For instance, the choice of glass jars is increasingly popular because customers can effortlessly reuse glass bottles or recycle them. Moreover, using glass containers provides perspectives for packaging collection and reuse in future production batches. However, glass packaging requires a lot of energy to produce and recycle. Therefore, plastics are attractive to use, for their lightweight, flexibility and because it is easier to recycle.

A big issue in cosmetics is the combination of materials. For example, even if the container is made of glass, the pumps will be made of plastics and pumps are very hard to recycle or reuse. It is particularly important to design packaging as simple as possible because customers do not take time to separate labels, jars and pumps before throwing their empty products away. Therefore, customers' education is important to ensure they will recycle them properly.

Working with a retail network would be the easiest way to implement empty packaging returns. Retailers are available in various cities and close to the customers, thus, it would be simpler to collect packaging than using post-offices. Nevertheless, there is still a risk that packaging collection would increase emissions and waste rather than reduce them due to all the operations related to this process.

One challenge to overcome to implement packaging returns programs is changing the mentalities. It takes a lot of efforts to push all supply chain partners to adapt their practices to perceive reverse flows positively. It is also fairly hard to convince the partners to see the benefits of collecting packaging and convincing production of the benefits of refilling. Therefore, it requires extra efforts from customers and everyone involved in the value chain. Additionally, adequate incentives need to be determined to encourage customers in taking part in this kind of return programs, such as loyalty benefits or discounts. Furthermore, finding innovative ways to reuse packaging and collecting them requires also financial means and human resources. As a small company, it is hard to implement as the benefits of economies of scale will not appear as they do for bigger firms. Nonetheless, returns programs can bring competitive advantages to the company as they provide publicity and marketing. This point puts forward additional drivers and barriers that were not addressed in Table 1 and 5.

Transportation is also responsible for the high ecological impact of products as it comprises raw materials, imports and shipping. Besides, products require extra packaging to keep products safe in transport, therefore, increasing the amount of waste due to packaging. Mirroring this aspect, shipping must be efficient, and customers expect to receive their products as quickly as possible. Modes of transport that pollute less also take longer to get to their destination, so it can be very hard to consider changes in practice. Similarly, operating returns requires transportation and thus, the ecological impact and cost of the mode of transport have to be taken into consideration. Overall, there needs to be a trade-off between financial, social and environmental decisions.

Regarding expired and obsolete products, for legal reasons, many products must have an expiry date when they potentially could be used for longer than evaluated. Besides, companies must also consider that the product must last at least 3 months after purchase. Thus, when products are close to their expiry dates and cannot be sold in their state, there is a need for innovative solutions. Providing samples for marketing events is one of the primary solutions, but other short terms solutions also exist. For instance, turning oil into soap and creating a new product that will last longer. It can also be hard to find new markets for marketing obsolete products, especially if the product's formulation is customized and might change in the future. The best solution is to have adequate sales and production forecasting methods, thus ensuring the volume of expired products will be limited. However, optimization of forecasts can only be done after years on the market and with enough expertise in the field of cosmetics.

Ultimately, as a small business, it is difficult to access the resources to actively engage. Most sustainable packaging have huge minimum order quantities, making it hard for startups and new businesses to obtain those. To become innovative, it's also easier on a larger scale as the costs will go down and there will be more budget for R&D. In the same way, digging deeper in environmental impact analysis like LCA requires financial resources for outsourcing and academic knowledge in the field, which is not always possible to acquire for a small company. If a small firm decides to invest in such resources, they will rather evaluate the emissions impact of the whole firm rather than narrowing the scope to single product types.

4.4 Diagnostic of the European Cosmetics Industry

This section provides an assessment of the European cosmetics industry based on reverse logistics activities. Then, the analysis is extended to answer the second research question of this thesis by relying on a diagnostic of the sector regarding empty packaging returns and product recovery.

4.4.1 Maturity assessment of reverse logistics

The first part of this section aims at answering the first research question "*Q1: What is the maturity level of the reverse supply chains of European cosmetics companies ?"* by applying the adapted maturity model of RL (Table 2) to the case of the beauty market.

To answer the first research question, Table 6 has been constructed by putting in perspective the dimensions of the adapted model of reverse logistics and the results from secondary data analysis, the survey, and the interviews of European cosmetics companies.

Table 6. Application of RL maturity model to European cosmetics companies.

Business aspect	***Dimension***	***Summary of secondary data analysis***	***Summary of survey results***	***Summary of interviews results***
Business strategy	Integration of RL in supply chain strategy	RL is mainly related to customer and retailers returns	RL is related to customer returns and few other returns	RL is developed for product recalls and customers returns
Reverse supply chain strategy and goals	Managing RL as a core business process	RL is increasingly added into the business strategy	RL is not considered a core business process, it does not occur a lot	RL is valuable but lack of knowledge on how to manage flows
	Holistic supply chain approach	Retailers or 3PL are usually responsible for RL	Retailers face RL more often than producers.	Retailers are more experienced with RL
	Clear RL goals for the end-to-end process	The objective is to sell products through other channels, satisfy the customer and comply with regulations	Customer satisfaction and compliance with regulations	Customer satisfaction, redistribution and conform with regulations

Business aspect	*Dimension*	*Summary of secondary data analysis*	*Summary of survey results*	*Summary of interviews results*
	Alignment with business objective	RL is aligned with business objectives	RL is not part of the business objectives	RL is not included in the business objectives
Secondary markets and remarketing	Knowledge of secondary markets	Secondary markets are used mostly for seasonal products, some products are redistributed directly to primary markets	Secondary markets are used mostly for seasonal products	Secondary markets are considered for expired, obsolete and seasonal products
	Remarketing	Faulty products are used as testers or sold in outlets	Faulty products are used as samples, sold in outlets or disposed of	Faulty products are used as samples, gifts or disposed of
Process recovery	Aligned asset recovery strategy	Recovery strategies come from regulations and economic advantages	Recovery strategies come from the improvement of corporate image and customer satisfaction	Recovery strategies are defined by economic and environmental advantage

Each company that answered the survey and the most prominent groups mentioned in Section 4.1 have been assigned a level of maturity by referring to the model. The details of the maturity assessment per company and global assessment are provided in Appendix 9. For each dimension, a maturity level was assigned to each firm. The average maturity state was determined by comparing large corporations, based on the secondary data analysis, and SMEs, based on the survey and interviews. The overall state was defined by taking the average per dimension, the results per business aspect are provided in Table 7.

Table 7. Diagnostic of the European cosmetics industry in terms of RL

Business aspect	*European Cosmetics industry*	*SMEs*	*Large corporations*	*Retailers*	*Producers*
Business strategy	2	2	3	2	2
RSC strategy and goals	3	2	4	2	3
Secondary markets and remarketing	2	2	4	2	3
Process recovery	2	2	3	1	2
Average maturity level	2– Naïve mature	2– Naïve mature	3– Semi-mature	2– Naive mature	2– Naive mature

The average maturity level per dimension is illustrated by Figure 19 to have more details about the attributes which influence the state of the business aspects.

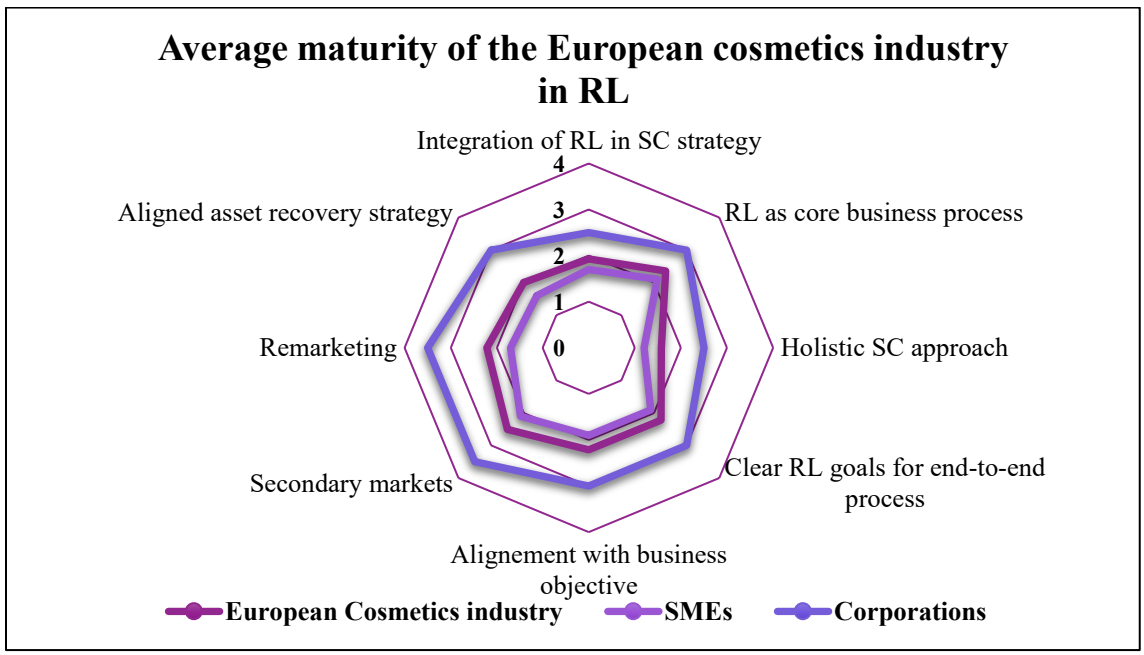

Figure 19. Average maturity level of RL in the European cosmetics industry

Because distribution channels and producers have very different experiences with reverse flow, Figure 20 shows the distinction in maturity, considering whether the company is a retailer/distributor or a producer. Though, it must be considered that the number of retailers was limited compared to the number of producers. Thus, it might show different results in reality when considering a wider range of retailers.

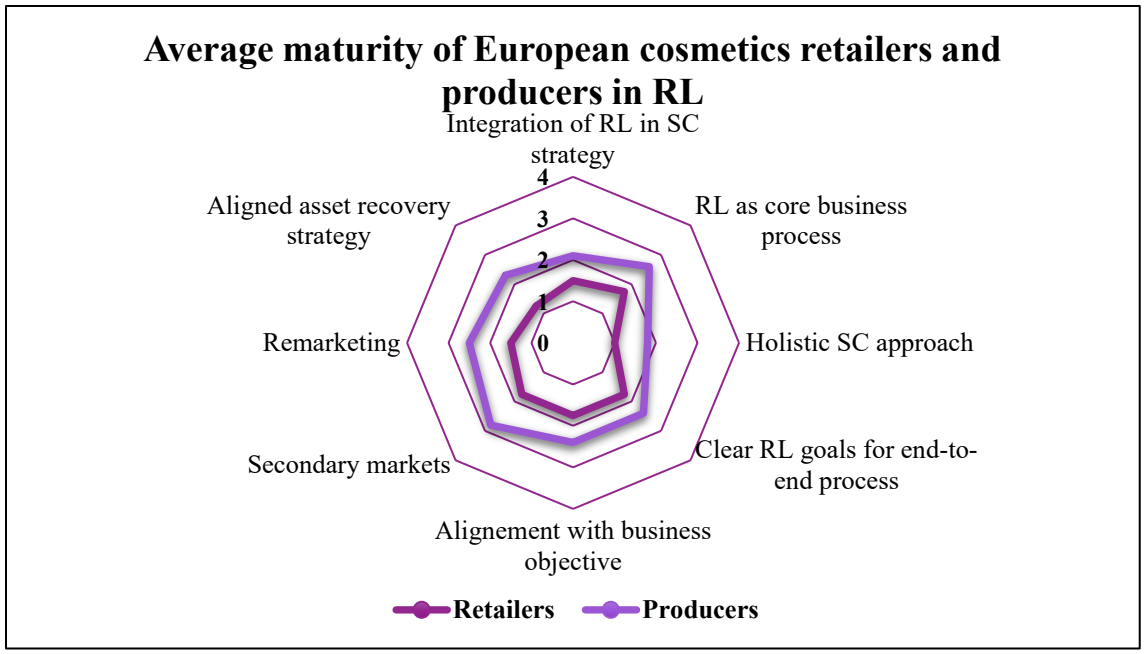

Figure 20. Average maturity of European cosmetics retailers and producers in RL

4.4.2 Maturity assessment of green reverse logistics

The second part provides an answer to the second and final research question "*Q2: What is the maturity level of operational environmental sustainability in the European cosmetics industry in terms of product recovery and empty packaging returns management?"* by referring to the extended model (Table 3) to the case of the personal care market.

Table 8 has been constructed by putting in perspective the dimensions of the adapted model of green reverse logistics and the results from secondary data analysis, the survey and the interviews of European cosmetics companies.

Table 8. Application of GRL maturity model to European cosmetics companies.

Business aspect	***Dimension***	***Summary of secondary data analysis***	***Summary of survey results***	***Summary of interview results***
Business strategy	Integration of GRL in supply chain strategy	GRL is operated by retailers, producers and specialized partners	GRL is split between retailers and producers	GRL is operated by retailers and specialized companies
Green reverse supply chain	Managing GRL as a core business process	GRL is increasingly added into the	GRL operations are important but lack of	GRL operations are valuable but lack of knowledge

Business aspect	*Dimension*	*Summary of secondary data analysis*	*Summary of survey results*	*Summary of interview results*
strategy and goals		business strategy	awareness on how to manage them	on how to manage them
	Holistic supply chain approach	All partners of the supply chain are implicated in the processes	Only the producer benefits from recovery	Producers benefit from products recovery
	Clear GRL goals for the end-to-end process	Better corporate image, recovery of value and cut down costs	Better corporate image, improvement of customer satisfaction and recovery of value	Improvement of corporate image, marketing strategy, increase of customer satisfaction and economic advantages
	Alignment with business objectives	GRL is aligned with business objectives	GRL is partially included in the vision and mission	GRL is vaguely considered the business objectives
Packaging management	Packaging design	Packaging designed for recycling, refill or reuse	Packaging designed for recycling or refill	Design for recycling and reuse
	Returns management	Partnerships with retailers or specialized companies to recover packaging for recycling	Empty packaging is not collected	Empty packaging is not collected
Product recovery management	Damaged products	Products used as testers or sent to partners for recycling	Collection from retailers to be recycled, disposed of, redistributed or donated to charities	Repackaging to be redistributed or donations
	Obsolete, overstock and seasonal products	Donations to charities, partnerships for recycling and redistribution to other locations	Obsolete and excess products are donated, redistributed, sold with a discount or	Outlet sale of excess production or use for marketing purpose

Business aspect	*Dimension*	*Summary of secondary data analysis*	*Summary of survey results*	*Summary of interview results*
			given out as samples	
	Expired products	Partnerships for recycling and destruction	Sent back to producers to be donated, recycled or disposed of directly	Destruction of outdated products by the retailer or producer
Environmental sustainability	Infrastructure and equipment	Dedicated facilities for sorting and recovery of products	No dedicated facility to handle returns or recovery processes	No dedicated facility to handle returns or recovery processes
	Performance monitoring and LCA	Close monitoring of environmental performance	No indicators or mainly economic indicators. Few environmental indicators	Lack of knowledge to implement environmental performance indicators
	Partnerships	Environmental partnerships and social partnerships are equally represented to improve overall sustainability	Social partnerships over environmental partnerships	Environmental partnerships to promote ecological behaviours

Comparably to the method used for the maturity estimation of reverse logistics, each respondent and the most important European companies have been assigned a level. The maturity state of each company was defined by contemplating each dimension, and the global state was identified by taking the average. The overall state was defined by taking the average per dimension, the results per business aspect are provided in Table 9.

Table 9. Diagnostic of the European cosmetics industry in terms of GRL

Business aspect	*European Cosmetics industry*	*SMEs*	*Large corporations*	*Retailers*	*Producers*
Business strategy	2	2	3	1	2
Green reverse supply chain strategy and goals	2	2	3	2	2
Product recovery management	2	2	3	2	2
Packaging management	2	1	2	1	2
Environmental sustainability	2	1	4	1	2
Average maturity level	2– Naïve mature	2– Naïve mature	3– Semi-mature	1– Immature	2– Naïve mature

The average maturity level per dimension is illustrated by Figure 21 to have more details about the attributes which influence the state of the business aspects.

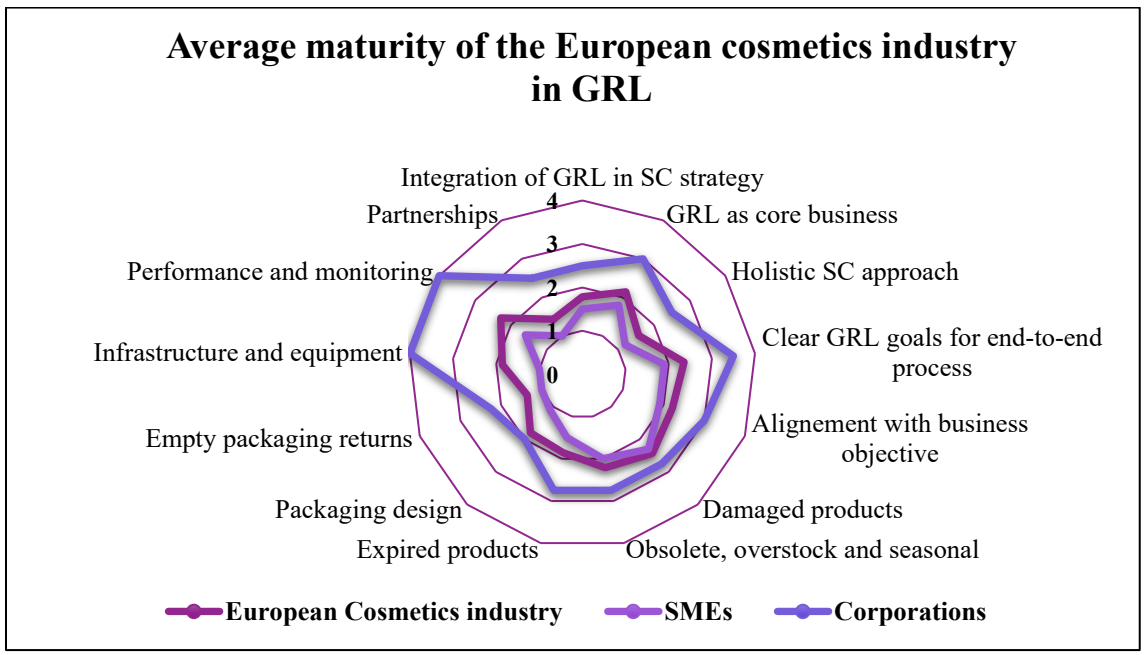

Figure 21. Average maturity level of GRL in the European cosmetics industry

Likewise, Figure 22 proposes the average maturity level of European companies by distinguishing retailers and brands due to the difference in the role of each business. In Appendix 10, the evaluation of GRL maturity per company is defined. The dimension of packaging design shows a maturity state of 0 for retailers as it does not apply to their purpose. As mentioned before, the retailers represent a restricted number of firms and a wider range of distribution channels could provide different results.

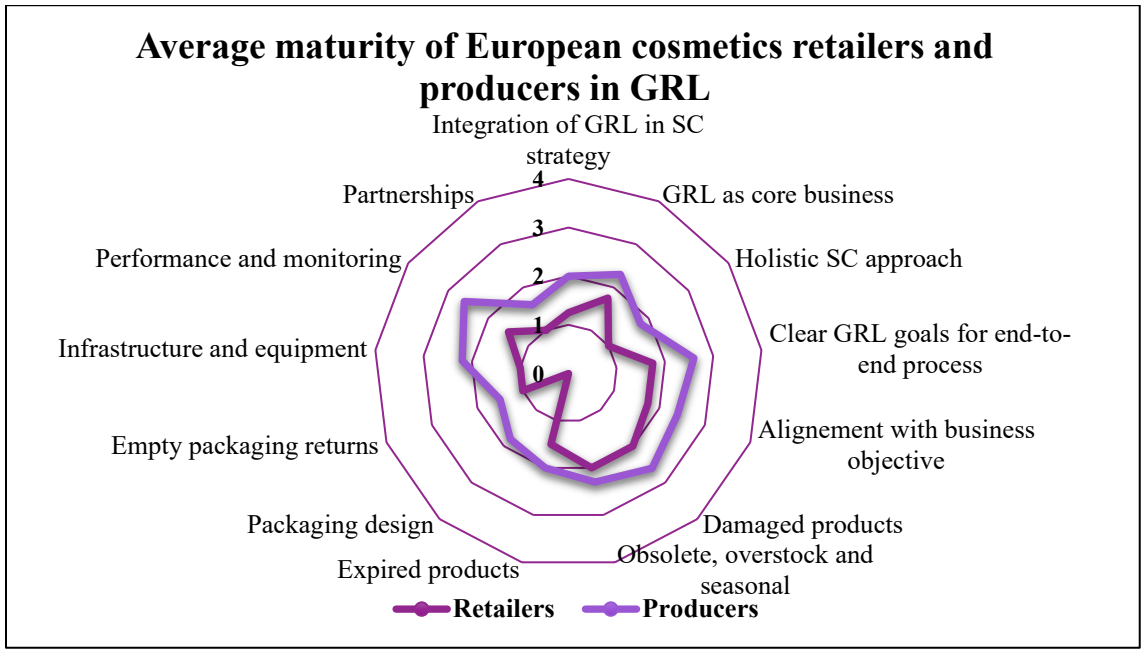

Figure 22. Average maturity of European cosmetics retailers and producers in GRL

5. DISCUSSION

5.1 Implications of the Practices

The collected information, either provided by the secondary data, the survey or the interviews, allowed a comparison of the approaches of different actors in the cosmetics and personal care industry regarding reverse logistics, green practices, products recovery and empty packaging collection. Regardless of their motivations, beauty firms have adopted various practices to improve their environmental footprint and tackle EOL waste.

As illustrated by the literature review, green practices are increasingly become more prominent in the beauty and personal care market, mainly due to the expectations of customers and directives of the EU. Different initiatives and programs are developed throughout Europe to confront sustainability challenges. Aiming at achieving circular economy, companies are extending the focus on specific aspects of the value chain towards an overall optimization of their design, purchasing, production and supply chain operations. The fast pace of the market compels businesses to constantly improve their processes and innovate in all aspects to stay competitive and follow the trends.

Even if major corporations are working towards better packaging design to reduce EOL waste, smaller firms will always struggle more to achieve the same result. Considering that there are over 5900 SMEs active in the European cosmetics industry (CTPA, 2019), adopting any aspect of environmentally sustainable operations is a complex process that requires both expertise, financial resources and support from supply chain dealers.

As pointed out by Sahota (2013), the dilemmas around packaging design, innovation and waste are the primary concerns of cosmetics firms. Refillable containers and packaging-free products are becoming the goal for all firms to address the end-of-life ecological impact. However, there is still a long way to go for all companies to achieve zero waste packaging for all their products portfolio.

Confirming the findings of Fortunati et al. (2020), focusing on eco-design and selecting material to facilitate recycling or reuse of empty jars and bottles is a prevalent way to deal with EOL waste and improve packaging management. The biggest challenge for the recycling of cosmetics packaging is the mixed-use of different materials. As mentioned by one interviewee,

glass is often selected because customers can effortlessly reuse or recycle their empty jars, but pumps are made of plastic and are hard to reuse or recycle. There is also the issue of the labels which must be taken off for effective recycling and the different layers of boxes to keep the products safe. Therefore, customer education is crucial in order to correctly recycle and dispose of empty containers.

Still, there is a place for collection systems and improved product recovery operations. Many pilot projects are held all over Europe by different organizations. The main goal of those programs is to educate and raise awareness among customers about the importance of adequate disposal of packaging and recycling rather than value recovery.

The number of firms which have developed packaging collection program without partnerships with specialised companies is fairly reduced. The bigger the organisation is, the harder it is to manage collection systems without a specialised third party like TerraCycle. Especially, when the distribution network is extremely broad but the volumes are low, there is a need for centralisation (Olorunniwo & Li, 2008), which can effortlessly be managed by third parties. If a company does not partner with another organisation, reusable containers are directly collected by retailers, cleaned and sent back into production because of the small size of the company. However, some firms are reluctant to implement collection programs, arguing that it might lead to higher emissions than regular disposal due to their product portfolio or the required transportation, thus confirming the results of Wang et al. (2020). Moreover, customers need incentives to take part in such programs, meaning that it could potentially lead to higher communication and marketing investments.

Despite different value recovery systems, there seems to be a lack of a strategic approach for managing unsold inventory. Producers are nearly exclusively familiar with customer returns and rarely consider other returns from their distributors. Additionally, there is a difference of perception on the frequency of the emergence of damaged, obsolete or expired products in inventory. While retailers state encountering regularly one of these, producers consider them as rare. Thus, there is a clear impact of the lack of return policies for retailers, which end up carrying the financial (and ecological) burden of overstock (Jayaraman & Luo, 2007; Padmanabhan & Png, 1995). Due to the high number of product types and the variety of substitutes, retailers must encounter alternatives to sell close-to-expiry-date products, use damaged products in-store and convince customers that marketing obsolete products are still

valuable. However, these alternatives are mostly motivated by economic reasoning rather than ecological policies.

Donations, repackaging, redistribution and recycling are the predominant ways to deal with unsold inventories. Considering the state of the product, firms will cascade the recovery solutions, starting with direct redistribution or repackaging before sending the product back in inventory for distribution. If it is not possible and products are still worthwhile, they will be donated to charities. Recycling is the last step in most cases, but some firms still just dispose of their unsold goods in landfills. This fits well with the inverted pyramid of Thierry et al. (1995). Product value recovery is also mostly accomplished through partnerships with recycling companies like Cèdre, avoiding the need for infrastructure, equipment and expertise.

Finally, cosmetics products are subject to strict laws regarding expiry dates, even if they can still be used after their due date. Following the definition of the marginal value of time established by Blackburn et al. (2004), most beauty products can be considered as products with a high marginal value of time and require responsive reverse supply chains. Typically, high MVT products would require a decentralised reverse network, but the cosmetics industry fosters centralised networks due to the low volume of returns and lower costs. Instead, the RSC are slow to react and the reuse or remanufacture of returned goods is delayed, reducing the recoverable value and reuse choices. Hence, mostly for SMEs, the lack of knowledge and expertise in RL might weigh on the recoverable value of cosmetics products.

Encouraging returns and increasing return rate would be the solution to provide firms with economies of scale. Consequently, it would reduce costs and improve the responsiveness of the RSC because companies would invest more in reverse flows and consider a decentralized network. Besides, as mentioned by Özkir & Başligil (2012), it would improve the overall performance of the closed-loop system.

5.2 Implications of the Maturity Assessments

The assessment brings forward that there is a disparity between practices of large corporations and SMEs, which was already pointed out in the interviews. It is harder for small businesses to have adequate financial support to engage in green operations as much as larger groups.

This disparity in the personal care industry influences greatly the results of the maturity assessment. Major groups have the resources to develop their supply chain activities and the

expertise to evaluate the performance of their operations. Large companies are established through different brands, they operate to cut down costs and constantly increase their performance. Thus, those brands can optimize their activities and improve the management of their RSC, leading them to a semi-mature state.

The situation is different for SMEs because their goal is not to optimize the performance of their supply chain but to develop their operations enough to make profit. Due to their size, it is more complicated to develop their RL in a way that will not increase their costs. Small companies do not benefit from economies of scale as much as multinationals. Hence, the cost of sustainability cannot be avoided and usually, small firms would rather invest in their forward flows because they recognize the direct profitability of the forward supply chain. Any investment in RSC would purely be to achieve an ecological goal that aligns with the vision of the business.

Additionally, retailers are in a delicate position regarding reverse flows. Distributors are dependent on the willingness of the brands to accept returns. Though the collection of packaging can easily be achieved for retailers, they are not equipped to manage recovery operations within their facility. Thus, only a reduced number of RL processes can be undertaken by retailers and their engagement in terms of green reverse logistics requires the participation of a third party. This explains why the maturity state of retailers is lower than the one of the manufacturing brands.

The assessment provides a detailed analysis that allows identifying the strengths and weaknesses of the sector in terms of RL practices. The summary of Table 10 emphasizes the aspects where improvements are required and where the industry is already performing correctly. The other dimensions are not perfect yet, but the situation is not the worse either.

Table 10. Strengths and weaknesses of the European cosmetics industry in RL

Strengths	***Weaknesses***
RL as a core business process	Holistic SC approach
Secondary markets	Aligned asset recovery strategy
Remarketing	

It is interesting to note that even if RL operations are perceived as core processes, the management approach of reverse flows is narrow and lacks a comprehensive approach.

Likewise, even if companies are aware of second markets and often redistribute their products, either geographically or by considering new distribution channels, their recovery strategy is still weak.

Similarly, the assessment provided in Figure 21 allows determining the strengths and weaknesses of the industry in terms of GRL operations. The summary of Table 11 provides insights on improvements required for the cosmetics industry to increase its maturity in terms of green reverse logistics. The other dimensions are considered as average, meaning that it is not perfect, but they are not critical.

Table 11. Strengths and weaknesses of the European cosmetics industry in GRL

Strengths	***Weaknesses***
Clear GRL goals for the end-to-end process	Holistic SC approach
Damaged products	Empty packaging returns
Performance monitoring and LCA	Infrastructure and equipment
	Partnerships

The extended model shows that, like for RL management, the cosmetics industry lacks a comprehensive supply chain strategy regarding green reverse logistics even if its objectives are clearly defined. Additionally, the sector lacks adequate infrastructure and equipment to manage products recovery. However, performance monitoring and LCA are some strengths of the beauty industry, fitting with the recommendations of Civancik-Uslu et al. (2019), Cosmetics Europe (2019a) and Sahota (2013). Most partnerships related to GRL are exclusively concluded with large corporations, making it harder for SMEs to engage.

5.2.1 Drivers and barriers

The diagnostic of the maturity state regarding a certain dimension strongly depends on the existence of a barrier. The enablers and barriers identified in the literature review, classified in the survey and put forward in the interviews, can all be linked to the dimensions, as shown in Table 12. One barrier or enabler can be associated with multiple dimensions since they often influence more than one aspect of the organisation.

Table 12. Relationship between drivers/barriers of RL and maturity

Dimension of MM	*Drivers*	*Barriers*
Integration of RL in supply chain strategy	Regulations Improvement of corporate image Improvement of customer satisfaction Competitive pressure	Company policies RL is not a priority compared to other issues Reluctance of the support of dealers, distributors, retailers Resistance to change and innovation
Managing RL as a core business process	Improvement of corporate image Recapturing value from returned products Financial and economic advantages Decrease resource investment levels Cooperation between value chain partners	Lack of awareness about reverse logistics Lack of strategic planning related to reverse logistics Lack of information and technological systems Lack of coordination in the supply chain
Holistic supply chain approach	Clean channel Competitive pressure Cooperation between value chain partners	Lack of awareness about reverse logistics Lack of coordination in the supply chain Reluctance of the support of dealers, distributors, retailers
Clear RL goals for the end-to-end process	Minimization of waste Recapturing value from returned products	Lack of training Lack of performance metrics Lack of awareness about reverse logistics
Alignment with business objective	Financial and economic advantages Decrease resource investment levels	Company policies Financial constraints Lack of strategic planning related to reverse logistics

Dimension of MM	*Drivers*	*Barriers*
Knowledge of secondary markets	Competitive pressure Regulations Improvement of corporate image Recapturing value from returned products Minimization of waste	Lack of awareness about reverse logistics Absence of secondary market
Remarketing	Recapturing value from returned products	Lack of awareness about reverse logistics Change in formulation
Aligned asset recovery strategy	Recapturing value from returned products Reduction of landfill capacities Minimisation of waste Social benefits	Company policies Lack of awareness about reverse logistics Lack of information and technological systems

For example, the management of RL operations as core business processes depends strongly on the end-value delivered by these processes. Thus, if the firm perceives value from corporate image improvement, actual financial advantage or value recovery, RL operations will be managed more efficiently. However, knowledge and expertise in terms of RL are required as well as strategic planning, which can be complicated because of the uncertainty of reverse flows. Likewise, information systems are required to ensure the effective management of returns. Furthermore, the lack of technological infrastructure can deeply impact the recovery strategy as the sorting process will take more time and an adequate recovery method might not be selected.

Similar links can be described between the dimension of the GRL maturity model, and the enablers and barriers, as shown in Table 13. The existence of a barrier will usually lead to going down in rank regarding the maturity state of a dimension, whereas drivers will elevate this rank.

Table 13. Relationship between drivers/barriers of GRL and maturity

Dimension of MM	*Drivers*	*Barriers*
Integration of GRL in supply chain strategy	Regulations Improvement of corporate image Improvement of customer satisfaction Competitive pressure	Company policies GRL is not a priority compared to other issues Reluctance of the support of dealers, distributors, retailers Resistance to change and innovation
Managing GRL as a core business process	Green marketing Improvement of corporate image Recapturing value from returned products Financial and economic advantages Decrease resource investment levels	Lack of awareness about reverse logistics Lack of strategic planning related to reverse logistics Lack of information and technological systems
Holistic supply chain approach	Clean channel Competitive pressure	Lack of awareness about reverse logistics Lack of coordination in the supply chain Reluctance of the support of dealers, distributors, retailers
Clear GRL goals for the end-to-end process	Minimization of waste Recapturing value from returned products	Lack of training
Alignment with business objectives	Financial and economic advantages Decrease resource investment levels	Company policies Financial constraints Lack of strategic planning related to reverse logistics
Packaging design	Regulations Improvement of corporate image Improvement of customer satisfaction Competitive pressure	Resistance to change and innovation

Dimension of MM	*Drivers*	*Barriers*
Packaging returns management	Regulations Improvement of corporate image Improvement of customer satisfaction Reduction of landfill capacities Minimization of waste Clean channel	Company policies Lack of awareness about reverse logistics Lack of information and technological systems
Damaged products	Regulations Competitive pressure Recapturing value from returned products Reduction of landfill capacities Minimization of waste Social benefits	Company policies Lack of awareness about reverse logistics Lack of information and technological systems
Obsolete, overstock and seasonal products	Regulations Competitive pressure Recapturing value from returned products Social benefits	Company policies Lack of awareness about reverse logistics Lack of information and technological systems Change in formulation Absence of secondary market
Expired products	Regulations Competitive pressure Reduction of landfill capacities Minimization of waste	Company policies Lack of awareness about reverse logistics Lack of information and technological systems
Infrastructure and equipment	Financial and economic advantages Decrease resource investment levels	Company policies Financial constraints
Performance monitoring and LCA	Development of expertise and knowledge	Lack of information and technological systems Lack of performance metrics

Dimension of MM	*Drivers*	*Barriers*
Partnerships	Improvement of corporate image Competitive pressure	Company policies Reluctance of the support of dealers, distributors, retailers Resistance to change and innovation

For example, if a company perceives financial advantages to product recovery, there is a higher chance that it will invest in infrastructures to manage returns and allocate resources (human and financial) to reverse logistics activities. However, if the company policies are against return policies for retailers, it is less likely the producer will invest in reverse logistics or allocate resources for product recovery. Likewise, some brands are against donating their products purely to protect their luxurious brand image and thus will not finance value recovery initiatives, choosing to only burn their overstock to keep the exclusivity of their products (BBC, 2018). While regulations and competitive pressure are powerful drivers for more green reverse logistics practices, the unwillingness to take part in supply chain partners and the lack of adequate technology are powerful barriers to developing green operations.

6. CONCLUSION

6.1 Summary

Over the years, there has been a growing recognition of the global challenges related to sustainability and the risk of exceeding the Planetary Boundaries irreversibly. From the 17 SDG of the United Nation to the European Green Deal, the international community expects businesses to play their part in becoming environmentally conscious and adopting sustainable behaviours. Customers' habits are shifting towards ethical and ecological decisions, consequently forcing companies to adapt their operations.

Circular economy is becoming a dominant topic in the business world as the ideal approach towards ecological production and consumption. By reducing waste to a minimum and keeping products longer in the economy, further value can be created through recovery processes. In terms of SCM, value recovery of products that are already in the economy require reverse logistics to close the loop.

As one of the largest sectors in Europe, the cosmetics industry causes a considerable share of EOL waste mainly due to the multiplicity of packaging which ends up in landfills. This fast-paced industry is constantly innovating, and a large variety of new beauty products reach shelves every day. Besides, the personal care market is prone to marketing obsolescence of packaging and formulation, leading to products that are hard to sell or just cannot be sold anymore. It is also predisposed to seasonal products which are taken out of shelves after a few weeks, like sunscreen lotions in the summer or festive eyeshadows for Christmas. Additionally, beauty products are characterised by the strict expiry dates required by the regulation and often, overstock leads to outdated products which are forbidden to be sold even with a discount by the law.

As discussed in the introduction and throughout this thesis, environmental consciousness is driving cosmetics companies towards green practices. Most initiatives are directed towards packaging management and packaging eco-design to minimise EOL waste through adequate disposal and recycling. Even if the accountability for waste generation falls on cosmetics producers, it cannot be ignored that retailers and customers both have a role to play in improving the situation. However, retailers are accountable for the ecological impact of the inventory they hold, while customers must handle the disposal of cosmetics products after use.

The aim of this thesis was to: (i) explore the current practices of cosmetics retailers and manufacturing brands in terms of green reverse logistics with a focus on product recovery management and empty packaging returns, (ii) identify the maturity level of the European cosmetics industry in terms of reverse logistics activities and unsold inventory recovery management, as well as packaging collection and (iii), understand the barriers and the drivers for implementing green reverse logistics operations within the beauty sector.

Chapter 2 provided the background theory related to the sustainable frameworks for managing supply chains and reverse logistics activities, as well as insights on the significance of research about sustainability in the cosmetics sector.

Section 4.1 provided a framework of the general commitments towards sustainability and green reverse logistics by considering four major players in the European market. The first research question *"Q1: What is the maturity level of the reverse supply chains of European cosmetics companies ?"* was answered in Section 4.4.1 by identifying the maturity level of reverse logistics activities in the beauty industry. It can be concluded from this section that there is a significant difference in reverse logistics management between SMEs and large cosmetics groups. This is mainly due to difficulty for small companies to access resources to develop their expertise, infrastructure and knowledge around reverse logistics activities. It also emerges that the cosmetics industry can be considered naïvely mature in terms of RL due to this gap between firms. Additionally, cosmetics producers tend to be semi-mature in some processes whereas retailers fall towards immaturity.

The second research question *"Q2: What is the maturity level of operational environmental sustainability in the European cosmetics industry in terms of product recovery and empty packaging returns management?"* was investigated and answered in Section 4.4.2. It can be concluded that green reverse logistics practices are variable among the industry. Again, there is a gap between SMEs and large cosmetics groups due to the difficulty to access resources. It seems that in general, the personal care industry is naïvely mature in terms of GRL and more specifically in terms of product recovery and empty packaging returns management. Furthermore, cosmetics producers can be considered semi-mature whereas retailers are immature in the majority of the investigated dimensions.

The main issue arising from this analysis is that cosmetics companies lack a strategic approach towards reverse logistics and product recovery. The companies taking part in the survey and

interviews were found to be unfamiliar with reverse flows and mostly considered that there was no value in encouraging packaging collection or offering return policies to the retail channels. It can be seen as contradictory to the fact that most companies are aware of the benefits of secondary markets and remarketing of products. Indeed, it is a common practice in the beauty industry to redistribute products throughout the year from a geographical location to another, to sell out overstock products in specific outlet retailers or to repackage products that can still be marketed. Besides, the staggering importance of environmental sustainability in the sector is acknowledged by every company. Thus, it seems that there is a mismatch between the perception of beauty enterprises, their commitments towards ecology and their implications towards adopting green operations to promote circularity.

6.2 Managerial Implications

This study aims at providing a starting point for managers in the cosmetics industry to link unsold product recovery, empty packaging collection and reverse logistics in their organization. The model can be used to optimise decision-making about the management of empty packaging, damaged, obsolete, expired, and seasonal products. Through this entire study, the main trends in terms of green reverse logistics have been identified in the cosmetics market. This maturity analysis also uncovered the various barriers and facilitators that are influencing the development of reverse logistics. This thesis also pinpointed key issues related to product recovery in a retailing environment. The conclusions of this work can be used to create awareness among managers about the importance of GRL activities and the perspectives for improvements in reverse supply chains management. Though this research was conducted in the specific sector of the beauty market, the reference model can be transferred to other sectors which might encounter overstock.

6.3 Theoretical Implications

The results of the present research enrich the knowledge of sustainable operations in the context of the cosmetics industry. This work particularly delivers comprehensions of the current management strategy in terms of reverse logistics. In the context of PRRM, previous research focused mostly on durable products for remanufacturing or refurbishing. The present study leans towards non-durable goods and provides perspectives for circular economy and closed-loop supply chain in the cosmetics industry. Additionally, this work examined the drivers and enablers for reverse logistics within the cosmetics industry and their link to green reverse

supply chains. Furthermore, it extended the model of maturity assessment of Janse et al. (2010) by applying it to consumer goods and considering the case of non-products. The maturity analysis of this research also integrated environmentally sustainable aspects to evaluate green operations.

6.4 Limitations and Future Research

This work has some limitations which should be acknowledged for future research. It could be the basis for deeper research into the factors underlying the decisions to implement green reverse logistics in the cosmetics industry.

This study was conducted with a focus on unsold inventory management in Europe. The survey was conducted in 5 European countries and was addressed to SMEs. Therefore, based on this thesis, it is impossible to draw significant conclusions for larger corporations. Against this background, for further research, it would be reasonable to include large enterprises to get an accurate picture of the European cosmetics industry. It would also be valuable to analyse firms from European countries which were not included in this study to assess their reverse logistics operations. Besides, the variety of the segments within the beauty market could be explored to compare practices. It would be interesting to explore further the practices of retailers in terms of packaging collection and reverse logistics towards manufacturing brands.

Concerning sustainability practices in different parts of the value chain, it would be useful to investigate the link between products' design and empty packaging returns. Finally, it would be worthwhile to examine the social aspects of sustainability in the framework of reverse logistics and closed-loop supply chain, and the need for transparency with customers.

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8. APPENDICES

Appendix 1. The United Nations 17 Sustainable Development Goals (SDGs).

Source : United Nations (2021)

Appendix 2. Drivers and barriers of reverse logistics implementation

Source: Govindan & Bouzon (2018)

Drivers

Driver	Internal/External	Stakeholders involved
1 - Policy related issues		
D1. Regulatory pressure for product return/recovery	External	Government
D2. License to operate	External	Government
D3. EOL levies at point of sale for the consumer	Internal	Organization
D4. Motivation laws	External	Government
2–Governance and SC process-related issues		
D5. Qualification and support of business partners	External	Suppliers, Customers
D6. Cooperation and integration with partners in the SC	External	Suppliers, Customers
3 - Management related issues		
D7. Employee satisfaction	Internal	Employees
D8. Number of staff	Internal	Employees
D9. Human resources support	Internal	Employees
D10. Top management awareness and commitment	Internal	Employees
D11. Department integration	Internal	Organization
4–Market and Competitors related issues		
D12. Customer satisfaction	External	Customers
D13.Competitive advantage	External	Market/Competitors
D14. Green consumerism/consumers' environmental awareness	External	Customers
D15. Green marketing	External	Society, Media
D16. Long-term sustainability	Internal	Organization
D17. Competitors' pressures to adopt green initiatives	External	Market/Competitors
D18. Brand protection	Internal	Organization
5–Technology and infrastructure-related issues		
D19. RL management information system	Internal	Organization
D20. Recycling management system	Internal	Organization
D21. Technological innovations	Internal	Organization
D22. Eco-design and Design for X techniques	Internal	Organization
D23. Recycling and remanufacturing technologies	Internal	Organization
6 - Economic related issues		
D24. Benefits of recycling	Internal	Organization

D25. Reduction on raw material consumption and waste disposal cost	Internal	Organization
D26. Value recovery	Internal	Organization
D27. Second-hand market	Internal	Organization
D28. Reduction of cost risks	Internal	Organization
D29. Economic viability	Internal	Organization
D30. Financial support	Internal	Organization
7 - Knowledge related issues		
D31. Knowledge on sustainable issues and perception of RL benefits	Internal	Organization, Employees
D32. Cost and performance knowledge	Internal	Organization, Employees
D33. Intellectual property (IP)	Internal	Organization
8–Social related issues		
D34. Higher public awareness	External	Society, Customers
D35. Corporate citizenship pressure	External	Society, Media
D36. Increasing landfill	External	Society
D37. Environmental conservations	External	Society

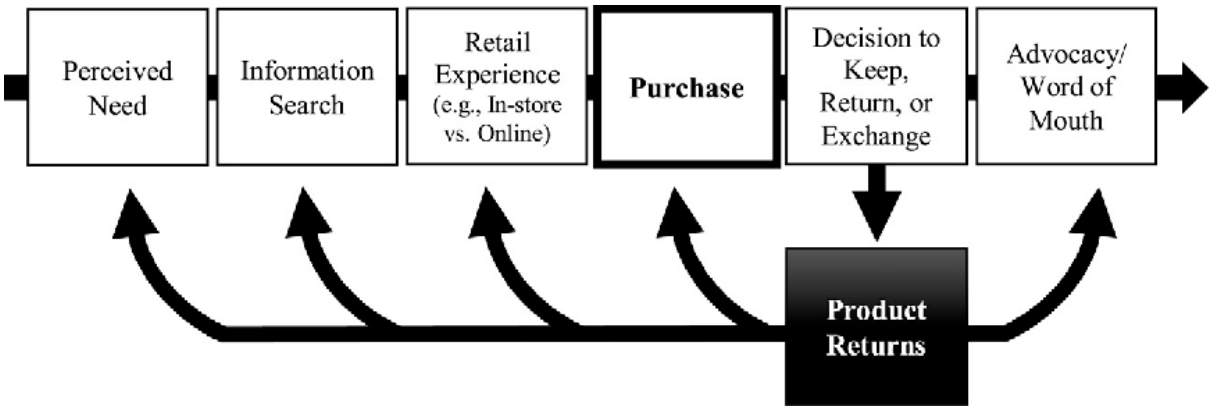
Barriers

Barrier	Internal/External	Stakeholders Involved
1 - Technology and infrastructure (T&I)		
B1. Lack of technical skills	Internal	Employees, Organization
B2. Lack of IT systems standards	Internal	Organization
B3. Lack of most recent technologies	External	Organization
B4. Lack of facilities	Internal	Organization
B5. Technology and Research and Development issues related to product recuperation	Internal	Organization
B6. Complexity in operation	Internal/External	Organization
2–Governance and SC process (G&SC)		
B7. Difficulties with supply chain members	External	Suppliers, Customers
B8. Limited forecasting and planning	Internal	Customers, Organization
B9. Inconsistent quality	External	Organization
B10. Lack of suitable performance management system	Internal	Organization
B11. Inappropriate organizational co-operation	Internal	Organization
3 - Economic related issues (E)		
B12. Lack of initial capital	Internal	Organization
B13. Funds for training	Internal	Organization

B14. Return monitoring system/storage and handling	Internal	Organization
B15. Uncertainty related to economic issues	Internal	Organization
B16. Lack of economy of scale	Internal	Organization
4–Knowledge related issues (K)		
B17. Lack of knowledge on RL practices	Internal	Organization
B18. Lack of information on take-back channels	External	Organization
5–Policy related issues		
B19. Lack of specific laws	External	Government
B20. Difficulties in extended producer responsibility across countries	External	Government
B21. Company policies against RL	Internal	Organization
6 - Market and competitors related issues (M&C)		
B22. Perception of a poorer quality product	External	Customer
B23. Undeveloped recovery marketplaces	External	Market/Competitors
B24. Little recognition of competitive advantage	Internal	Organization
7 - Management related issues		
B25. Low importance of RL relative to other issues	Internal	Organization
B26. Low involvement of top management and strategic planning	Internal	Organization

Appendix 3. Returns and the customer journey

Source: Robertson et al. (2020)



Appendix 4. Online survey questionnaire

TOPIC	QUESTIONS
Introduction	1- Company profile 2- Does your company publish a sustainability report or display sustainability information on your website? 3- Does your company have a partnership with an organization that promotes sustainability behaviours? 4- Does your company have a partnership with an organization that promotes sustainability behaviours?
Brands (producers)	
General questions	1- Which kind of products is your company specialized in? 2- Which structure reflects the distribution channels of your company the most? 3- Has your company ever carried a life cycle analysis of your products? 4- If yes, does the scope and system boundaries of your products' life cycle assessment include the use and post-use phase of the products (including packaging)? 5- Which means of transport do you use to deliver and/or collect back products from customers/retailers/distributors? 6- Does your company track the inventory quantities of your retailers/distributors?
Reverse logistics	1- To what extent does your company have to deal with reverse flows and activities? 2- Usually, what are the main causes for reverse flows? 3- Which products (damaged, obsolete, overstock, seasonal, expired, empty packaging) are sent back to your company by your retailers/distributors/customers? 4- Rank the motives for the development of reverse logistics within your company (1 most important, 10 less important) 5- Rank the barriers to the development of reverse logistics within your company (1 most important, 10 less important) 6- Which return processes are performed by your company? 7- Which return processes are performed by your retailers/distributors? 8- Which return processes are performed by a third-party logistics service provider? 9- Which economic indicators are used to assess the performance of your reverse logistics activities? 10- Which environmental indicators are used to assess the performance of reverse logistics activities?

Unsold inventory (damaged, seasonal, obsolete, overstock, expired products)	1- Which factors could be responsible for the accumulation of unsold inventory in the cosmetics industry? 2- How has COVID-19 affected the quantity of unsold inventory of your products? 3- How often does your company face damaged products? 4- How do you manage damaged products? 5- If damaged products are sent back by distributors: Where are damaged products forwarded to? 6- How often does your company face obsolete products? 7- How do you manage obsolete products? 8- If obsolete products are sent back by distributors: Where are obsolete products forwarded to? 9- How often does your company face outdated products? 10- How do you manage outdated products? 11- If outdated products are sent back by distributors: Where are damaged products forwarded to?
Packaging management	1- Are your packaging designed to facilitate recycling? 2- Which types of material for primary packaging does your company typically use? 3- Are paper and cartons coming from sustainably managed forests (following the Forest Stewardship Council, Program for the Endorsement of Forest Certification schemes or any other organization) 4- Does your company propose reusable or refillable packaging? 5- If empty packaging are sent back: Does your company accept to collect empty packaging from different brands than yours? 6- If empty packaging are sent back: Where are empty packaging forwarded to when sent back from your retailers/distributors? 7- Which kind of empty packaging returns do you accept? 8- Does your company intend to reduce packaging size and weight to optimize the quantity of products transported and reduce the environmental impact of transportation? 9- How are empty packaging managed by your company? 10- If empty packaging are sent back: Which of the following incentives does your company provide for customers to bring back their empty packaging?

Retailers, distributors, wholesalers	
Reverse logistics	1- To what extent does your company have to deal with reverse flows and activities? 2- Usually, what are the main causes for reverse flows? 3- Which return processes are usually performed by your company? 4- Rank the motives for the development of reverse logistics within your company (1 most important, 10 less important) 5- Rank the barriers to the development of reverse logistics within your company (1 most important, 9 less important) 6- Which of the following economic indicators are used to assess the performance of your reverse logistics activities? 7- Which of the following environmental indicators are used to assess the performance of reverse logistics activities?
Unsold inventory (damaged, seasonal, obsolete, overstock, expired products)	1- Which factors could be responsible for the accumulation of unsold inventory in the cosmetics industry? 2- Which of the following do you encounter the most within your inventory (damaged, expired, obsolete products)? 3- How has COVID-19 affected the quantity of unsold inventory? 4- How often does your company face obsolete products? 5- How are obsolete products managed? 6- How often does your company face expired products? 7- How are expired products managed? 8- How often does your company face damaged products? 9- How are damaged products managed?
Packaging management	1- Is it possible to refill empty bottles in your store? 2- Does your company collect empty packaging from your customers? 3- Which of the following is responsible for managing empty packaging returns? 4- Where are empty packaging forwarded to? 5- Which kind of empty packaging returns do you accept? 6- How are empty packaging returns managed by your company? 7- Which of the following incentives does your company propose for customers to bring back their empty packaging?

Appendix 5. Interview guide

Maiwe Skincare Interview

TOPIC	INTERVIEW QUESTIONS
Introduction - Environmental sustainability	What would you say is the place of environmental consciousness in your business? Are you planning on evaluating the environmental impact of your product portfolio in the future?
Packaging	What are the current practices related to the packaging design and recycling of your company?
Returns management	How do you perceive reverse flows? How do you imagine handling a bottle collection system?
Expired and obsolete products management	What type of strategies is in place to handle expired or obsolete products?
Barriers	Do you think being a smaller company makes it harder to engage?
Drivers	What would push your company to encourage returns?
Closing - Future plans	How do you envision the future of your company and the industry in terms of sustainability?

Nøie ApS Interview

TOPIC	INTERVIEW QUESTIONS
Introduction - Environmental sustainability	What would you say is the place of environmental consciousness in your business? Are you planning on evaluating the environmental impact of your product portfolio in the future?
Packaging	What is preventing your company from proposing more sustainable packaging or proposing refills systems?
Returns management	How do you perceive reverse flows? How are returns usually managed throughout your value chain? How do you imagine handling a bottle collection system?
Expired and obsolete products management	What type of strategies is in place to handle expired or obsolete products?
Barriers	What actions would you need to take to overcome the major barriers to the implementation of RL and GRL activities?
Drivers	What would push your company to encourage returns?
Closing - Future plans	How do you envision the future of your company and the industry in terms of sustainability?

Appendix 6. Interviewees' profiles

INTERVIEWEE'S PROFILE

Date of interview, time, method	May 5th, 2021, 42 minutes, videoconference
Company	Maiwe Skincare
Current role in the organization	Founder
Size, Location	Small company, Antwerp, Belgium
Relevant information about the company	- Formulated in Antwerp - Clean and natural skincare products - Selling through retailers and webshop - Works with a female-run company in southern Chile - Support of sustainable development projects in Chile - Planning on establishing a Chilean women's cooperative
Date of interview, method	First week of May 2021, email exchanges
Company	Nøie ApS
Current role in the organization	Co-founder, CFO
Size, Location	Small company, Copenhagen, Denmark
Relevant information about the company	- Personalized skincare products - Formulations based on science and community feedback - Selling directly to customers through webshop - Aiming at becoming a carbon negative company - Packaging design as the key improvement point for sustainability

Appendix 7. Initial maturity model of reverse logistics

Source: Janse et al. (2010)

		Business maturity			
Business aspect (reference model)	Dimension	State 1: immature	State 2: naïve mature	State 3: semimature	State 4: mature
Business strategy	Integration of reverse chain management in supply chain strategy	Reverse chain management is an appendix of the supply chain strategy	Reverse chain management is secondary part of the supply chain strategy	Reverse chain management is semi-integrated in supply chain strategy	Returns chain management is an integral part of the supply chain strategy
Reverse supply chain management strategy and goals	Managing reverse logistics as core business process	Product returns are perceived as irrelevant and managed as purely cost driver	Importance of product returns is recognised but no awareness about how to handle	Strategic focus on product returns and manage both as cost and value driver	The reverse supply chain is a strategic, profit generating core business process
	Holistic supply chain approach	Isolated approach to manage returns in each part of the reverse chain	Cross-functional approach to manage product returns	An integral approach of the supply chain is taken to manage returns	A comprehensive supply chain approach is adopted to manage product returns
	Clear reverse logistics goals for end-to-end process	Reverse Logistics management goals are not in place	Reverse logistics management goals are in place for parts of returns processes	Reverse logistics management goals are in place for all processes	Reverse logistics management goals are in place for all end-to-end processes
	Alignment with business objectives	Reverse chain operations are not adapted to business objectives	Reverse chain processes are adapted to business objectives	Reverse chain processes and operations are aligned with business objectives	Reverse processes and operations are aligned with business objectives and market developments
Spare part management	Synchronisation	Spare part planning and forecasts do not incorporate product returns	Short term return forecasts are used in spare part planning and forecasts	Return forecasting is integral part of spare part planning	Synchronised planning of spare part demand and return forecasting
Secondary markets and remarketing	Knowledge of secondary markets	Knowledge about secondary markets for recovered assets is considered as irrelevant	Knowledge about secondary markets for recovered products is available	Knowledge about demand markets for recovered asset is used during the returns processes	Advanced knowledge of demand markets for recovered assets is integrated in management decisions for reverse flows
	Remarketing	Non-fault found and excess products are written-off as faulty products	Non-fault found and excess products are used to retrieve spare parts	Secondary markets are identified for nonfault found and excess returns	Primary markets are identified for nonfault found and excess products
Process recovery	Aligned asset recovery strategy	No clear asset recovery strategy exists	Clearly stated recovery strategy exists based on economic and technical viability of recovery options	Clearly stated asset recovery strategy is aligned with reverse chain strategy and business strategy	Fully aligned recovery strategy exists based on economic, technical, and environmental viability of recovery options

Appendix 8. Organizations promoting sustainability and their missions

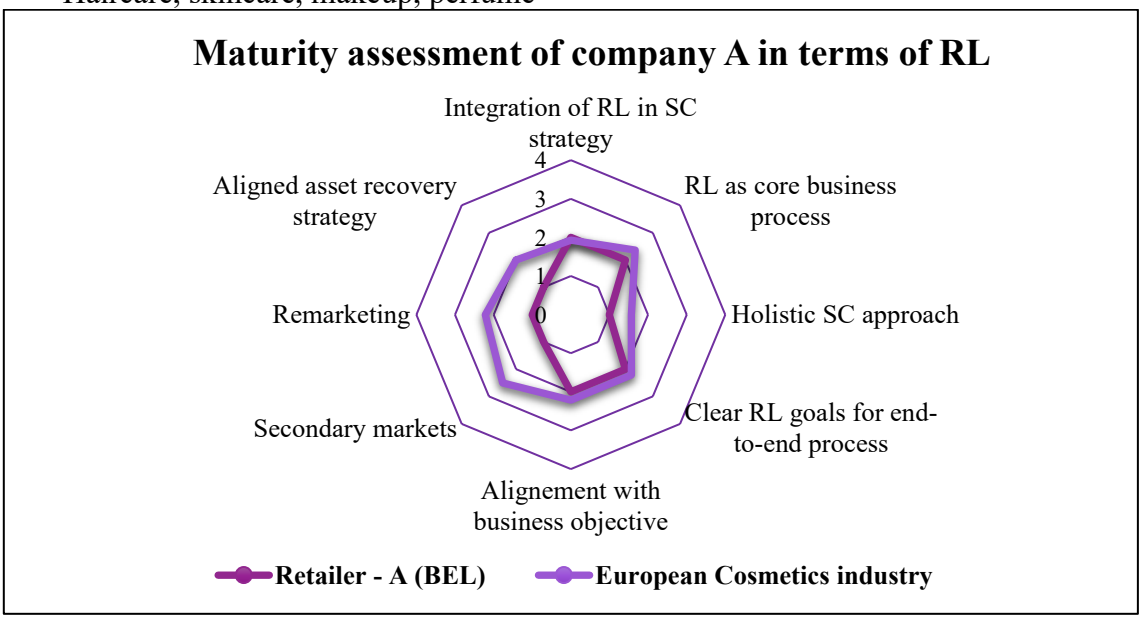
Organization	Mission
1% for the Planet	International organization with a network model whose members commit to donating at least one percent of their gross sales each year to nonprofit partners. 1% for the Planet members assist nonprofit organizations to protect the environment and encourage sustainable methods of energy production (1% for the Planet, 2021).
The Shift	National contact point for the World Business Council for Sustainable Development (WBCSD) and CSR Europe. The Shift connects organisations from different sectors (companies, NGOs, academic institutions, government agencies…) to develop innovative solutions to realize a transition towards a sustainable society and economy (The Shift, 2021).
PETA (People for the Ethical Treatment of Animals)	Nonprofit organization dedicated to establishing and protecting animal rights (PETA, 2021).
RSPO (Roundtable on Sustainable Palm Oil)	Nonprofit organization uniting various sectors of the palm oil industry and environmental and social NGO's to establish standards for sustainable palm oil (RSPO, 2021).
Soil association	Charity which activities support local purchasing, opposed to intensive farming, improve public education on nutrition and certificate organic consumer goods (Soil Association, 2021).
CNCD 11.11.11 (Center for Development Cooperation)	Aiming at promoting sustainable alternatives, Belgian organization coordinating 90 NGO's and volunteers to organize 11.11.11 which is an operation to finance development programs in poor countries, to coordinate campaigns to inform Belgian citizens and challenge political leaders (CNCD-11.11.11, 2021).

Appendix 9. Maturity assessment of reverse logistics per company

Company A

Profile:

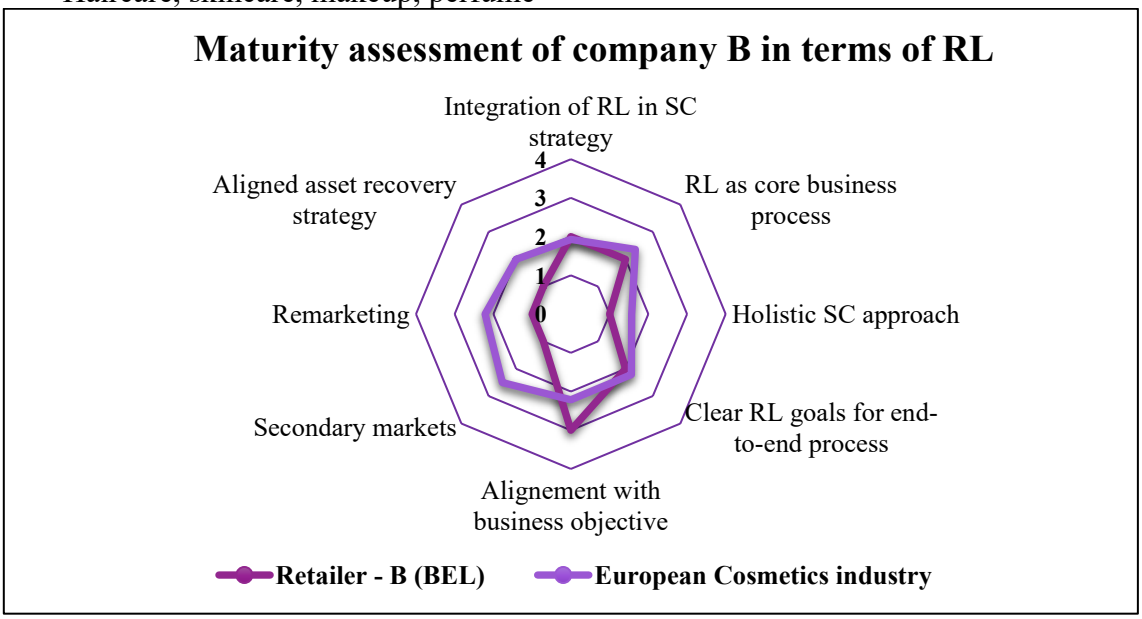
- Retail group (Webshop)
- Belgium
- Small enterprise
- Haircare, skincare, makeup, perfume



Company B

Profile:

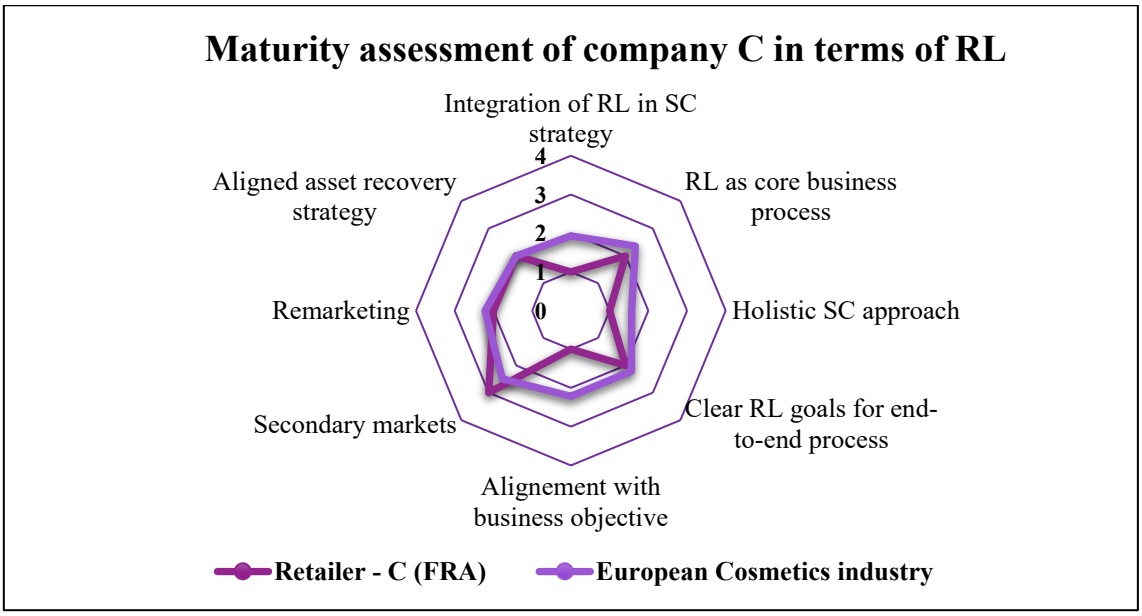
- Retail group (Webshop)
- Belgium
- Small enterprise
- Haircare, skincare, makeup, perfume



Company C

Profile:

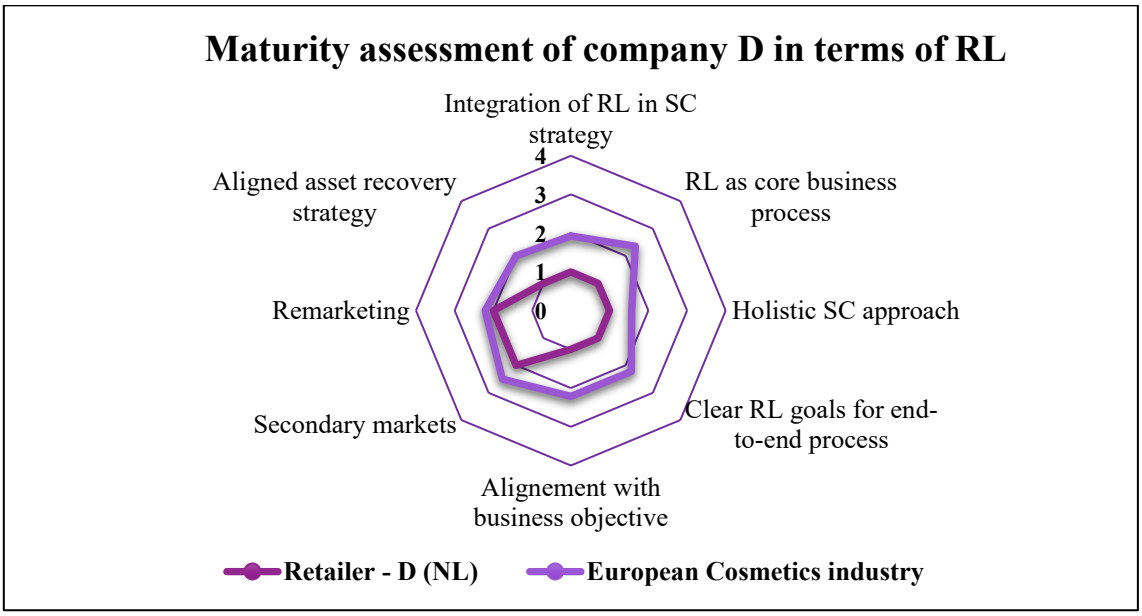
- Retailer (Webshop)
- France
- Microenterprise
- Skincare



Company D

Profile:

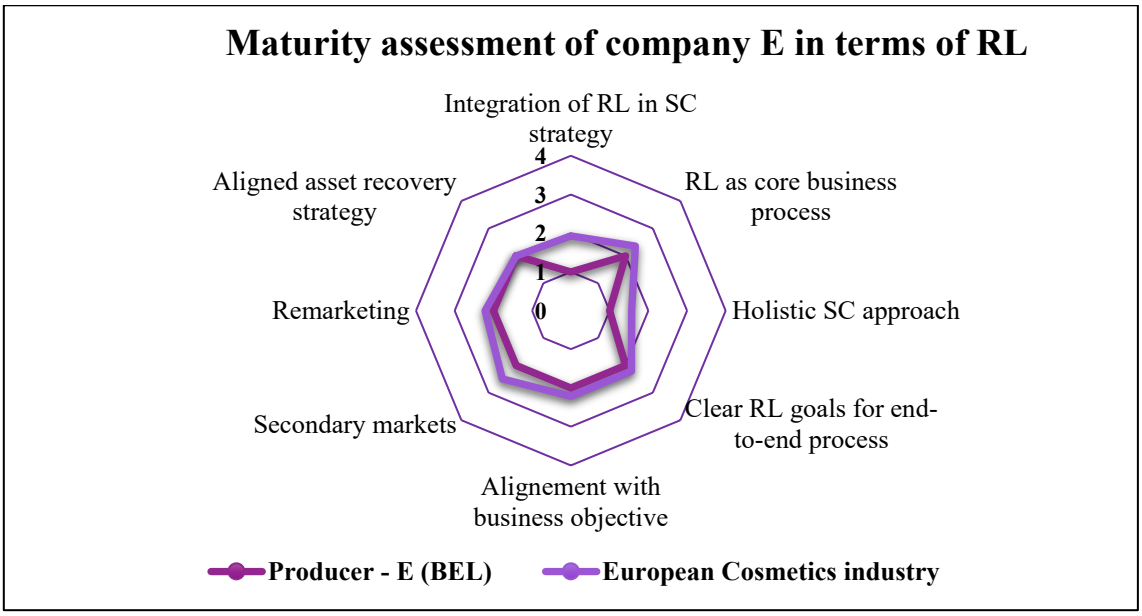
- Retailer (Webshop)
- The Netherlands
- Small enterprise
- Skincare



Company E

Profile:

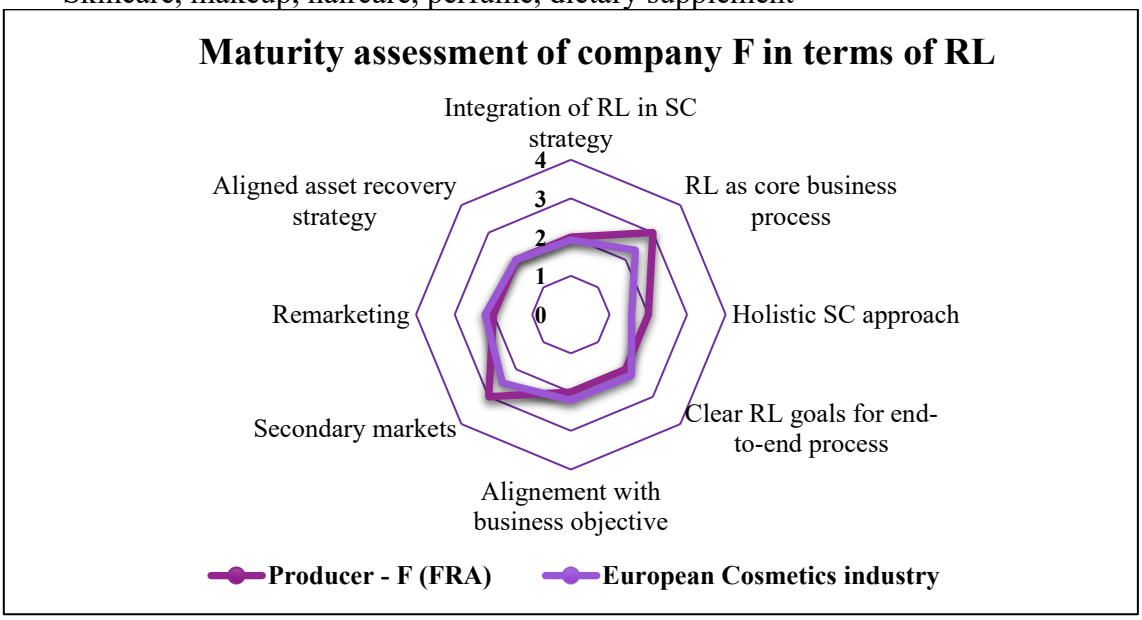
- Producer
- Belgium
- Small enterprise
- Skincare



Company F

Profile:

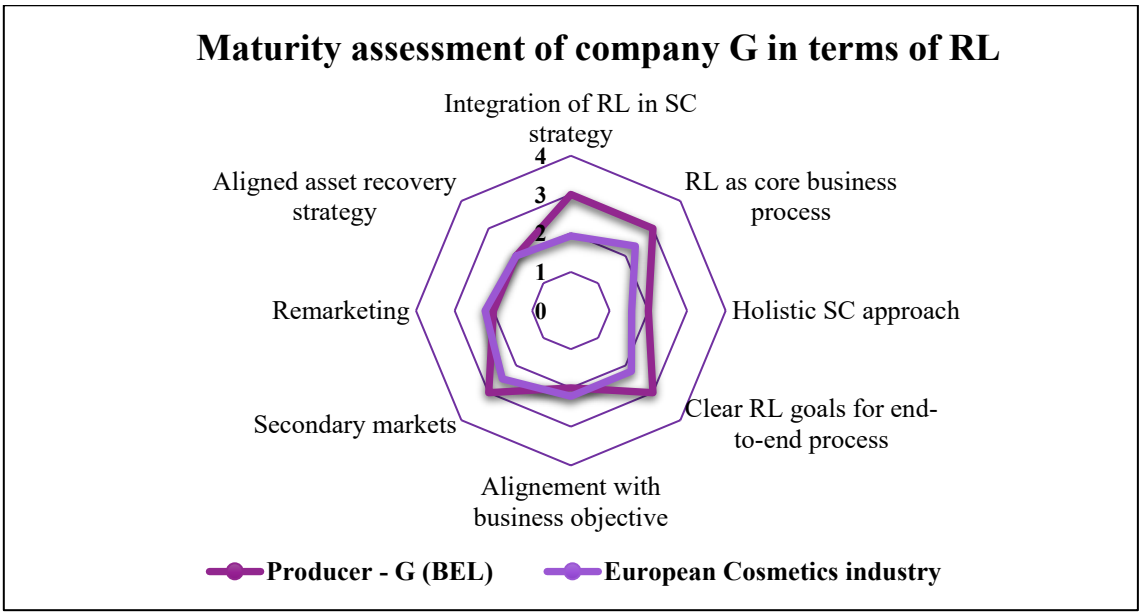
- Producer
- France
- Medium-sized enterprise
- Skincare, makeup, haircare, perfume, dietary supplement



Company G

Profile:

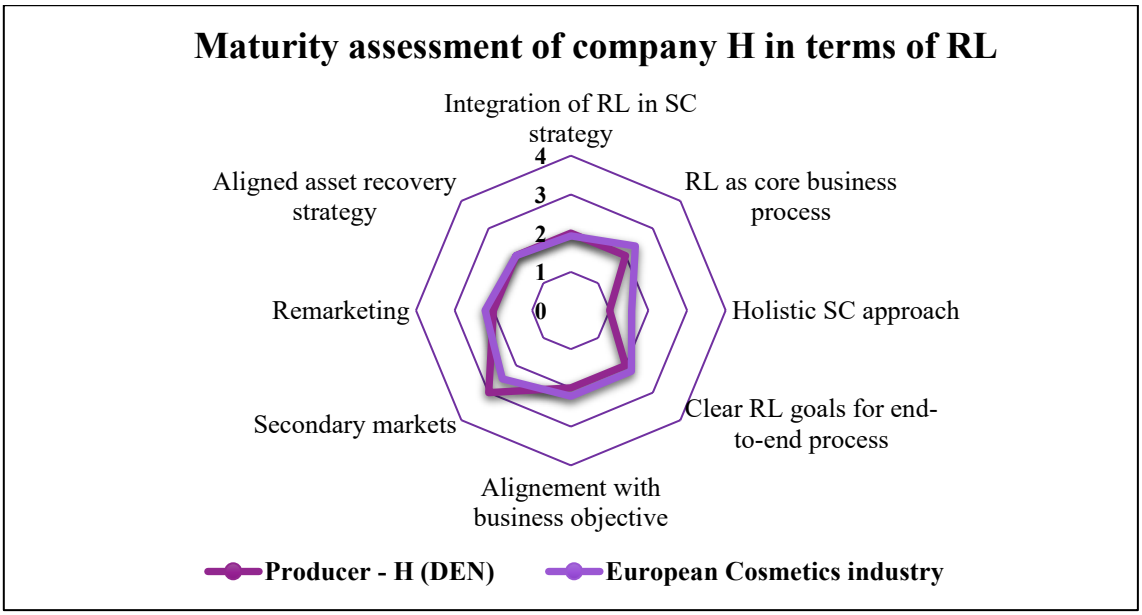
- Producer
- Belgium
- Small enterprise
- Skincare



Company H

Profile:

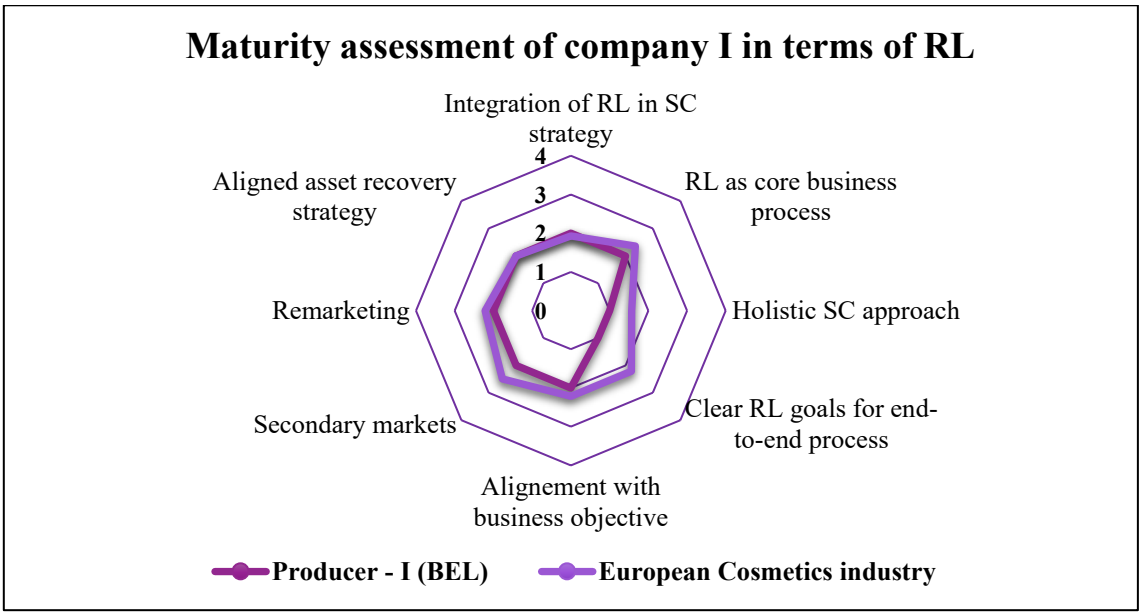
- Producer
- Denmark
- Small enterprise
- Skincare



Company I

Profile:

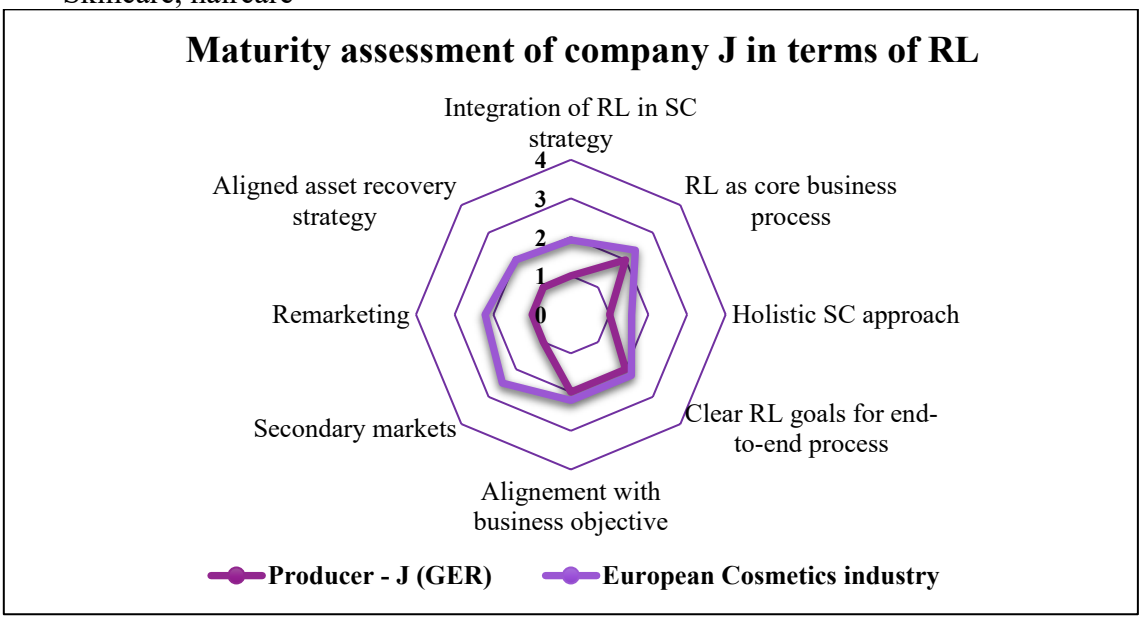
- Producer
- Belgium
- Small enterprise
- Skincare



Company J

Profile:

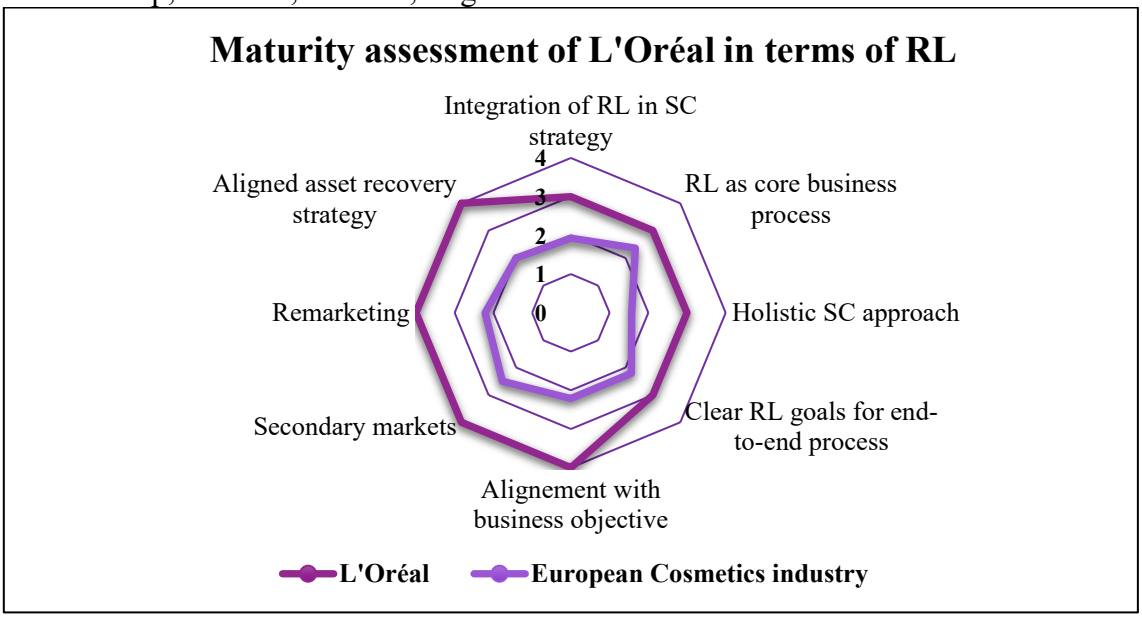
- Producer
- Germany
- Small enterprise
- Skincare, haircare



L'Oréal

Profile:

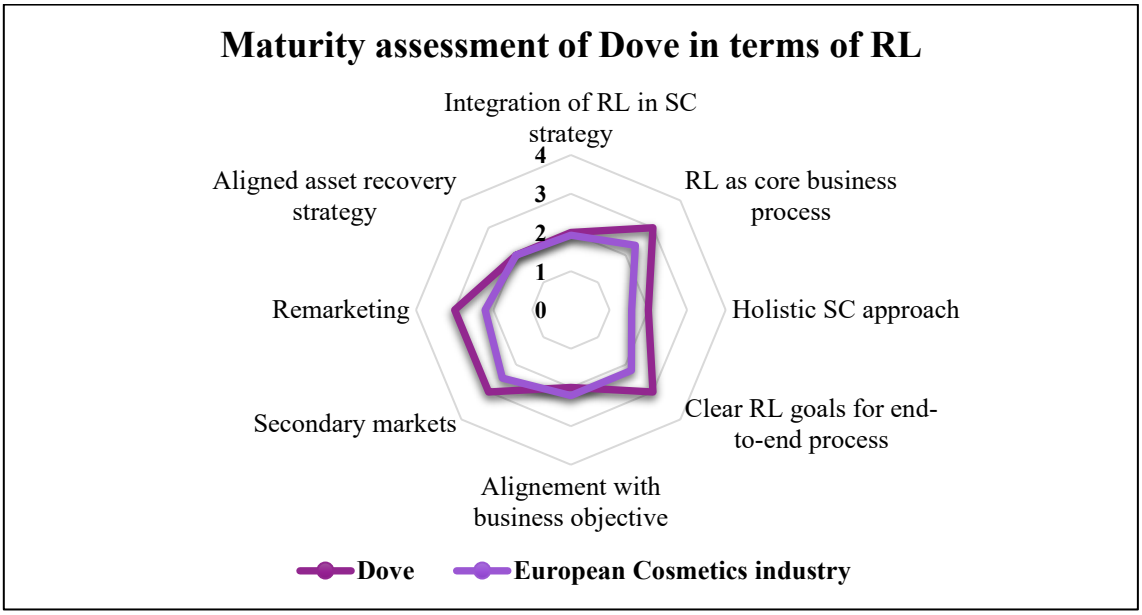
- Producer
- France (HQ)
- Multinational group
- Makeup, skincare, haircare, fragrance



Dove (Unilever)

Profile:

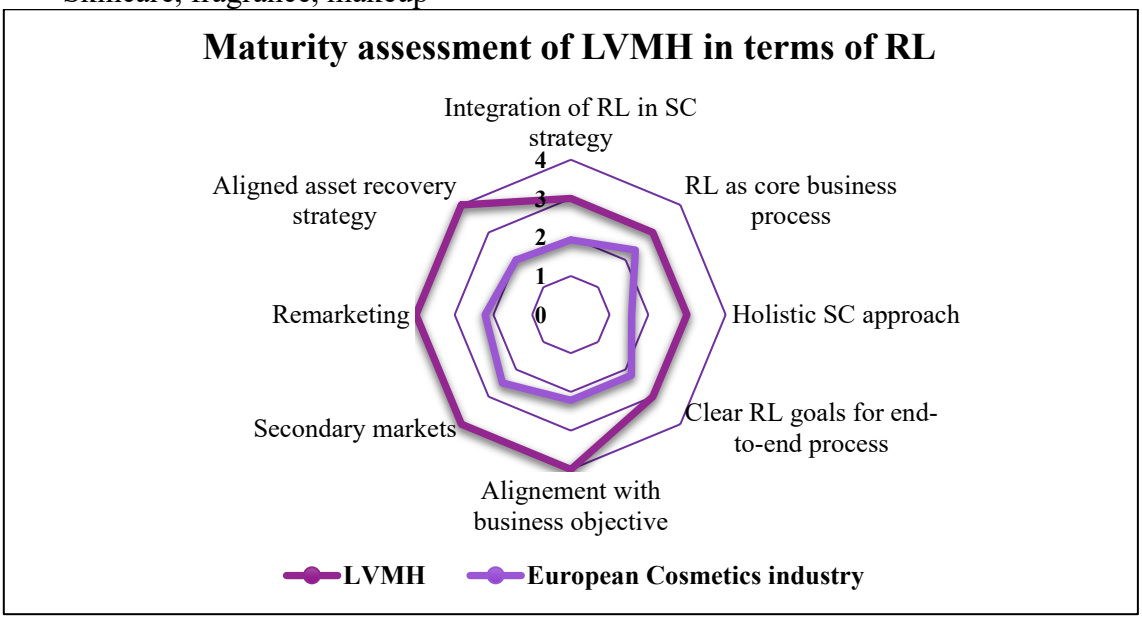
- Producer
- United Kingdom (HQ)
- Multinational group
- Skincare



LVMH

Profile:

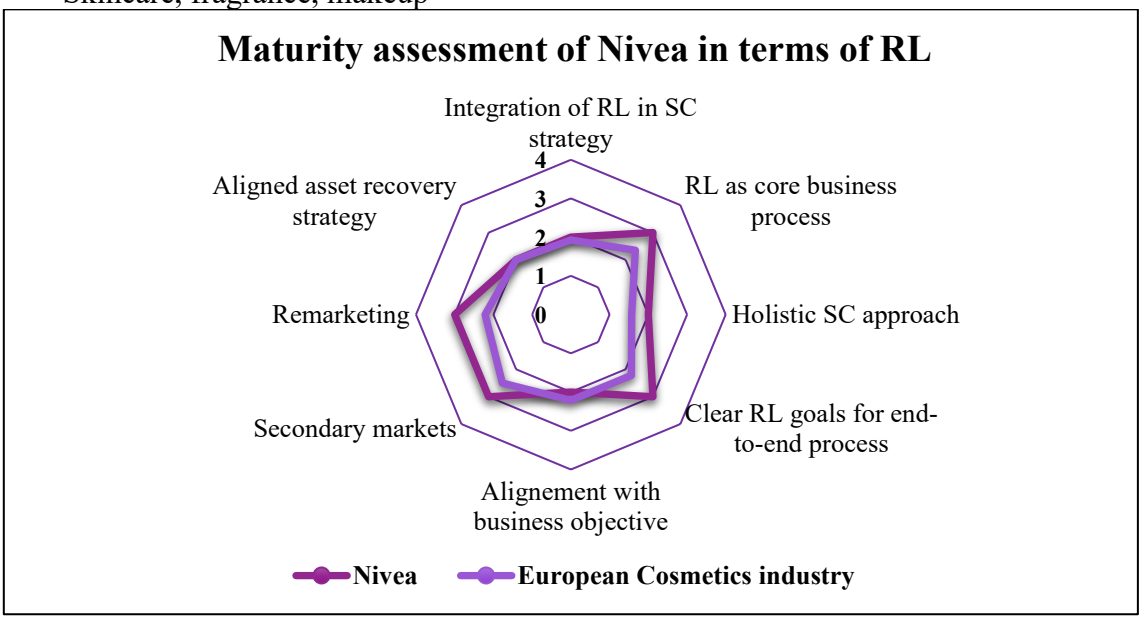
- Producer
- France (HQ)
- Multinational group
- Skincare, fragrance, makeup



Nivea

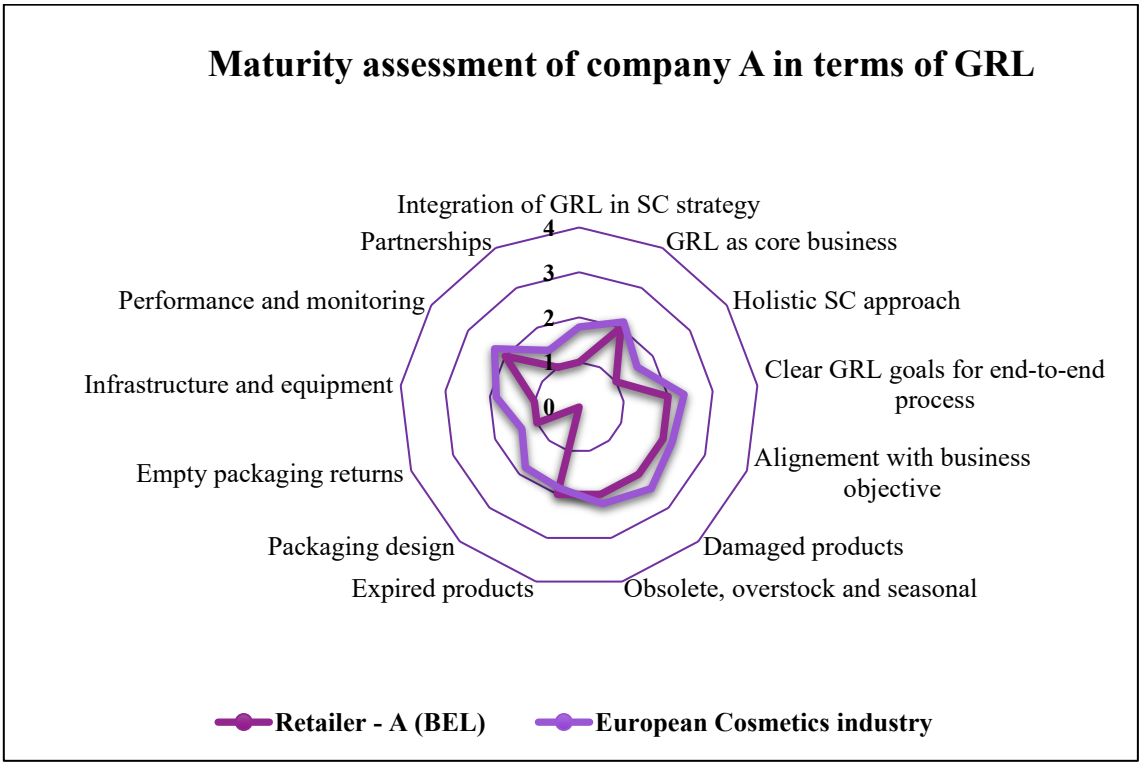
Profile:

- Producer
- Germany (HQ)
- Multinational group
- Skincare, fragrance, makeup

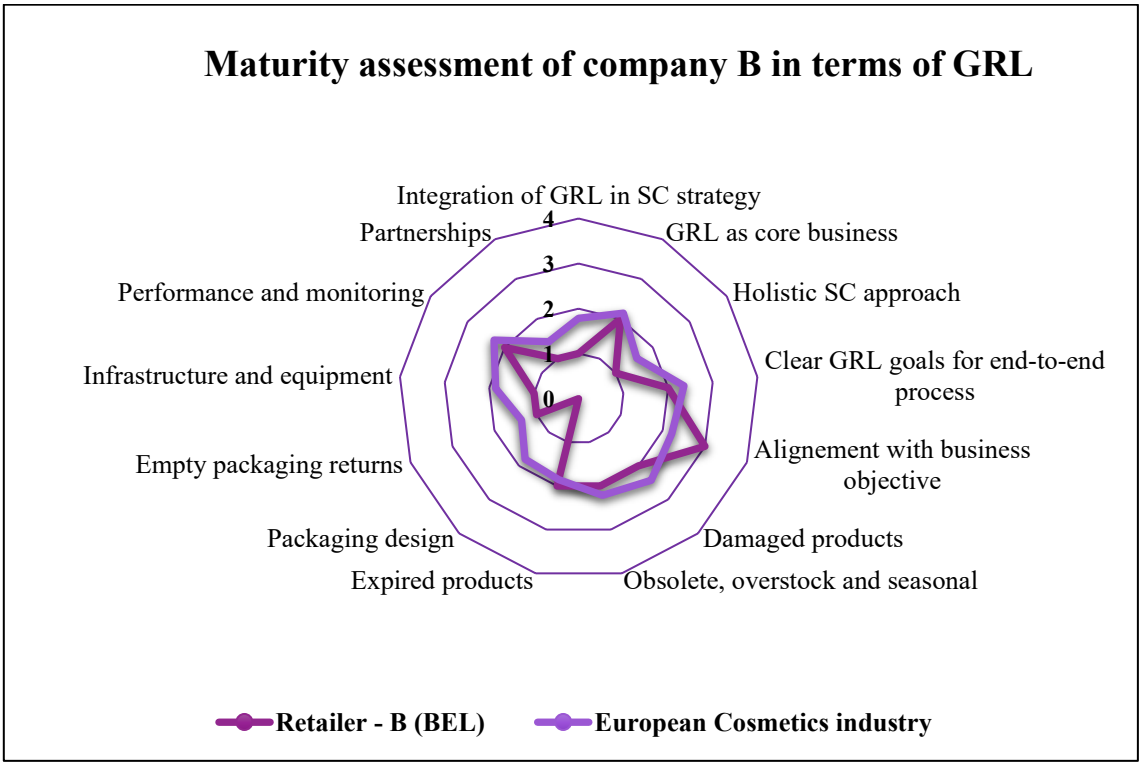


Appendix 10. Maturity assessment of green reverse logistics per company

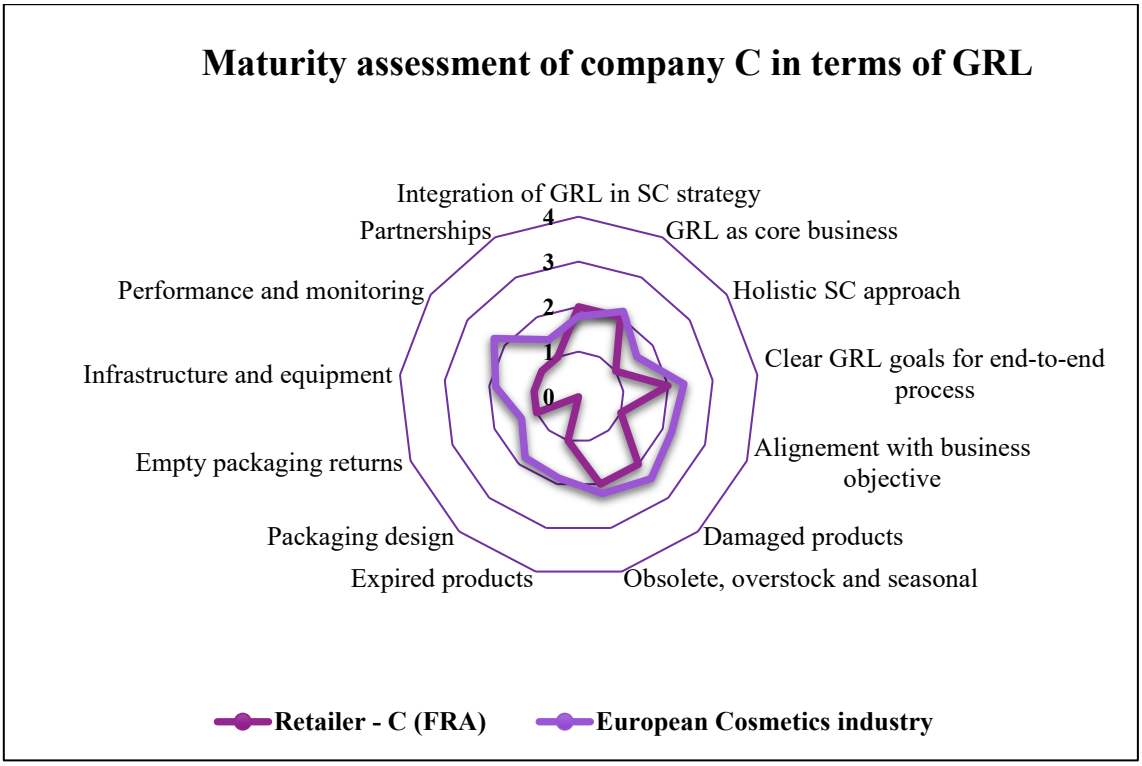
Company A



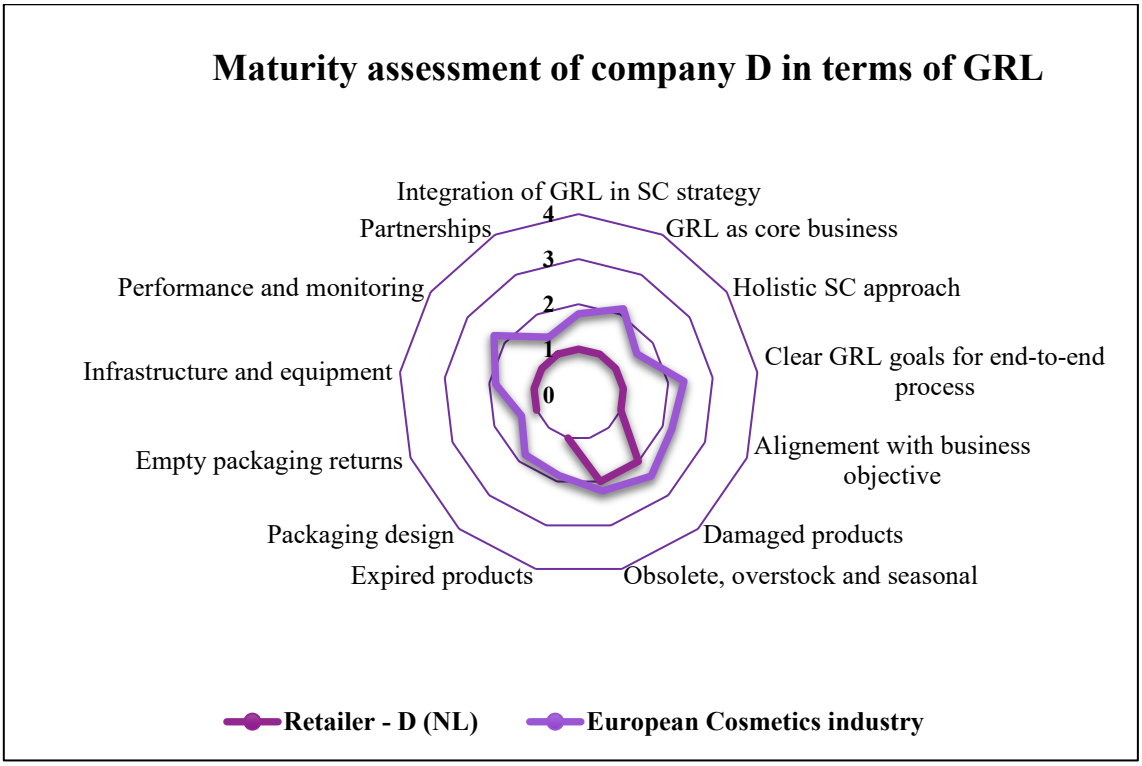
Company B



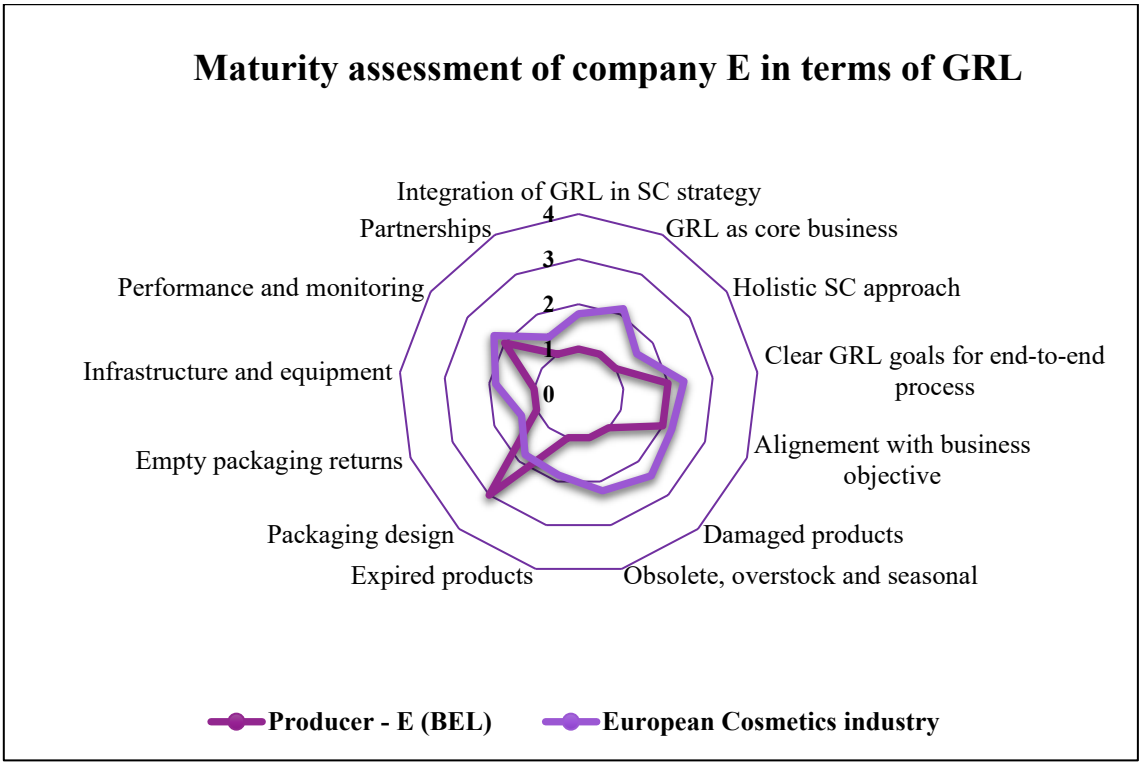
Company C



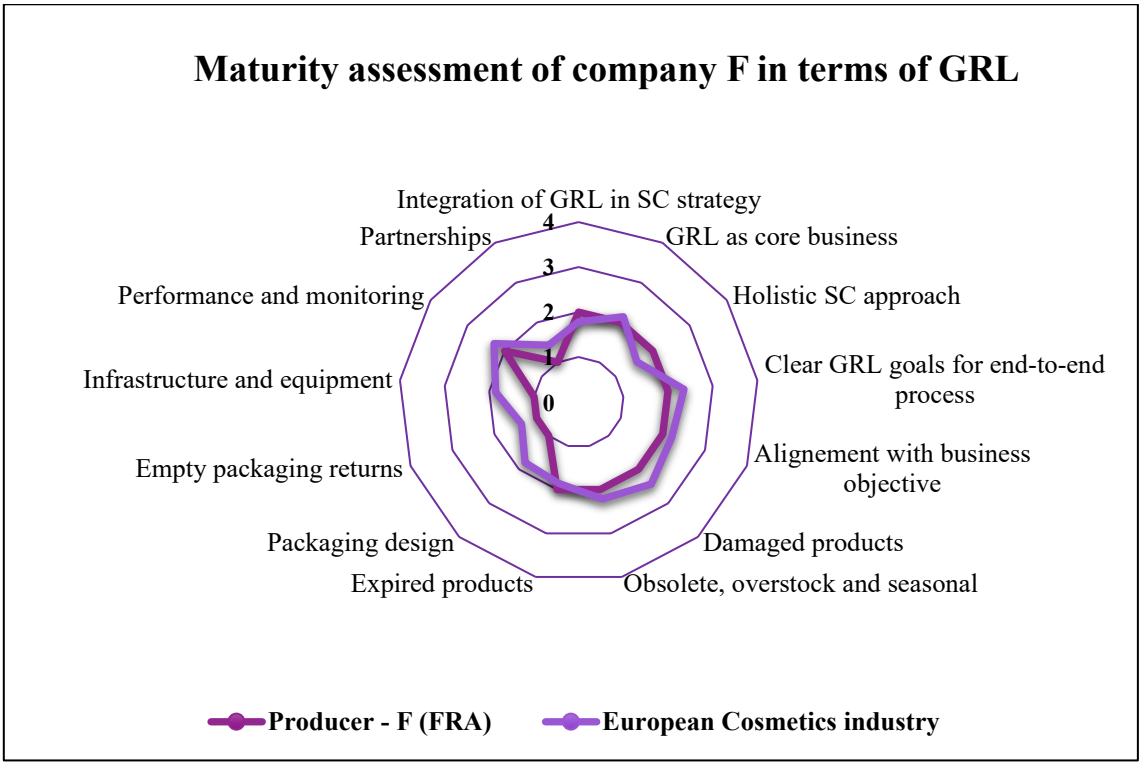
Company D



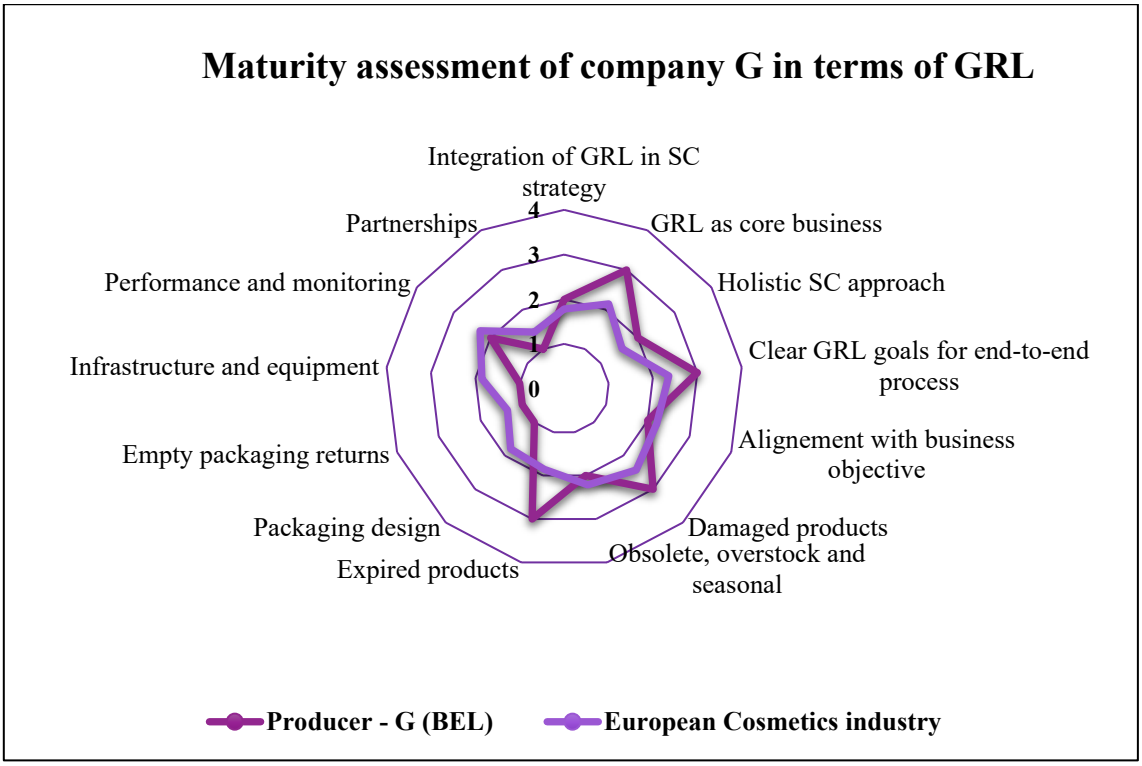
Company E



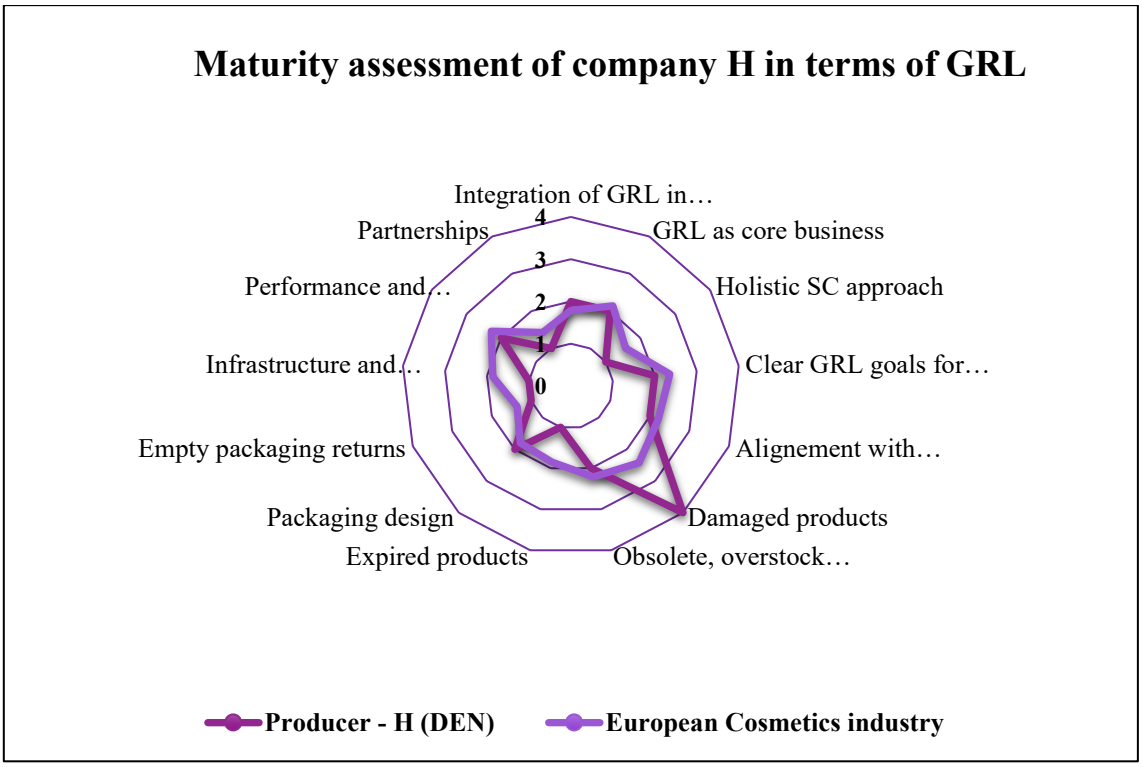
Company F



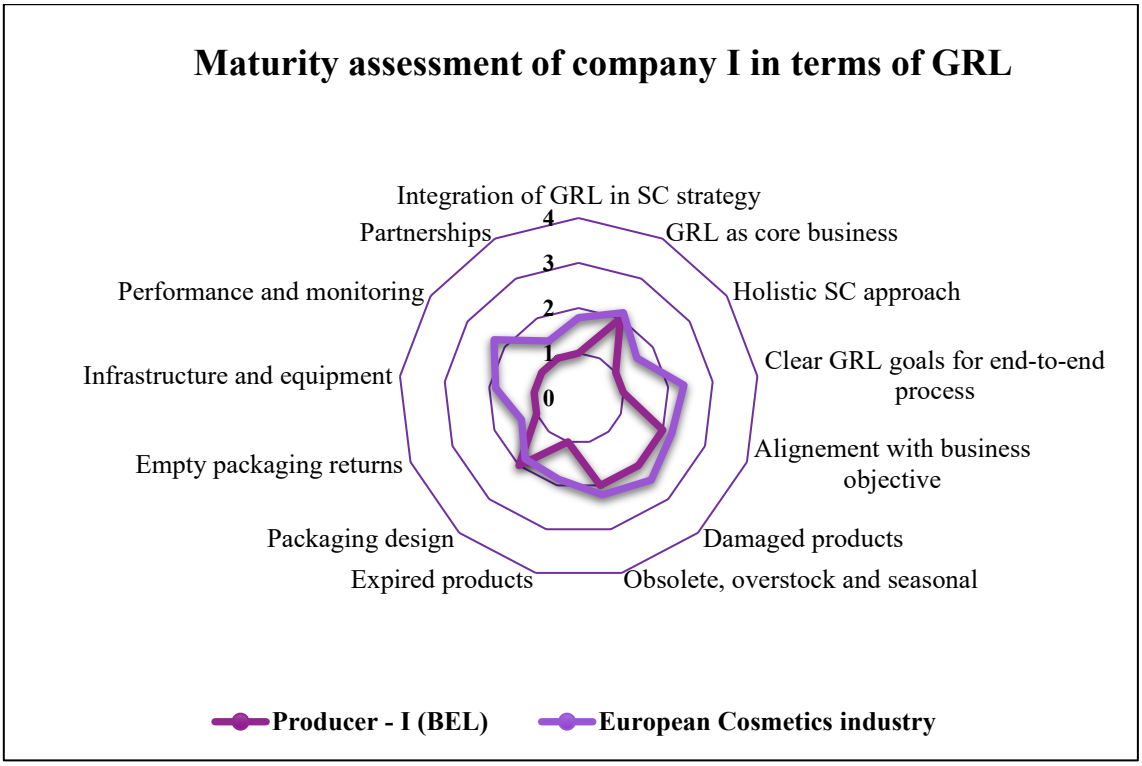
Company G



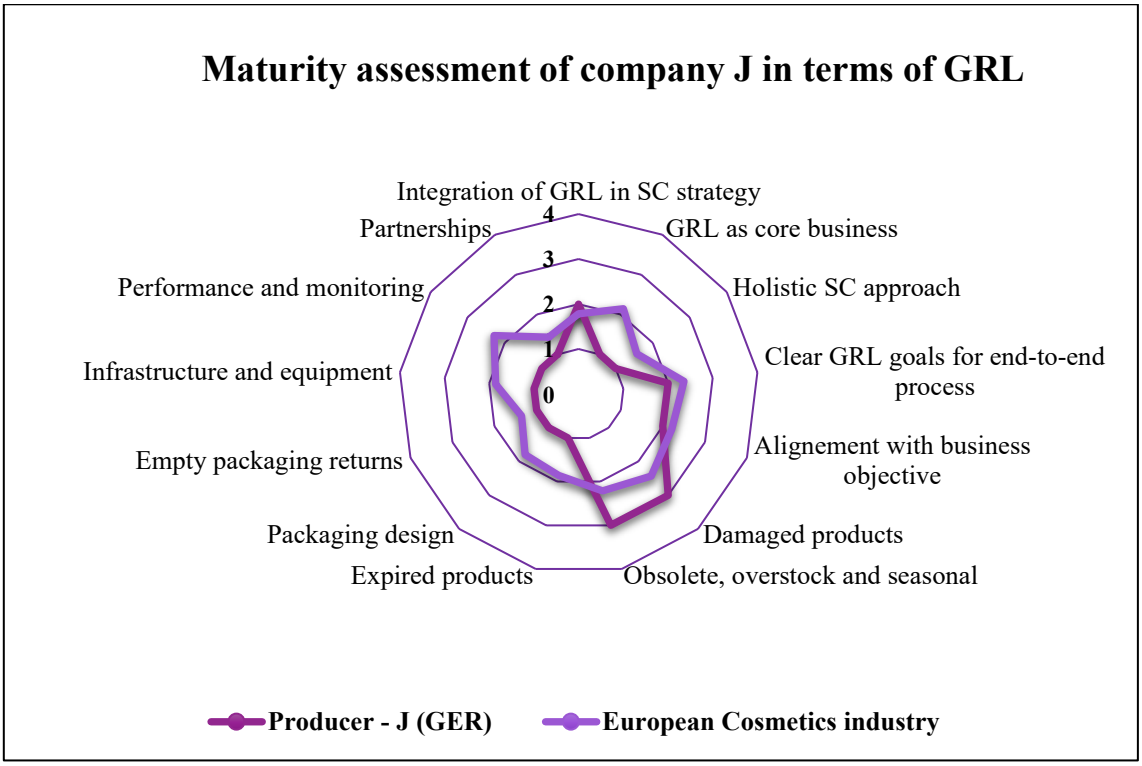
Company H



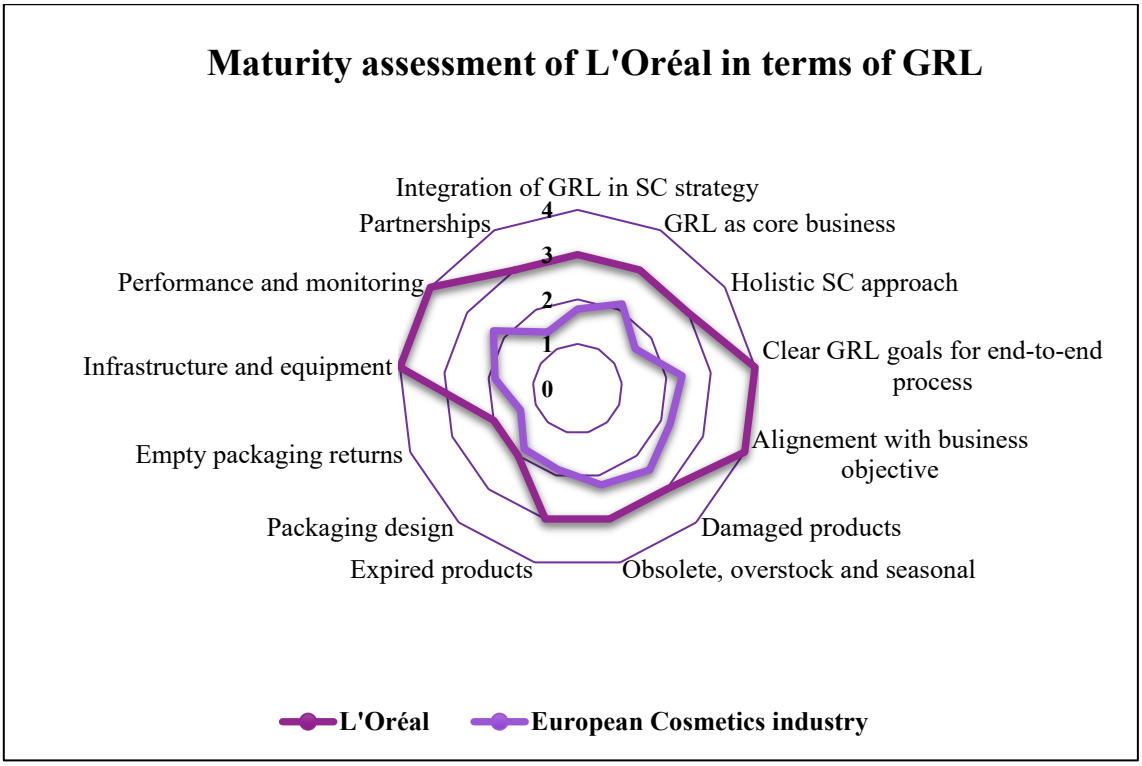
Company I



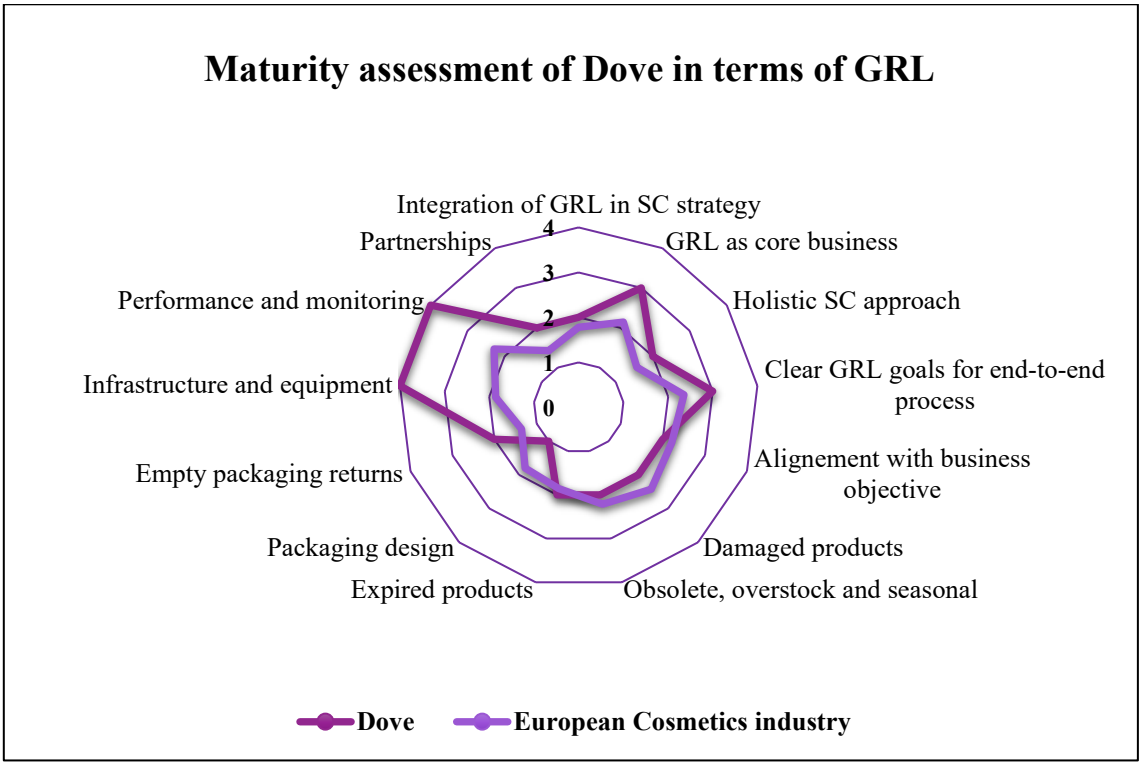
Company J



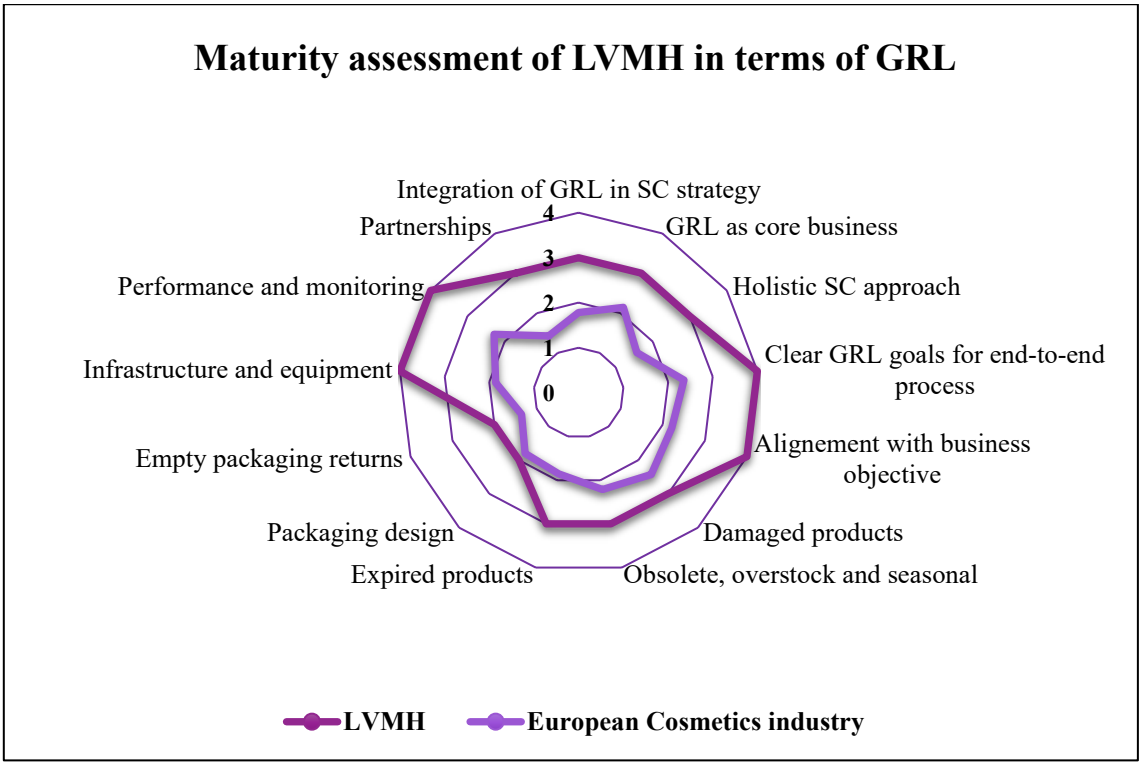
L'Oréal



Dove (Unilever)



LVMH


Maturity assessment of LVMH in terms of GRL
Integration of GRL in SC strategy
GRL as core business
Holistic SC approach
Clear GRL goals for end-to-end process
Alignement with business objective
Damaged products
Obsolete, overstock and seasonal
Expired products
Packaging design
Empty packaging returns
Infrastructure and equipment
Performance and monitoring
Partnerships
4
3
2
1
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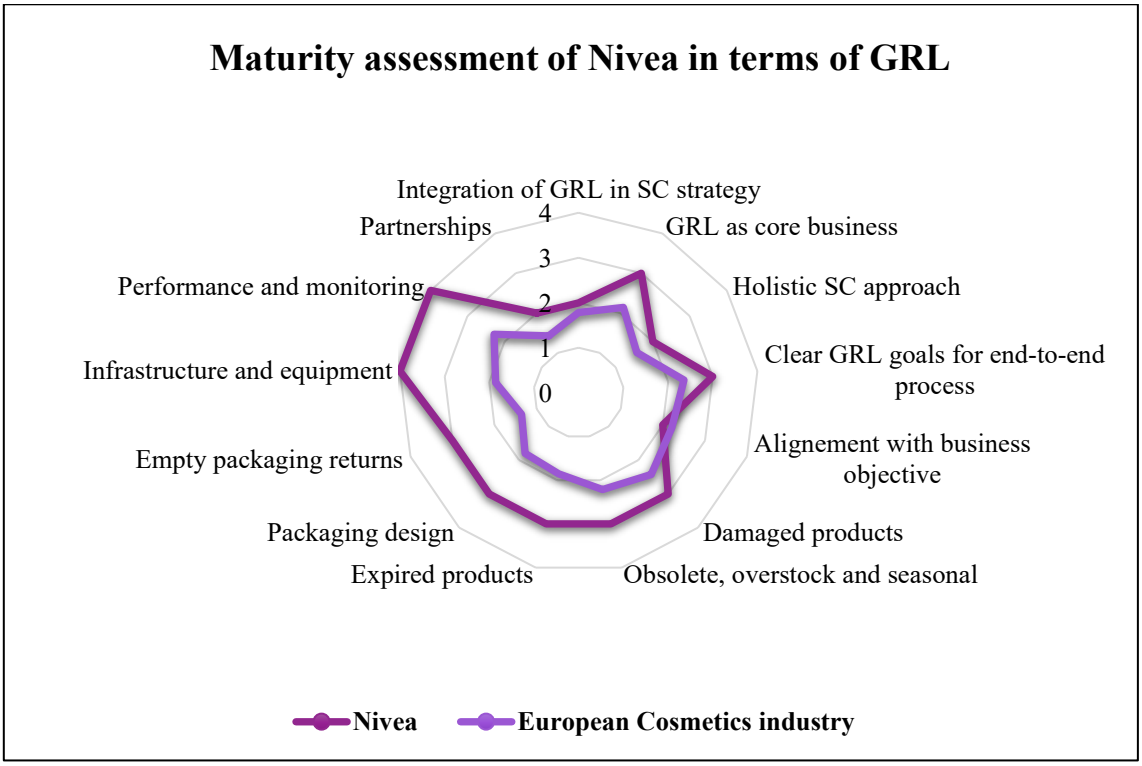
LVMH
European Cosmetics industry

Nivea


Maturity assessment of Nivea in terms of GRL
Integration of GRL in SC strategy
GRL as core business
Holistic SC approach
Clear GRL goals for end-to-end process
Alignement with business objective
Damaged products
Obsolete, overstock and seasonal
Expired products
Packaging design
Empty packaging returns
Infrastructure and equipment
Performance and monitoring
Partnerships
4
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Nivea
European Cosmetics industry

Executive Summary

The cosmetics industry is one of the largest contributors to end-of-life waste in Europe due to the wide variety of packaging used for beauty products and the rapid emergence of new products. To tackle this aspect and because of the growing concern and interest in sustainability among consumers and organisations, the personal care industry has started to implement various strategies to reduce its ecological impact, including the implementation of collection programs and adopting a circular approach.

The aim of this master thesis is to investigate the logistics practices currently undertaken by European cosmetics firms to achieve circularity. More specifically, this work intends to evaluate the level of maturity of the beauty sector in terms of green reverse logistics through unsold product and empty packaging recovery management. This study also explores the drivers and barriers experienced by retailers and producers to implement reverse supply chain operations.

To this end, qualitative research was conducted by analysing secondary data, conducting a qualitative survey and interviewing European producers. This research concluded that there is a significant gap between green reverse logistics management of SMEs and large cosmetics groups. It was also found that there is a difference of methods within the industry between the retailers and producers. Overall, the European industry is naïvely mature in terms of product recovery and empty packaging returns management. Areas for improvement such as the need to adopt a comprehensive overview of the value chain and the lack of strategy in reverse supply chain management were highlighted. Moreover, practices put in place by cosmetics firms appear to be motivated by the improvement of the corporate image through green marketing and customer satisfaction as well as the possibility to recover value from returned products.

Key words: Environmental sustainability, Cosmetics, Product recovery, Packaging, Circular economy, Reverse logistics, Maturity analysis