



**INVESTIGATING GREEN SUPPLY CHAIN  
PRACTICES IN THE PACKAGING INDUSTRY**

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# ABSTRACT

## INVESTIGATING GREEN SUPPLY CHAIN PRACTICES IN PACKAGING INDUSTRY

Lekesiztürk, Derya

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Advisor: Assoc. Prof. Dr. Bengü SEVİL OFLAÇ

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The thesis analyzes the green supply chain applications in the packaging industry. The main purpose of this study is to define the environmental perceptions of the partners in the packaging industry, to detail the practices, and to investigate how the environmental perception of the companies affects the supply chain decisions. A semi-structured interview method was used to collect data on the subject, and eleven participants from the packaging supply chain companies were selected for interviews. Five participants were selected from packaging manufacturers, two participants from suppliers, two participants from customers, a participant from both customers and

suppliers, and a participant from a recycling company. In order to analyze the interviews and collect data, a grounded theory perspective was adopted. As a result of the analysis, nine main and twenty-four subcategories emerged. The identified nine main categories are environmental awareness, global differences in sustainable packaging, problems in sustainable packaging, innovations in sustainable packaging, waste management, co-creation, supplier selection, environmental certifications, and legal issues.

**Keywords:** Green Supply Chain Practices, Packaging Industry, Co-creation in Green Supply Chain, Innovation, Sustainable Packaging Problems



# ÖZET

## AMBALAJ SEKTÖRÜNDE YEŞİL TEDARİK ZİNCİRİ UYGULAMALARININ İNCELENMESİ

Lekesiztürk, Derya

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Bu çalışma, ambalaj endüstrisindeki yeşil tedarik zinciri uygulamalarını analiz eder. Bu çalışmanın temel amacı, ambalaj sektöründeki ortakların çevre algılarını tanımlamak, uygulamaları detaylandırmak ve firmaların çevre algılarının tedarik zinciri kararlarını nasıl etkilediğini araştırmaktır. Konuyla ilgili veri toplamak için yarı yapılandırılmış görüşme yöntemi kullanılmış ve görüşmeler için ambalaj tedarik zinciri şirketlerinden onbir katılımcı seçilmiştir. Ambalaj üreticilerinden beş katılımcı,

tedarikçilerden iki katılımcı, müşterilerden iki katılımcı, hem müşterilerden hem de tedarikçilerden bir katılımcı ve bir geri dönüşüm firmasından bir katılımcı seçilmiştir. Veri toplama ve analizi için gömülü teori bakış açısı benimsenmiştir. Analiz sonucunda dokuz ana kategori ve yirmidört alt kategori ortaya çıkmıştır. Çevre bilinci, sürdürülebilir ambalajda küresel farklılıklar, sürdürülebilir ambalajdaki sorunlar, sürdürülebilir ambalajdaki yenilikler, atık yönetimi, birlikte oluşturma, tedarikçi seçimi, çevre sertifikaları ve yasal konular olmak üzere dokuz ana kategori tanımlanmıştır.

Anahtar Kelimeler: Yeşil Tedarik Zinciri Uygulamaları, Ambalaj Sektörü, Yeşil Tedarik Zincirinde Birlikte Yaratma, Sürdürülebilir Ambalaj Problemleri, İnovasyon

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## **LIST OF ABBREVIATIONS**

GSCM: Green Supply Chain Management

GP: Green Purchasing

IEM: International Environmental Management

CC: Cooperation with Customers Including Environmental Requirement

ECO: Eco Design

IR: Investment Recovery

GNP: Gross National Products

ITC: International Trade Center

ISCC: International Sustainability and Carbon Certifications

GT: Grounded Theory

## CHAPTER 1: INTRODUCTION

With the impact of globalization, many firms work on a worldwide scale and for most of the time, the keen global competition underpins the preference of cost-efficient industrial options. This often results in outsourcing to low-cost overseas suppliers with a high possibility of non-sustainable low-cost material usage. Recognizing that the eco-friendly footprint of the product is not limited to the final industrial stage, progressively more caution is being given to the overall sustainability of supply chains (Seuring and Müller, 2008). To meet the growing market constraints and to assort with more claiming environmental statutes, many corporations are imbued in ecological administration and communication instrumentality. In today's world, companies endeavor to assure sustainable operations all along the supply chains by utilizing consistent environmental management systems (e.g. ISO 14001), sustainable packaging, supplier scorecards on sustainability, environmental tagging of goods, carbon revelation plans, and sustainability reportage plans (Nawrocka et al., 2009).

In recent years, packaging has had a considerable amount of impact on environmental sustainability in almost any sector. The process of accepting and implementing green purchasing and green supply chain management is affected by various factors. Personal, institutional, sectoral, and government-based factors may become critical in environmental aspects of packaging (Psomas, Fotopoulos and Kafetzopoulos, 2011). Awareness and environmental perception; company and supply channels, suitable new raw material, applicability, and economic power; government support and surveillance of environmental laws and environmental certification can be counted as some of the critical factors in green packaging practices (Psomas, Fotopoulos and Kafetzopoulos, 2011). The ISO 14000 arrangement intends to give direction to building up an exhaustive way to deal with natural administration and for normalizing some key ecological apparatuses of investigation, marking, and life cycle appraisal. They are intended to be corresponding to public administrative systems and are not planned to supplant or copy a country's administrative framework (Ritchie and Hayes, 1998).

Ecological regulations are explained as

*“a set of characteristics for government environmental policies aimed at mitigating a firm's impact on the natural environment and creating a context where a firm will engage in environmental innovation”* (Eiadat et al., 2008).

For the public authority, one principle reason for authorizing and actualizing a progression of ecological guidelines is to decrease negative natural effects and improve ecological quality (Dasgupta et al., 2001).

New packaging enactment ought to be drafted, which would give an administrative structure to guarantee that the expenses of managing bundling waste are borne by the individuals who are associated with bundling; producers and merchants of bundled products, and providers of bundling materials. The standard behind the enactment was that the polluter pays, in light of the fact that the providers of merchandise had the minimal impetus to change their bundling strategy as long as the State was paying for the removal of bundling waste (Livingstone and Sparks, 1994).

The business model developed and improved in the packaging industry is generally based on supporting the green environment through recycling and green purchasing practices for ensuring sustainability for a greener environment. In the global and developing world, packaging has become an important tool for green applications with lots of opportunities for research and design for green. This fact has led the suppliers, manufacturers, customers, and public opinion groups to contribute to sustainable developments in the packaging area. With the rising environmental concerns, the packaging industry is eager to meet the changing legal requirements and consumer demands. Global companies announce more green strategies supporting their brand images more. Considering the changing environmental factors, the emerging supply and purchasing channels, pricing factors, technological advances, and new package designs, more need to be investigated in the area of green packaging (Li et al., 2020).

The packaging is directly linked to the green environment, and every innovation in the area is directly related to the future. In this regard, the purpose of this

thesis is to understand the green supply chain practices and strategies in the packaging industry. By exploring the employed practices and innovations in the field, the aim is to reveal the problems and to underline the benefits of sustainable packaging.

### ***1.1 Objective of the Thesis and Research Questions***

The objective of the thesis is to provide an insight for green applications that can be applied by packaging companies to evaluate the green performance of redesign alternatives and strategies in the supply chain management process.

The research questions are as follows:

- What are the green practices and strategies adopted in the packaging industry?
- How can green supply chain management (GSCM) strategies be implemented in packaging supply chains?
- What are the problems faced by the practitioners in the application and how to overcome those issues in the packaging industry?
- What are the innovative approaches in sustainable packaging?
- In sustainable packaging, what are the collaborative practices done with business partners (customers and suppliers)?

### ***1.2 Significance of the Study***

The research includes an exclusive point on environmental sustainability in the packaging industry. The concepts and problems related to the green supply chain management strategies are among the current subjects that point out research and practices.

The thesis contributes to the literature by focusing on the different green supply chain strategies in the packaging industry. The originality of the thesis comes from the fact that the research problem is being explored from the perspectives of multi-level players such as raw material suppliers, packaging producers, and business buyers in the packaging industry. In addition to those players, we have also included specialized service providers related to green operations. In this way, we provide a full view of the green practices and the problems within the supply chain. More

specifically, we provide green packaging-related innovations in the industry by shedding light on the projects undertaken. Moreover, we provide further information on current waste management practices and the related problems faced. Furthermore, we point out the global differences in the packaging industry. As another significant point, this study highlights the importance of value co-creation of value. We also obtain data regarding the environmental certification and legal issues.

Although there are some applications made in this field and information about supply chain decisions in the literature, there was not enough information about the current practices of the companies or the legal issues and certifications. This study can provide a better understanding of green practices in the packaging industry.

The practices and concepts related to green supply chain management are among the contemporary topics that draw the attention of both researchers and practitioners. This research will contribute to enlarge the practical information regarding green packaging, which will hopefully lead to higher levels of green SCM awareness.

### ***1.3 Directory Part***

This paper is planned as follows. Chapter 2 is related to the theoretical background and the part shows comprehensive literature on green supply chain management practices, value co-creation and collaboration in SCs, sustainable packaging, and environmental regulations and legal aspects in packaging. The packaging industry and green operations are clarified in detail.

In Chapter 3, the packaging and packaging industry is explained with a worldwide perspective in detail. In addition, this sector is examined for Turkey. The current data for the industry is given in this part and is supported with the tables.

The Methodology part is given in Chapter 4. We present the data collection, data analysis, and sampling information within this chapter.

Chapter 5 consists of findings. As a result of the analysis of the interviews, the findings were shaped, classified, and explained with the discourses of the participants.



Finally, in Chapter 6, we explain our contribution to theory and practice. In addition, the limitations of the study and suggestions for further research are presented.



## **CHAPTER 2: THEORETICAL BACKGROUND**

The literature review is structured to pursue the step of the improvement of the research topics. The review of the literature tackled green supply chain practices and investigations in the packaging industry.

Recent studies on supply chain management practices contain an increasing assessment of green investigations. We first understand the green supply chain management perspectives, aims, and how to improve this perspective and design the boundaries of green management in the overall chain.

The recent green practices in the packaging industry are presented by discussing the literature.

### ***2.1 Green Supply Chain Management (GSCM) and Practices***

In recent years, protecting our habitat has turned into a significant worldwide issue. Because of expanding human and industrial impacts on the climate, environmental issues have become more critical and inescapable. In this regard, businesses need to provide a balance between the environment and the business goals. This paper is an initiative to explain the way towards that end and feature steps to be taken by business organizations in the packaging industry through green production networks (Eltayeb and Zailani, 2014).

Today, natural issues have been increasingly incorporated into the global exchange markets and consumers are increasingly demanding environmental products (Anbumozhi and Kanda, 2005). The rising significance of GSCM is driven fundamentally by climate change and the related rising pollution, waste, and raw material scarcity issues. Adding the 'green' constituent to supply chain management comprises addressing the effect and relation between supply chain management and the biological environment (Srivastava, 2007). This requires a decision framework for choosing and prioritizing the necessities in green supply chain management (Sarkis, 2003).

Green supply chain management is defined as inserting eco-friendly conditions in traditional supply chain management to perform all actions of the value chain (Adhikari et al., 2019). The idea of a green supply chain is a multidisciplinary issue that arises from performing ecological administration rehearses concerning supply chains (Sarkis et al., 2016) and characterized GSCM as incorporating ecological worries into the authoritative acts of the production network including reverse coordination (Sarkis, Zhu and Lai, 2011).

Green supply chain management is ‘combined environmental decisions in supply chain management, involving product plan, manufacturing process, material resourcing and selection, shipment of the finished product to the customers as well as the end of life administration of the product later (Srivastava, 2007). According to Tseng et al., (2019), GSCM can be characterized as the coordination of ecological administration framework into the production network. GSCM practices require cooperation among customers, providers, and specialized organizations to impart data and information with an intent to improve execution. Furthermore, this definition underlines the importance of collaboration among different parties in supply chains.

Sarkis, Zhu and Lai, (2011) studied how the idea of GSCM can be clarified with set up speculations and how the current assortment of information could be broadened further. Green et al., (2012) argued that ecological execution should be centered on diminishing the degrees of natural poisons. Financial execution focuses on the reduction in earth-related costs such as material sourcing and energy utilization. Barari et al., (2012) provided an incorporated and all-encompassing reasonable system that joins the viable parts of the green inventory network with the goal of benefit augmentation of the elements in the production network by utilizing transformative elements.

GSCM has arisen as a useful administration instrument and theory. The extent of GSCM rehearsed execution goes from green buying (GP) to coordinated life cycle perspective by including the supply chain executives, service providers, producers, clients and shutting the circle with turnaround coordination. The reasons for the rise of GSCM studies can be counted as the increasing environmental concerns that

accompany industrial development (Sheu et al., 2005), declining raw material resources, overflowing landfills, and increasing pollution levels (Srivastava, 2007). Therefore, the companies have an awareness of environmental sustainability and they are willing to establish their sustainability perspective (Lewis and Gretskakis, 2017).

Firms attach importance to green supply chain practices to reduce their negative environmental impacts, and in the literature GSCM practices refer to various activities carried out by various companies to minimize their impact on the environment (Vachon and Klassen, 2006; Sarkis and Bai, 2010).

The extent of the investigation directed on GSCP by Zhu et al., (2008) and Sarkis and Bai, (2010) is more extensive and covers both inward (for instance intra-hierarchical), and outer rehearses. For example, inward drives incorporate carrying out natural administration frameworks and venture recuperation, while green buying and co-activity with clients for green bundling can be delegated outside practices.

Existing contributions in this field by many authors have also been classified according to their scope, taking a broad perspective by looking at various environmental management issues and multiple actors in the supply chain (Handfield et al., 1997; Narasimhan and Carter, 1998; van Hoek, 1999; Hall, 2000). ; Bowen et al., 2001; Zhu and Sarkis, 2004; Gonzalez-Benito and Gonzalez-Benito, 2006; Vachon and Klassen, 2006; Presley et al., 2007; Vachon, 2007; Zhu et al., 2007; Perotti et al., 2012).

To fully understand the environmental impact of practices, it is necessary to focus on the entire supply chain (Hoek, 1999), because the existing literature is mainly focusing on the design of sustainability (Zhang et al., 1997; Zhu and Deshmukh, 2003; Diwekar and Shastri, 2010; Perotti et al., 2012), reusable inventory (Guide and Srivastava 1997; Guide, Srivastava and Jayaraman, 1999; Wong et al., 2005; Kim et al., 2007; Perotti et al., 2012), arranging and controlling remanufacturing (Bras and McIntosh, 1999; Guide et al., 1997; Guide, 2000; Perotti et al., 2012), green assembling and product recuperation (Guide et al., 1996; Gungor and Gupta, 1998; Perotti et al., 2012) , and purchasing of sustainable products (Min and Galle, 2001; Cousins et al., 2004; El Tayeb et al., 2010; Perotti et al., 2012).

Logistics activities have been included in the GSCM literature, and the literature has expanded in this area as well (Carter and Rogers, 2008). Other examples include reverse logistics (Fleischmann et al., 1997) and logistics network design, distribution and transportation applications, warehousing, and green building (Jumadi and Zailani, 2010; Perotti et al., 2012).

Moreover, Zhu and Sarkis (2007) explain the positive relationship between green supply chain management and environmental impacts. The findings of that study show how the green supply chain management decisions affect costs, reliability, performance or energy utilization efficiency, and quality. According to Zhu et al., (2008), the positive relationship is explained with the two order models and are defined as the principal request model with internal environmental management (IEM), green purchasing (GP), cooperation with customers including environmental requirements (CC), eco-design (ECO), and investment recovery (IR).

## ***2.2 Value Co-creation and Collaboration in SCs***

The progressions in innovation, contests, and client requests essentially modify the way the organizations work. Organizations depending on regular company-centric rehearsal end up in diminished consumer loyalty and declined benefits. The customary disconnected value creation procedure is losing its utility in the rising economy. Organizations are moving their core interest from expanding inward productivity to use outer assets, particularly the client ability, to acquire new upper hands in the new economy (Lovelock and Young, 1979; Prahalad and Ramaswamy, 2004; Prahalad and Krishnan, 2008; Zhang and Chen, 2008).

Future contest fixates on customized connection with clients to co-make esteem (Prahalad and Ramaswamy, 2004; Prahalad and Krishnan, 2008; Zhang and Chen 2008). Besides, the client firm cooperation no longer cuts off points in customary help areas or showcasing exercises. Maybe, organizations may co-make esteem with clients along the supply chain (Zhang and Chen, 2006; Zhang and Chen 2008), from the co-advancement of new items to creation, get together, circulation, retail, after deals administration and use (von Hippel, 1988; Ross, 1996; Duray, 2002; Zhang and Chen 2008). Therefore, value co-creation gains importance.

Co-creation has been bantered in the literature, and some writing audits have effectively been distributed. These surveys exhibit the number of approaches and objectives that have been utilized to apply co-creation as an idea (e.g. Grönroos, 2012; Saarijärvi, Kannan and Kuusela, 2013; Galvagno and Dalli, 2014; Ind and Coates, 2013; Carù and Cova, 2015; Jaakkola, Helkkula and Aarikka-Stenroos, 2015; Neghina et al., 2015). Commonly, value co-creation is viewed as being founded on cooperation in help connections and characterized as

*"joint synergistic exercises by parties associated with direct collaborations, expecting to add to the worth that arises for one of the two players"* (Grönroos, 2012).

Moreover, value creation is an interaction through which the client turns out to be lucky in some regard (Groönroos, 2008) or which builds the client's prosperity (Vargo et al., 2008).

Co-creation is considered according to various hypothetical viewpoints. The assistance science viewpoint is the prevailing viewpoint. The researchers utilizing the assistance science point of view underline the constitutive idea of co-creation for the improvement, all things considered (item, administration, and so on) in which the client makes esteem through assets that organizations give. The connection among suppliers and clients is viewed as the fabricating block for value creation, regardless of whether there is an analysis of the miniature logical construction and cycles (Groönroos, 2008; Groönroos 2011; Groönroos and Ravald, 2011; Groönroos and Voima, 2013; Galvagno and Dalli, 2014), the social embeddedness of co-creation (Edvardsson et al., 2011; Galvagno and Dalli, 2014), and the danger of suppliers abusing clients (Cova et al., 2011; Galvagno and Dalli, 2014).

In addition, value co-creation is viewed as being founded on joint coordinated effort in help associations and characterized as

*"Joint communitarian exercises by parties engaged with direct connections, intending to add to the worth that arises for one of the two players"*

and firmly contends for saving the idea of significant value co-creation for circumstances where the supplier and client are associated with joint cooperative exercises (Grönroos, 2012).

Cova and Cova (2015) stress the significance of understanding customer groups as far as worth co-creation, and, comparatively, recommend that co-creation as a point of view ought not to be delimited to administrative concerns (Ind and Coates, 2013). Neghina et al., (2015) propose the esteem co-creation ought to be characterized as an intricate joint synergistic action among clients and workers.

Value co-creation comprises six attributes in collaboration: individualizing, relating, enabling, moral, formative, and purposeful (Neghina et al., 2015). In Karpen et al., (2012) studies include the six attributes in collaboration categories and Neghina et al., (2015) have given details of them and a firm's ability to six attributes as defined as follows; individualize interaction has been defined at the organizational level as

*"the ability to understand an organization's resource integration process, contexts, and desired outcomes of individual customers and other value network partners".*

In addition, a firm's relational interaction capability is defined as an organization's ability to strengthen social and emotional bonds with consumers and other value network partners. Joint exercises 'are based on the reason that the two members can impact the result of the communication. At the firm level, this converts into the company's

*"capacity to empower its clients and other value organization accomplices to shape the nature and content of trade".*

In addition, a company's formative cooperation capacity is characterized as its

*"capacity to help clients and other value organization accomplices' information and skill improvement".*

Deliberate association capacity as

*"an association's capacity to work with facilitated and incorporated assistance measures with clients and value organization accomplices. Moreover, ethical behavior cooperation and successful interactions are critical for participants to work towards a common goal and not have any conflicting hidden agendas (personal gains)"* (Randall et al., 2011; Neghina et al., 2015).

In value co-creation, clients expect a working position and make regard alongside the firm (Kohler et al., 2011) through quick and deviant collaboration across more than one period of creation and usage (Hoyer et al., 2010; Payne et al., 2008; Payne and Apergis 2009; Roggeveen et al., 2012; Tynan et al., 2010). Nonetheless, esteem co-creation isn't only indispensable (Saarijärvi, Kannan and Kuusela, 2013), it is also a term that depicts a move considering relationship as a definer of motivating force to a more participative communication in which people and affiliations together deliver and make meaning (Ind and Coates, 2013).

Value co-creation exertion is a fruitful process. With value co-creation, brands fortify their goals, acquire market knowledge through examination, increment organization assets, and improve the organization's administration. A co-creation exertion is by all accounts evaluated as effective if it takes into consideration brands to strengthen its image-building procedure, increment brand reliability, and brand mindfulness, improve the brand insight and increase a brand's separated situation on the lookout (Kennedy and Guzman, 2016). In a comparative design, Zwass (2010) alludes to the co-formation of significant value as a type of development happening in the organization (Witell et al., 2011).

### ***2.3 Sustainable Packaging***

In recent years, environmental aspects have gained significance in the worldwide packaging industry (Kozik, 2020). Green packaging is a trend, which is made from all-natural plants, can be cyclical or second-used, prone to degradation, and promotes sustainable development. Sustainable packaging can also be defined as ecological packaging or environmentally friendly packaging. Moreover, green packaging is the fitting bundling that can be reused, or subject to debasement,



defilement. This kind of packaging does not cause contamination in people and provides a healthy climate during the product life cycle (Zhang and Zhao, 2012).

The studies of green packaging are mainly divided into three categories. Academics take the subject from a micro perspective and focus on the study of materials and production standards as the first category. For example, in these studies, various design principles of green packaging were proposed, and within these principles, subjects such as reduction, simplification, lightness, harmlessness, and cleaner production were examined (Liu et al., 2010; Hao et al., 2019).

Hao et al., (2019) specifies the second category as a macro point of view and, based on the analysis of the status quo of light green packaging. This viewpoint concludes that the well-being of green packaging requires the joint efforts of governments, businesses, and consumers at various levels if the goal is a complete and well-functioning recycling system. Moreover, in all stages of the packaging industry- the design, production, transportation, consumption, abandonment, and recycling- carbon emissions, legislation, and regulations should be strictly controlled to encourage the dissemination and the use of green packaging for creating low carbon awareness and environmentally friendly consumption habits. It reveals that through these efforts, sustainable development can be achieved.

The consumers' behavioral psychology and regional cultural differences have emerged in the third category. Also, the relationships between consumers' characteristics and green packaging choices were analyzed. Investigations of the social effect of different packaging waste administration frameworks exhibited that proper assortment frameworks optimistically affect residential health aid and private wellbeing (Ciftcioglu et al., 2017; Hao et al., 2019). In addition, considering that recycling and collection are significant for green packaging and wanting to keep up with the times, four typical internet recycling modes were researched by Wang et al., (2018) and Hao et al., (2019).

## CHAPTER 3: PACKAGING AND PACKAGING INDUSTRY

Packaging has more than one definition and Paine (1981) created extensive and

*“well-designed descriptions for packaging that is the packaging is a coordinated system of preparing goods for transport, distribution, storage, retailing, and end-use, the packaging is the means of ensuring safe delivery to the ultimate consumer in sound condition at minimum cost and packaging is a techno-economic function aimed at minimizing costs of delivery while maximizing sales (and hence profits)”.*

Therefore, the packaging enables as a defender (Paine, 2002; Lockamy, 1995) of the goods through coordination of logistics activities and collaboration with the consumers.

Consumer packaging and logistics packaging are two types of packaging categorized (Johansson et al., 1996). The packaging is classified according to conditions of use with three-level categories. These are primary packaging or the packaging for selling, secondary packaging, and tertiary packaging or transport packaging. The primary packaging is an integral part of the sales. It is the first material to surround and to come into contact with the product directly. Secondary packaging is used for carrying products and for making groups of products. Tertiary packaging is related to transport or bulk products. This type of packaging makes it easier to carry, handle, transport, and store the goods (Jönson, 2000).

In the main packaging groups, there are different types of packaging that are wooden, plastic, glass, paper, and metal. Wood is the oldest packaging material to protect the goods because of toughness and durability. The pallets, chests, and cases can be given as an example of wood packaging. The most common packaging type is plastics that are produced from petrochemicals. Nearly all food packaging can be given as examples of plastic packaging. Another packaging type is glass that generally is used for beverages. In addition, metal packaging is used for it and foods. The last

packaging material is paper. The types of packaging materials cover and protect the goods and help to deliver more safety (Özek, 2016).

*“The process of planning, implementing and controlling the coordinated packaging solution that prepares goods for secure, safe, effective and efficient transportation, handling, distribution, storage, retailing, consumption, reuse or disposal and related information combined with maximizing customer value, sales and hence profit” (Saghir, 2002).*

Therefore, packaging is a principal constituent that may increase competitiveness (Zheng et al., 2009).

The packaging industry is regarded as the third largest industry that is related with the way of this sector in one aspect of another, so it causes that the packaging would be a significant zone in the world and human needs affect the packaging industry (Monteiro, Straume and Valante 2019).

The global packaging industry market has a number of leading players to concentrate on the type of packaging; others manufacture a variety of packaging components. An assortment of the motivations has been recognized as driving change inside the packaging industry involving the degrees of financial movement; segment patterns counting the maturing of the total populace; different lifestyles, including the development in the quantities of women in workplaces and in single-person households; health and environmental awareness. (Hillier, Comfort and Jones, 2017).

### **3.1 Global Packaging Industry**

In the industrialized part of the World, packaging is significant commerce and it is occurring more significant logistics objectives in emerging markets. The worth of the international packaging market is approximated at 500 billion dollars, bookkeeping in gross national products (GNP) that refer 1-2 percent (Rundh, 2005).

In developing markets, the packaging industry becomes incrementally prominent. Especially in Asia, sales of packaging calculated for a total %36 in value in 2012. In the meantime, respectively 23% and 22% percentages are shared by North

America and Western Europe. In 2012, the fourth largest consumer of packaging with a global share of 6% belonged to Eastern Europe. In addition, Africa and Australasia had 2% shares of the global demand for packaging but the Middle East represented 3% of it. However, Asia is anticipated to cover more than 40% of the worldwide interest, though North America and Western Europe miss out recognizably (Pira, 2013).

In 2019, the World packaging industry's export rate was approximately 300 billion dollars. The World's packaging exports consist of 55.5% plastic packaging and 30.4% paper-cardboard packaging. Other groups of exported packaging are metal, glass, and wood components. In addition, China, Germany, the USA, Italy, Japan, and France are the World's largest packaging exporters (Ministry of Trade, 2021).

In 2019, the World packaging industry's import rate was approximately 297, 1 billion dollars. The World's packaging imports consist of 55.7% plastic, 30.5% paper-cardboard, 7.5% metal, 3.6% glass and 1,5% wooden packaging. According to the World packaging import rates, the largest packaging importers are the USA, Germany, China, France, Mexico, England, Canada, Holland, Italy, Belgium, and Poland (Ministry of Trade, 2021).

Table 1. ITC- International Trade Center - Trademap: The World Packaging Industry with import and export rates

Type of Packaging	2019 Export Rate (Billion USA \$)	2019 Import Rate (Billion USA \$)
Plastics	166,6	165,5
Paper-Cardboard	91,2	90,6
Metal	22,9	22,4
Glass	11,1	10,7
Wooden	4,9	4,5
TOTAL	300,3	297,1

### ***3.2 Packaging Industry in Turkey***

Packaging in Turkey is a rapidly evolving industry. This sector is affected by urbanization, population growth, increasing living standards, changing consumption habits, increasing shopping tendencies and demand for consumer products are the main

factors in the rapid development of the sector. There are five main concepts to produce the packaging materials that are plastics, metal, glass, wooden and paper – cardboard (Ministry of Trade, 2021).

The packaging material producers pursue not only the national but also international environmental regulations and try to adapt them. The regulation of packaging waste controlling is aimed to constitute the technical and administrative standards (Ministry of Trade, 2021).

The third-largest industry has specific regulations in Turkey. One of the regulations is related to a “packaging information system” that has been established by the Ministry of Environment and Urbanization (2021) within the scope of “control of packaging wastes regulation”. The users who can enter information into this system are the ministry, provincial directorates of environment and urban planning, packaging manufacturers, suppliers, businesses that put the product on the market as packaged, packaging waste collection, sorting and recycling facilities, authorized organizations, and municipalities. The information system gives results of the amount of the packaging put on the market and recycling rates based on packaging production, intended use. In 2019, the results of packaging types put on the market information are given as below:

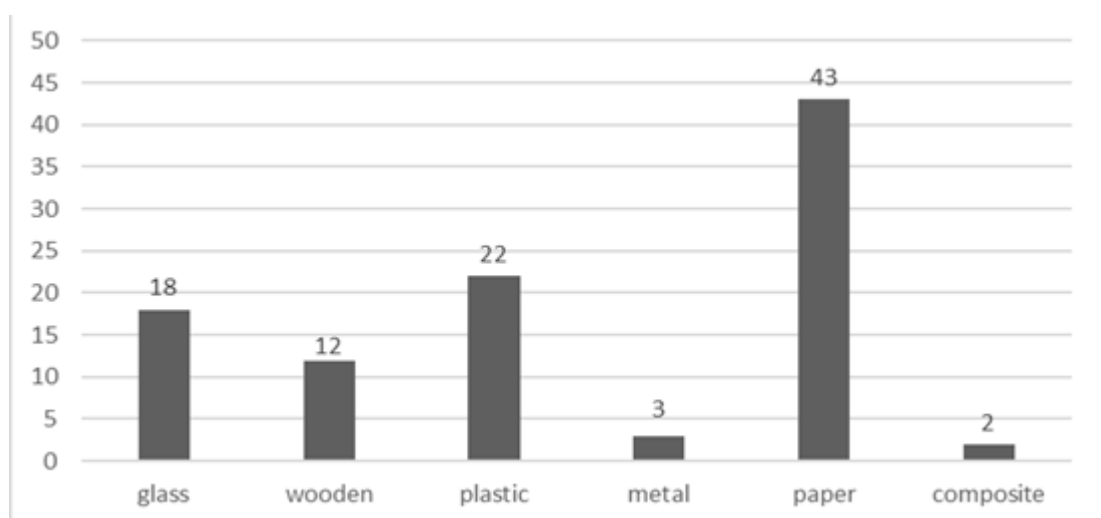


Figure 1: Packaging types (Source: The Ministry of Environment and Urbanization 2021)

Turkey has a significant export and import rate for the packaging industry. In 2019, the packaging export rate became 4,7 billion dollars and the export rate increased one billion dollars in the last five years. The plastic packaging export rate comprises 60,6% shares, the paper-cardboard export rate involves 24,4% shares, the metal packaging export rate 8,6% shares, and the other packaging export rates contain 6,4% shares. In addition, Turkey exports to the UK, Germany, Iraq, Israel, Italy, USA, France, Iran, and Netherlands are the main countries (Ministry of Trade, 2021)

The packaging import rate is another statistics to understand the Turkish position in the World's packaging import operations. There are two main types of packaging which are plastics and paper cardboard. The plastic packaging import share is 53,6% and the paper-cardboard packaging share is 37,3%. The main importing countries are Germany, China, Italy, USA, France, Poland, South Korea, Spain, Finland, UK and Sweden (Ministry of Trade, 2021).

Table 2. ITC- International Trade Center - Trademap: The Turkish Packaging Industry with import and export rates

Type of Packaging	2019 Export Rate (Billion USA \$)	2019 Import Rate (Billion USA \$)
Plastics	2.860	1.555
Paper-Cardboard	29	8
Metal	1.152	1.081
Glass	142	61
Wooden	404	194
<b>TOTAL</b>	<b>4.717</b>	<b>2.901</b>

### 3.3 Green Packaging

The global green packaging market is affected by the environmental awareness of the consumers directly. In addition, governmental regulations for environmentally friendly packaging issues affect the market size and consumer behavior (Zion Market Research, 2021). According to the development of the green packaging industry, the market size for global sustainable packaging was USD 258.35 billion in 2020. (Fortune

Business Insight, 2021). The global green packaging market size is anticipated to attain USD 270.543 million by 2022 from USD 132.556 million in 2015 (Allied Market Research, 2021).

The green packaging market is emergent and divided by geography, packaging type, and application. The geography refers to North America, Europe, Asia-Pacific, and LAMEA. The packaging type includes recycled, reusable and degradable packaging. The application refers to personal care, health care, food and beverage, and other packaging (Allied Market Research, 2021).

Sustainable packaging or eco-friendly packaging is known as green packaging, that appeals to designs of packaging that have the minimizing environmental impact. Green packaging aims to limit the packaging waste created, increase the number of sustainable materials and use of renewable energy during production (Noissue, 2021).

The green packaging is produced with environmentally friendly materials such as organic fabrics, biomaterials, refurbished products, recyclable plastics and papers and bioplastics. There are some given examples for sustainable packaging in green packaging solutions. Sustainable packaging takes collaboration to constitute both compostable packaging and recycle. In addition, renewable resources and additives can be solutions in green packaging. In addition, the bio-based materials can be an appealing alternative and primarily biodegradable, oxo-degradable and photodegradable materials decrease the accrument of waste of packaging (Bulk Bag Reclamation, 2021).

The benefits of green packaging are related to minimizing the environmental impact. Sustainable packaging can decrease the rate of carbon emissions, to use of fossil fuels and environmental pollution.

Green packaging provides advantages and competition in world trade. The type of packaging should be compostable, recyclable and biodegradable. Eco-friendly packaging reduces the consumption of resources and accordingly reduces the carbon

footprint. Therefore, green packaging should be versatile and flexible to reuse and re-purpose in the industry that contains packaging (Green Business Bureau, 2021).

The advantages of green packaging provide the competition to create a customer portfolio. Green packaging becomes attractive for expanding the customer base because it creates a great impression and increases the companies' responsibilities so the brand image progresses (Green Business Bureau, 2021). The green packaging market comes up against placement from the traditional packaging industry when it is more affordable than sustainable packaging. Price and quality of product is the main competition status. In addition, low switching cost enhances the competition between opponents. However, brand loyalty is not a main competition aspect for the customers in the sustainable packaging market (Allied Market Research, 2021).

In most countries, green packaging is a responsibility of governments. Most governments implement the regulations for minimizing the environmental waste and improving the waste management system. These regulations provide various methods to minimize and to manage the packaging waste. Australia focuses on increasing recycling and recovering packaging or China has limited imports on packaging waste in 2017 and they are given as instances for governmental regulations (McKinsey and Company, 2021)

Turkey is a developing country and green packaging is not a prevalent issue. Therefore, incentive politics is very important. The waste management policies can improve in Turkey. Thus, Turkey can decrease the rate of import of raw materials, increase economic power and reduce the deficit of foreign trade. On the other hand, waste management is very significant for protecting the natural environment and sustainable economy (Istanbul Chamber of Commerce, 2021)



Table 3. Rate of Recycling Operation in the World

Country	Number of Recycling Operation	Country	Number of Recycling Operation
Austria	63%	Iceland	23%
Germany	62%	Hungary	21%
Belgium	58%	Poland	21%
Switzerland	51%	Estonia	20%
Netherland	51%	Southern Cyprus G.R.	20%
Sweden	49%	Portugal	19%
Luxembourg	47%	Greece	18%
Denmark	42%	Czech Republic	16%
Norway	42%	Malta	13%
England	38%	Latvia	9%
Ireland	36%	Slovakia	9%
Italy	36%	Lithuania	5%
France	35%	Croatia	4%
Spain	33%	Romania	1%
Finland	33%	Turkey	1%
Slovenia	31%		

## **CHAPTER 4: METHODOLOGY**

In this study, we analyze the green practices and strategies in the packaging industry. The thesis is based on qualitative research, which helps to analyze the main subject in a deeper manner. Therefore, the methodology followed in this thesis is mainly semi-structured interviews. The methods used during data collection and classification are mentioned in detail below, and the data analysis is also discussed in this chapter.

### ***4.1 Semi-structured Interview Method***

In qualitative research, a semi-structured interview approach is widely used and semi-structured interviews are a typical information assortment strategy in subjective exploration, and the nature of the meeting guide on a very basic level impacts the consequences of the investigation (Kallio et al., 2016). In qualitative research, real life experiences can easily be discussed with semi-structured interviews (Horton et al., 2004).

The semi-structured interviews were chosen as the means of information assortment because of two primary reasons. First, they are well suited for the reconnaissance of the notices and opinions of defenses assuming complicated and sometimes delicate subjects. Second, with interviews, we may access more data with further unstructured questions generated from the participants' given answers. It also leaves a space through which you might explore with participants the contextual influences evident in the narratives but not always narrated so much (Galletta, 2013).

The process began with a tender examination of whether the aim of the study and the research questions can be explored and answered with the semi-structured interview method. If the basics of using the technique were to succeed, the researcher progressed to the second rank, using the previous information as a foundation for formulating the anterior interview lead. The literature review presents a vital foundation for planning previous information. It is noteworthy, however, that a diversely consistent, extensive semi-structured interview directory often needed

complementing abstract frames with experimental information using the knowledge of specialists in the issue and other researchers (Kallio et al., 2016).

The methodology we utilize in the data collection is expert interviews. We conducted semi-structured interviews to identify green supply chain management practices in the packaging industry.

#### ***4.2 Sample***

Considering the exploratory nature of the study, the objective is not to quantify the data but to provide insights on the underlying motives and emerging practices related to change in green supply chain practices in the packaging industry.

Eleven semi-structured interviews were carried out to gain a deeper understanding of how differences in companies' supply chain decisions affect their green practices and emerging green patterns. The interviews lasted from 30 to 45 minutes. They were digitally recorded and then transcribed for analysis. Participants were asked about their environmental awareness, green practices they are involved in, the problems they experience in environmental practices, innovations, waste management, purchasing decisions, legal issues, and certificates they hold.

In order to examine the green supply chain practices in the packaging industry with more detail, five packaging manufacturers, two business customers packaging consumers, two raw packaging material suppliers in packaging, one company that both demands and supplies packaging, and a recycling company were selected as participants. Participants were selected from leading companies in the sector. In this way, the application differences in practice, the problems experienced, and the approach to environmental applications during data analysis were revealed more clearly.

Information assortment measures proceeded till there were comparative reactions and remarks and significant examinations between people could be performed (Glaser and Strauss, 1968; Mariampolski, 2001). Repetition in the

information implied that adequate information was accumulated. The details of the interviews are given in the sample table below (Table 4).



Table 4. Sample Table of Interviews

Participants	Departments	Positions	Experience Years	Company Info	Scope of Company	Duration of the Interview
P1	Research and Development	Chief	25	Packaging Producer	Number of factories around the world: 4 Number of employees : 770	42
P2	Product Development	Product Developer	2	Customer	Number of factories around the world: 230 Revenue: US 7.7 billion Number of employees : 47.000 +	38
P3	Production	Production Engineer	2	Packaging Producer	Number of factories around the world: 11 Revenue: EUR 303 million Number of employees : 2.000 +	44
P4	Purchasing	Raw Material Supply Associate	4	Customer	Number of factories around the world: 110 Revenue: JPY 2.175 billion sales Number of employees : 40.000 +	36
P5	Research and Development	Team Leader	5	Supplier and Customer	Number of factories around the world: 24 Revenue: JPY 257 billion sales Number of employees : 8.000 +	37

Table 4. Continued

P6	Purchasing	Purchasing Responsible	3	Packaging Producer	Number of factories around the world: 109 Revenue: US 6.2 billion sales Number of employees : 12.000 +	39
P7	Sales	Business Development and Sales Manager	11	Recycling Service Supplier	Number of factories around the world: 800 Revenue: EUR 6.4 billion Number of employees : 30.000 +	29
P8	Safe, Health and Environment	Manager of SHE	9	Packaging Producer	Number of factories around the world: 100 Revenue: EUR 6.6 million Number of employees : 26.000 +	38
P9	Sales	Senior Sales Manager	36	Supplier	Number of factories around the world: 94 Revenue: US 27.75 billion Number of employees : 19.000 +	36
P10	Research and Development	Manager	35	Supplier - Trader	5 exclusive representative companies 10 non-exclusive representative companies 75% of plastic manufacturers are provided with raw materials	37
P11	Sustainability Directorate	Environmental Management Manager	14	Packaging Producer	Number of factories around the world: 43 Revenue: US 3.2 billion Number of employees : 22.000 +	44

### ***4.3 Grounded Theory and Data Analysis***

The data analysis was based on a grounded theory approach. We followed the stages of open, axial, and selective coding processes. Grounded theory was chosen for use in data analysis because it is a notable procedure utilized in many examinations.

In this thesis, we center around a key methodology utilized in the scope of subjective fields. In particular, we center on iterative-inductive topical examination from the beginning to the end of the interviews, the entire conversation is coded line by line because achieving consensus among multiple coders poses problems as coders may describe the same text with different words and themes differently (Armstrong and Shimizu, 2007).

Open coding is a great source of explanation that needs to be managed and controlled when performing grounded theory (GT). The purpose of creating a GT is to generate a new set of concepts and properties that theoretically integrate and work with relevance. The outcome of this open coding is an abundance of explanations of possible concepts that do not fit the theory that comes to mind (Glaser, 2016).

Grounded theory has three phases: open coding, axial coding, and selective coding. In open coding, the data is described as line-by-line. Focusing on the smallest unit of data and its interpretation, this strategy helps to develop the theoretical sensitivity of new ideas related to data and prevent forcing data into existing categories. Once a complete set of categories is defined, with axial coding it is possible to connect the data in new ways by making connections between numerous categories (Strauss, 1987). This process helps to establish a selective coding step in which it tries to systematically identify categories that are closely related to the core categories (Haid et al., 2010).

During the analysis of the data, we explicitly coded the interviews using grounded theory and tabulated the summary of the coding phase below (Table 5).

Table 5. Categories and Pioneering Quotes of the Interviews

Main Categories	Sub Categories	Pioneering Quotes
Environmental Awareness	Market Awareness	<i>“As consumers prefer environmentally friendly products with higher costs, the market will grow and perhaps product costs will decrease with the proliferation of alternatives” (P10)</i>
	Company Awareness	<i>“On such days, we form groups of three or four people and collect the garbage. Then we report the collected garbage and deliver it to the municipalities. It is a different practice for companies to donate to the theme foundation in this area. We try to contribute to environmental greening on our behalf by donating with foundations” (P2).</i>
	Self-consciousness	<i>“Not everyone in Turkey is very knowledgeable about sorting or throwing away. Even when you go to a beach or forest, you see a lot of garbage on the side or, as the simplest example; you see that household waste is not separated” (P3).</i>
Global Differences in Sustainable Packaging	Developed Countries	<i>“All of our suppliers in Europe have a subsidiary because recycling is a significant issue. For this reason, companies invest in the establishment of their recycling facilities and try to produce recycled products that they can use” (P1).</i>
	Underdeveloped Countries	<i>“But environmental issues, especially in countries like Saudi Arabia, India, and South Korea, where we buy the raw materials cheaper, are not at a stage yet” (P1).</i>
	Cultural Differences	<i>“I think the most important benefit is culture. Although we all live in the same country, we are people who grew up in different families and environments. As a result, environmental sensitivities may differ” (P8).</i>
	Location Related	<i>“A considerable amount of our facilities are in the Middle East region, Saudi Arabia. That's why we have to be very careful about water” (P9).</i>
Problems in Sustainable Packaging	Materials Related	<i>“Environmental friendly materials are incredibly expensive. In other words, it can be as expensive as %300-400-500 of the normal raw material, maybe even more” (P1).</i>
	Production Related	<i>“Machines are not suitable for the use of recycled products, which also reduces productivity” (P1).</i>



Table 5. Continued

Innovations in Sustainable Packaging	Green Projects	<i>“We also recall plastic parts. We usually do these after-cost studies. According to the results of the study, we provide the return of the products if they will provide benefit. At the same time, our environmental damage is reduced by using the relevant product less” (P3).</i>
	Research and Development Projects	<i>“Especially in a film manufacturer, they have environmentally friendly packaging. They get an opp-style film using 70 percent natural plants. In particular, they obtain polyethylene or polypropylene-style materials by using vegetable-based fibers and use them in their production” (P2).</i>
Waste Management	Waste Sorting	<i>“If the problems of waste sorting can be solved correctly and the waste sorting operation can be managed well, waste sorting provides the benefits for the companies” (P7).</i>
	Decomposition at Source	<i>“If we can't separate it at the source, there are many issues such as contamination, mixing of polymers, mixing of paper with polymer in the separations we make later” (P10).</i>
	Reusing	<i>“Think about it, you are reusing something instead of purchasing it when you need it. Thus, the products are not thrown into the environment as waste and consumed in production. Therefore, provide advantages in every environmental and financial respect” (P1).</i>
	Recycling	<i>“Since we have adopted the concepts of zero waste management system and waste minimization in packaging and packaging, recyclable materials are used” (P6).</i>
	Scraping	<i>“Criteria such as expiration date, suitability of product structure, and reparability are examined while making the scrapping decision” (P7).</i>
	Zero Waste	<i>“Companies are willing to have a zero-waste certificate in order to increase their prestige and invest in the future situation, and in this process, they provide zero waste requirements” (P11).</i>
	Water Purification	<i>“Water is an important factor both in terms of cost and accessibility, so our company management pays particular attention to water management” (P9).</i>

Table 5. Continued

Co-creation	Supplier Selection	<i>“We cannot choose our supplier; we have such a problem. Our customer tells us who we will work with” (P2).</i>
	Supplier Development	<i>“There are areas they know, there are areas we know. Let me tell you what we did last. We organized training with our cylinder supplier. They told us the intricacies of using photoshop or auto pro at work. We told them about the sides that we encountered in the cylinder on the printing side or that we thought would be a solution. Of course, they are much more skilled at making cylinders than we are, but there are points that they cannot see in practice. We share them with them” (P2).</i>
	Supplier Involvement	<i>“One of our customers requested that the level of ink used for paper and cardboard packaging should have a low carbon footprint. At this stage, we worked with the university experts on the methods of calculating the damage of these volatile organic compounds to the ozone layer” (P5).</i>
Environmental Certifications	ISO 14001	<i>“We have an ISO 14001 certificate on environmental dimensions. Almost all of our factories have 14001 certificates of our production facilities” (P11).</i>
	International Sustainability and Carbon Certification (ISCC)	<i>“ISCC is a certification process for recyclable products. Required to use recycled material in production and to declare it in use” (P1).</i>
	Zero Waste Certification	<i>“Companies are willing to have a zero-waste certificate in order to increase their prestige and invest in the future situation, and in this process, they provide zero waste requirements” (P11).</i>

Table 5. Continued

Legal Issues	Legal Gaps	<i>“Legal requirements are fulfilled by creating processes, procedures, instructions, and related documents for the implementation of the legislation. Wastes are separated at the source, and disposal of hazardous wastes is done through licensed companies. OHS and environmental measurements (noise, vibration, emission, chemical, dust, and water analysis) are made through accredited institutions” (P6).</i>
	Regulations	<i>“The deposit system will be available. A deposit will apply to beverage packaging. Customers will give and receive special additional money to them. When they take their empty packaging, they will get their money back” (P11).</i>
	Taxes	<i>“We are subject to the GEKAP regulation. We make our statements periodically. We are taxed for packaging waste released to the market within the framework of GEKAP regulation” (P8).</i>

#### 4.4 Validity and Reliability of the Study

As to legitimacy, various concerns were thought about in the planning cycle of this examination. To build legitimacy, test choice was finished in regards to the capacity for catching the developments.

Validity is a fundamental issue in obtaining causal relationships in a research design. Participants were classified as packaging manufacturers, suppliers, consumers, and service providers. In addition, using the same questions to the participants prevented the problems that may be experienced during information collection.

A structure was established to provide multi-level perspectives, to detail the data, and to confirm its accuracy, and expert interviews were conducted to ensure structure validity. The interview guideline was revised based on the initial interview. Thus, questions that disrupt the flow, questions that were not clearly understood were determined and removed from the interview guideline.

## **CHAPTER 5: FINDINGS**

According to the findings eight categories have emerged; co-creation, global differences in sustainable packaging, problems in sustainable packaging, innovations in sustainable packaging, waste management, environmental certifications and legal issues. In addition, there are sub categories for each main category that are given below in Figure 2. Besides, each subject is explained in this chapter.



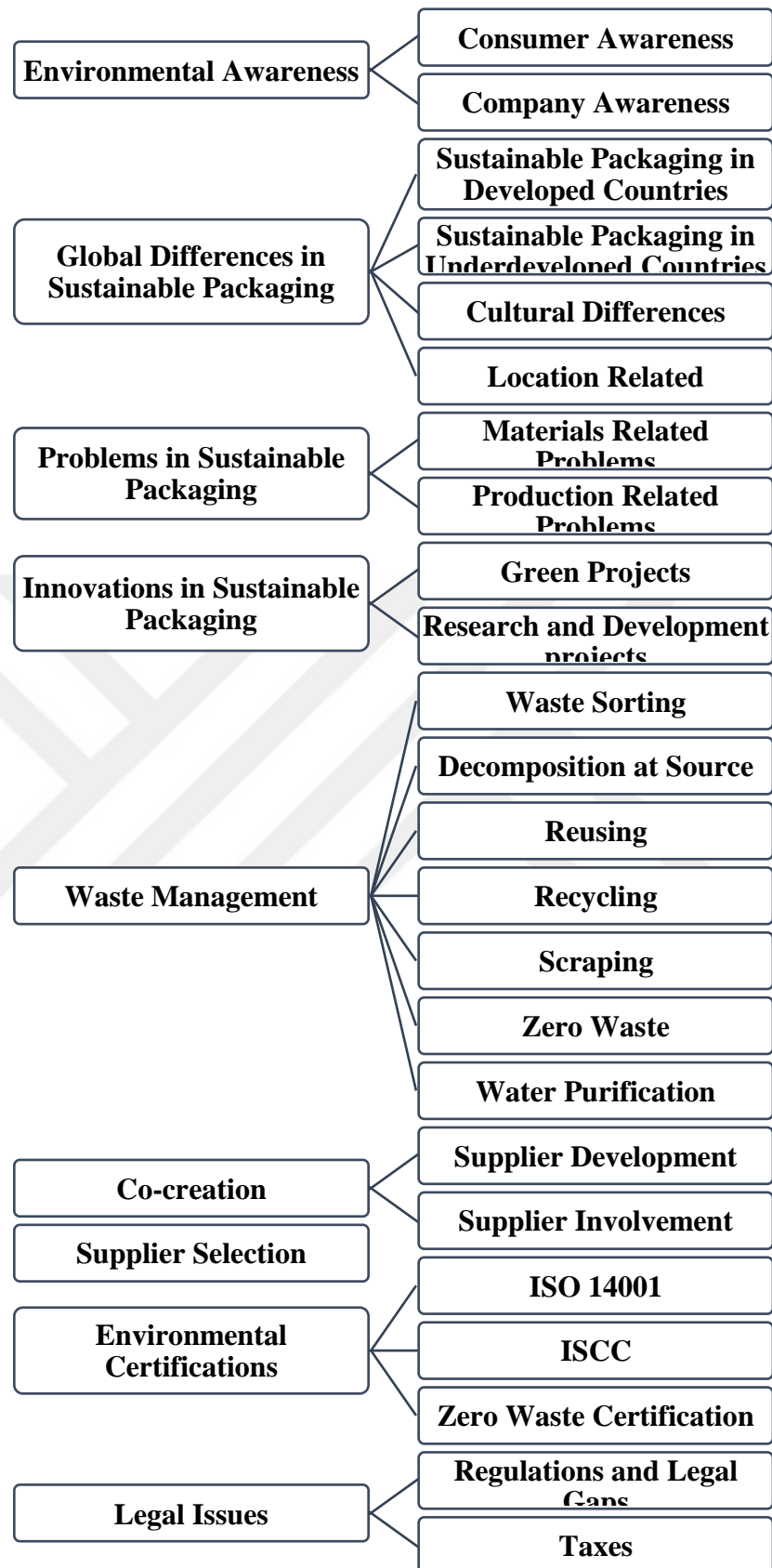


Figure 2. Detailed Codes of the Interviews

## 5.1 Environmental Awareness

Based on the information given by the participants, the environmental perception was discussed under three main headings. The awareness of individuals, environmental awareness of companies, and awareness of the market on environmental issues were discussed in detail by the participants. The effects of the changing and developing world, which cause an increase in environmental awareness, have been observed.

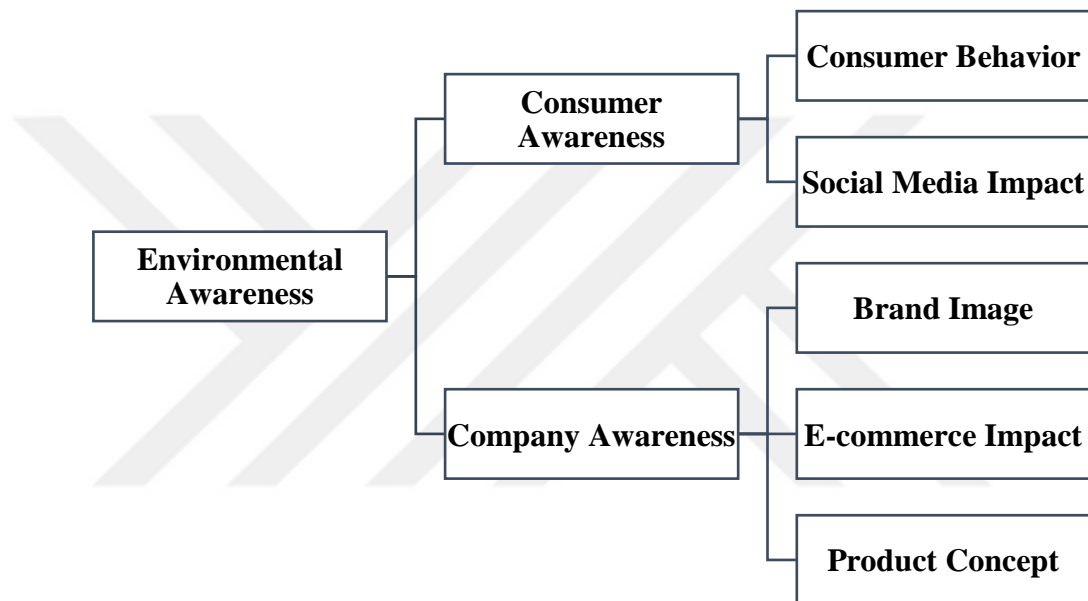


Figure 3. Codes of Environmental Awareness

### 5.1.1 Consumer Awareness

We define market awareness as the level of environmental impacts of sustainable packaging on the consumer side.

When you look at the production sector, everything is shaped by consumer demand. As P8 stated, if end users' demand for environmentally friendly products increases together with the increasing perception of green, all raw material and intermediate product manufacturers indirectly are forced to take a position and develop their processes accordingly (P8).

Another participant points out another aspect in demand and cost relation:

*“As consumers prefer environmentally friendly products with higher costs, the market will grow and perhaps product costs will decrease with the proliferation of alternatives” (P10).*

Developing this knowledge and awareness on the customer side significantly changes user preferences. In addition, the actual consumers, who are the end-users, are now more sensitive about the environmental compatibility of the packaging covering the product they buy (P6). Therefore, the market is shaped by the demands of the consumer (P4).

Environmental awareness starts with individuals first. Although most participants support environmental issues, they mostly fail to apply those environmental practices in their daily lives.

*“Not everyone in Turkey is very knowledgeable about sorting or throwing away. Even when you go to a beach or forest, you see a lot of garbage on the side or, as the simplest example; you see that household waste is not being separated.” (P3)*

As the findings reveal, social media has a huge impact on environmental awareness. Environmental awareness in most of the participants develops with social media, news, and advertisements.

*“In today's world, where the impact of social media and access to information is rapidly increasing, the negative impact of human consumption habits on the environment can be seen more.” (P8)*

On the other hand, awareness-raising activities carried out both through social media and official channels to be more sensitive (P6). Thus, the sustainable approach in society and the interest in environmental products increase as affirmed by one of our participants (P8).

When we ask for their individual sustainable packaging practices, we found that some of the participants separate their waste personally, some use glass bottles instead of plastic bottles, or their own coffee mugs or bags to consume less packaging in their daily lives (P2, P3, P4, P5, P6, P8, P9). They all think that the use of recyclable packaging or recyclable products should be expanded.

### ***5.1.2 Company Awareness***

Company awareness determines the method and the responsibilities in sustainable packaging to ensure that the necessary actions for the protection of the environment are carried out systematically by reducing the consumption of natural resources and waste as stated by participant 6. The participants of the companies with high environmental perceptions stated that various projects and practices were carried out within the companies. Some of the projects and applications are related to developing new products, while some are executed to increase sensitivity and create prestige.

There is a sustainability trend in some packaging companies (P4, P5, P11). For example, a company has discussed sustainability under three main headings: *Protect*, *strengthen* and *develop*. In their sustainability philosophy, protect means protecting natural resources, strengthening means taking actions and developing means creating products to improve the weak points affecting climate change and to increase energy efficiency (P11).

The studies of companies with high environmental awareness can be exemplified as follows. There are projects carried out to increase recycling areas and to determine the sustainability of the products they use and to find out more sustainable raw materials (P7). In one participant company, they produce and promote



biodegradable films in a project (P1). As some participants stated, there is a rising trend to consider environmental aspects at the product concept stage (P2, P5).

Different from product concepts and recycling operations, companies make operational improvements. Although such projects are generally cost-reducing studies, they reduce the negative environmental impact. For example, while reducing excess packaging shipments is a cost-effective effort, reducing the packaging material used is an environmentally positive action (P5). In some companies, there are some basic actions such as reducing the use of plastic bottles by distributing glass bottles to company employees (P4).

Various projects carried out by the companies with their employees or some foundations (P2, P9). Some companies have special dedicated days such as environmental cleaning days, coastal cleaning days, and garbage collection days.

*“On such days, we form groups of three or four people and collect the garbage. Then we report the collected garbage and deliver it to the municipalities. It is a different practice for companies to donate to the theme foundation in this area. We try to contribute to environmental greening on our behalf by donating with foundations” (P2).*

Most of the companies in the sector provide an increase in environmental perception with small or large applications. As stated by some of our participants (P2 and P4), if small companies are excluded, large companies must have a role in the environment as they have to remove most of the waste .

In some cases, company awareness is being shaped even faster with digitalization. With the development of e-commerce, there has been a significant increase in the need for packaging. In line with this rise, e-commerce companies are doing different works to be a more prestigious brand and to catch the environmental consumers (P8, P10).

## ***5.2 Global Differences in Sustainable Packaging***

In the coding made according to the information given by the participants, four sub categories are formed under the global differences in sustainable packaging. Generally, sustainable packaging is discussed with the differences existing in developed and developing countries. Besides, the cultural differences of companies and consumers are found to be important in sustainable packaging. As another point, the participants mentioned the importance of location in sustainable packaging.

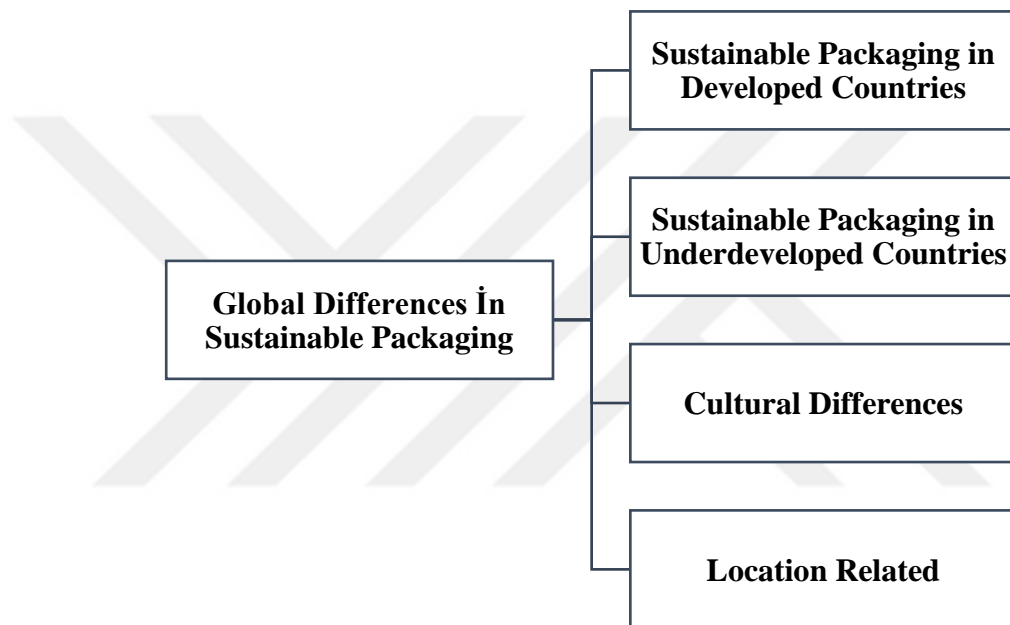


Figure 4. Codes of Global Differences in Sustainable Packaging

### ***5.2.1 Sustainable Packaging in Developed Countries***

Participants briefly talked about the recycling operations in developed countries. As stated, there are major differences in environmental practices, packaging materials used and the perception of sustainability when compared with Turkey. In addition, examples were given from the different practices of developed countries in environmental issues.

The high environmental perception of European individuals and companies ensures that environmental practices are carried out more intensively and are of greater

importance. Therefore, companies attach more importance to waste management, recycling operations and the use of recycled products (P7).

*“Waste collection in Europe is quite easy because the rules in Europe are stricter, and people are more responsible” (P10).*

When the practices of European companies are examined, each company has established its recycling facilities or works with recycling companies (P1, P7). This is clearly declared by P1 in the following quote.

*“All of our suppliers in Europe have a subsidiary because recycling is a significant issue. For this reason, companies invest in the establishment of their recycling facilities and try to produce recycled products that they can use” (P1).*

### **5.2.2 Sustainable Packaging in Underdeveloped Countries**

The participants also discussed the sustainable packaging issues in developing and underdeveloped countries. Based on the participants, we can conclude that Turkey is being considered as a developing country with an environmentalist approach. Green practices are becoming more common in the packaging industry and there is a favorable attitude for the green innovation in packaging related companies in Turkey.

Although there are positive aspects, there are some concerns and problems. At the root of the problems experienced in environmentalist approaches in Turkey are the disruptions in recycling operations (P1, P9, P10). The recycling is not widespread in Turkey.

*“In our country, even a collective collection process cannot be performed during this recycling phase” (P1).*

*“Thanks to the garbage collectors, we try not to collect the garbage for recycling, but to use it in a recyclable way, but of course, this is not the right thing” (P1).*

Furthermore, as stated by P6 and P7, recycling operations are not being monitored closely by the state and so penalties are not being applied that much.

The environmental orientation in company culture in Turkey is another factor affecting nature. The participants think that the environmental cultures of the companies are not formed yet and that affects company operations negatively (P1, P5, P6, P7, P9, P10). For example, any company in Turkey does not request environmental certification from its domestic supplier or from its Asian supplier, while European companies pay attention to such certifications when choosing their suppliers (P1, P9).

*“There are some problems specific to Turkey. I think it is probably because the environmental culture of companies in Turkey is not settled yet” (P9).*

The rare usage of environmentally friendly materials is a common issue in Turkey. For example, the low demand for compostable and biodegradable inks in Turkey reveals the environmental culture of the companies (P5, P10).

*“There is no such perception in Turkey. Especially not for sustainable ink. There are quite a few companies demanding it as a material.” (P5).*

As for the underdeveloped country practices, the findings revealed that most manufacturers do not have environmental certifications or do not seek environmental certifications from their partners (P1,P6,P9).

*“In environmental issues, especially in countries like Saudi Arabia, India, and South Korea, where we buy the raw materials cheaper, are not at a stage yet” (P1).*

### **5.2.3 Cultural Differences**

Participant experiences reveal that cultural differences are also important. Culture shapes the behaviors of the customer and behaviors affect the market (P2,P8).

*“I think the most important thing is culture. Although we all live in the same country, we are people who grew up in different families and environments. As a result, environmental sensitivities may differ” (P8).*

Customer groups are among the factors that affect the decisions and environmental perspectives of the manufacturers. Customer behavior and the perception of the market cause the environmental culture of the producers to not develop. The perception of the customer is also shaped depending on the geography (P4, P5).

*“Our customer group in Turkey is not very interested. Especially in the domestic market, there is no interest in environmental issues” (P5).*

### **5.2.4 Location Related**

The strategic location of the factories is another factor that affects the environmental work of the companies. According to the location of the factories, the type of environmental projects varies. In some areas water consumption and energy consumption related projects are more common (P9,P11). In particular, the importance of water increases in some regions due to scarcity. Therefore, the concerns are directly related to the geographical location of the factory (P9).

*“A considerable amount of our facilities are in the Middle East region, Saudi Arabia. That's why we have to be very careful about water” (P9).*

Companies with high water consumption due to their geographical location are developing various projects on water use. Depending on the geographical location, projects to obtain water from the sea are carried out in companies with high water consumption.

### **5.3 Problems in Sustainable Packaging**

In the changing world, sustainable packaging is almost a new topic. Therefore, companies experience different problems during production, use, recycling and acceptance of sustainable packaging by different customer segments. We revealed that there are two main categories: materials related and production related problems. Related to materials related problems, we further categorize quality problems and cost issues.

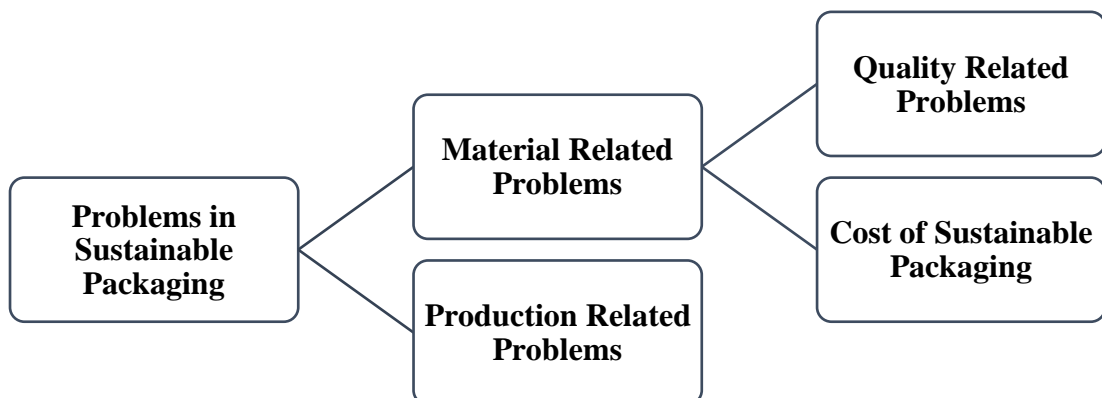


Figure 5. Codes of Problems in Sustainable Packaging

### ***5.3.1 Material Related Problems***

The findings reveal that the main and auxiliary materials used in packaging production directly affect sustainable packaging. The most important effects are the availability, accessibility, sufficient resources, sufficient producers, alternatives, and the development of the supply market of those raw materials (P1,P2,P5,P6,P10,P11).

Different packaging companies have various problems regarding sustainable raw materials. Especially plastic and packaging ink producers can be selected for detailed examination and sampling.

Plastic packaging manufacturers conduct research and development studies for the production of recyclable or biodegradable products because fuel-oil and plastic reserves will run out eventually. Therefore, they mentioned that it is difficult to find recycled or pp material made from wood and to find biodegradable or bio compostable materials (P1, P2, P3).

*“We are working on using polymers obtained from a tree, but the resource is very limited and we could not find the raw material” (P1).*

Manufacturers who are suppliers of packaging printing ink mentioned the difficulty of using recyclable materials and the impossibility of rapid transition to these materials (P2, P5).

*“It is not possible to use recyclable packaging, especially in food packaging” (P5).*

The low number of producers producing environmentally friendly raw materials affects the market and creates problems for those who want to reach the product. High costs, insufficient resources, the lack of new generation raw materials, and the inability to create an alternative to existing raw materials are among the main problems (P1, P2, P6, P10).

*“Due to not being produced on a large scale, those raw materials are rare and expensive” (P10).*

*“The number of companies producing polylactic acid is only two in the world as far as I know. The fact that the products are very rare and the companies that produce them are very few, makes the environmental raw materials difficult” (P1).*

### **5.3.1.1 Quality Related Problems**

The quality can be a biggest problem for the companies and it is affected by the usability of recycled, biodegradable, and compostable products, the inconvenience of the production process, and the inability of the machines to produce the required specifications (P1, P3, P8). Since the products included in the production differ, it is also difficult to achieve the standard in production (P3, P11).

Quality problems can be encountered by companies in their sustainable packaging and raw materials projects. As stated by Participant 1 in an example incident, a plastic manufacturer produced corn bags for cinemas with recycled products, but this product had a more metallic sound than others, so it received a customer complaint and its production was stopped. On the other hand, as told by one of our participant companies (P6), health safety issues and compliance to health quality standards is very crucial in packaging.

### **5.3.1.2 Cost of Sustainable Packaging**

The biggest reason why sustainable packaging materials are expensive is the high prices of recycled or natural raw materials used. These materials are limited and difficult to access.



*“Environmental friendly materials are incredibly expensive. In other words, it can be as expensive as %300-400-500 of the normal raw material, maybe even more” (P1).*

Also, the sector of sustainable packaging materials is still developing (P1, P2, P10, P11). For most of our participant companies the raw material market is a niche business.

*“When you make a normal print, you can sell 1000 of them for 4 euros or 5 euros, but when you do such a niche business, it is sensitive to nature or better soluble. When you say things like recycled materials, of course, the price of those packages increases much more” (P4).*

*“Since the inputs of the packages are made of environmentally friendly materials-they are expensive and they cannot be spread enough” (P10).*

The recycling processes of products are one of the most important factors affecting the cost of the recycled product. An example of the recycled product process, we may focus on plastic packaging and recycled bottles as raw material.

*“The bottle is collected. Collecting is a separate process. The bottle will be divided into its monomers, that is, its constituent components. For this, a factory with a heat reactor is needed. Manpower, and land are needed. After the separation, it is necessary to combine them again. The polymer must be made again, which is a separate process” (P1).*

Since the cost is high, the companies are reflecting those costs to their prices. This creates another problem: finding customers. Such environmentally friendly raw materials and packaging materials affect the price of the final product, making them more expensive (P10). For this reason, finding a customer group that will accept the cost increase becomes very critical (P1).

### **5.3.2 Production Related Problems**

The fact that the use of recycled raw materials is a new issue that can create problems for companies. Problems arise since the production machines are not suitable for using such materials and the employees do not know how to process (all participants).

Turkey is lagging behind Europe in terms of using recycled products in the production process. For example, there are polylactic acid and starch-based polyethylene materials in the market, but special machines are needed to use them, but these are not available in Turkey either.

*“Machines are not suitable for the use of recycled products, which also reduces productivity” (P1).*

After the packaging is produced from the recycled product, it becomes difficult to bring this packaging to the consumer because there are printing problems on the packaging. There are problems such as the use of different inks during printing in the design of product images and the inability of these inks to adhere to the product surface. In short, there are printing and lamination problems in sustainable packages produced with recycled raw materials (P2, P3, P5).

### **5.4 Innovations in Sustainable Packaging**

As a result of the interviews with the participants, it was revealed that the companies attach importance to research and development projects and green projects. The participants talked about the projects carried out throughout the company in terms of the environment. The projects made by the companies were generally related to carbon emissions, efficiency, environmentally friendly factory practices, innovative environmental products, production, and product designs.

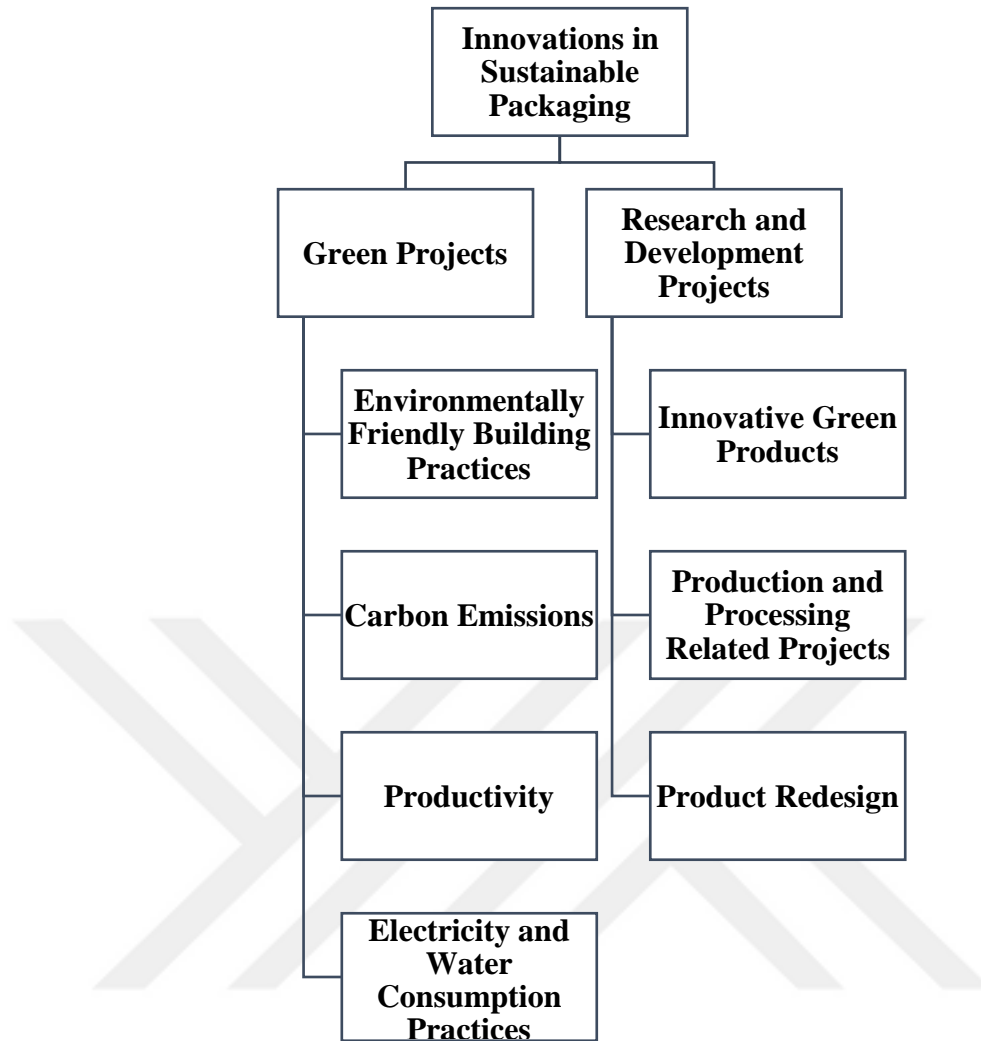


Figure 6. Codes of Innovation in Sustainable Packaging

#### ***5.4.1 Green Projects***

Participants include environmental projects in their in-house KPIs. The most common and well-known environmental issues are carbon emission measurements, energy and water consumption reduction projects, and the establishment of new environmentally-friendly facilities.

The participants talked about the projects carried out in all kinds of environmental fields under this topic. For instance, Participant 4 talked about the project of using special adhesives to reduce the stretch film on the pallets.

*“We glued the boxes to the pallets and to each other with a special adhesive to reduce the use of stretch film on the pallets. We had such work with minimal damage to the packaging. We can create such alternatives” (P4).*

Participants also detailed their projects related to pallets. Projects such as reducing the number of pallets and easing storage by increasing the number of raw materials on the pallet help the companies to, indirectly reduce the waste of pallets, and the harm given to the environment. Additionally, recollecting the used pallets from the customers is also counted as one of the important green projects employed in the participant companies.

*“There was a project that we did to reduce the pallet waste, in which we changed the pallet arrangement, to increase the number of raw materials on the pallet, to make room for storage, and to reduce the number of pallets” (P4).*

In addition to the recollected pallets, other parts are also recollected with reverse logistics operations. By this way, companies achieve lower costs in their operations while reaching their environmental targets. (P9, P10).

*“We also recollect plastic parts. We usually do after-cost studies. According to the results of the study, we provide the return of the products if they provide added value. At the same time, our environmental damage is reduced by using product less” (P3).*

#### **5.4.1.1 Environmentally Friendly Building Practices**

According to the information obtained from our participants working in multinational companies, factories are established in harmony with environmental factors because awareness is high in these companies. Companies mostly make such investments to save energy (P2, P3, P4).

Facilities have been established and investments have been made in companies to use energy correctly and to ensure recycling, both during and after the establishment of the factory. Plant-wide investments were made for the ink treatment plant, solvent recycling plant, and trigen plants. At the same time, investments were made to adjust the heat-humidity balance in some factories and more use of daylight was achieved with glass ceilings. Some companies generate electricity from natural gas, and energy by installing solar panels.

*“Our company has its solvent recycling facility. Here, all the solvents we buy from our facility are recycled and sent back to the field” (P3).*

*“There are investments such as landfill, wastewater facility monitoring, electricity supply from natural gas, electricity generation with solar panels. We produce our energy. We have a big trigen facility and we generate electricity from natural gas. I think a large amount of electricity is being produced” (P4).*

#### **5.4.1.2 Carbon Emissions**

Participants briefly talked about carbon emission measurements and carbon emission reduction projects. According to the findings, companies pay attention to carbon emission measurements in logistics operations.

Participants talked about the subjects such as carbon emission measurements, their monitoring and reporting, carbon footprint reduction projects, and providing the least emission with the least energy consumption (P4, P5, P11).

*“Companies that have started to look at a particular sustainability framework outside the legal dimension and have matured business have their targets. These are product design with minimum energy consumption, minimum emissions, or process designs, equipment design” (P11).*

*“Let me talk about the products that I am responsible for by focusing mostly on plant sources. In these studies, we have products that have reduced this carbon footprint. Here, there is a decrease of 50-60%” (P5).*

#### **5.4.1.3 Productivity**

Participants report that each improvement project carried out provides operational or cost efficiency throughout the factory. In order to increase the efficiency in energy consumption, the participant companies control the resource consumption of the setup values, invest in machines and they try to reduce electricity and water consumption by increasing the efficiency of the machines. Besides, the companies seek environmental efficiency in their logistics operations. In several aspects the companies struggle to increase environmental efficiency such as prolonging the wear time of the product and increasing the quality of the recycled solvent or the compatibility of the materials.

*“In the section of offices and machines, we usually pay attention to extra setups. For example, we do not think of it as just additional resource consumption, but directly as the consumption of the main resource. Too much setup means too much electricity. There are a lot of elements required for the generation of this electricity. At this point, we are talking about what we can do about them” (P2).*

*“We have activities such as reducing the crushing times by improving the crushing performance of the products and saving the energy used in the machine there” (P5).*

*“At the same time, with the machinery investments we make every year, we try to reduce energy consumption by providing equipment with high energy efficiency motors” (P8).*

#### **5.4.1.4 Electricity and Water Consumption Practices**

Participants also touched upon their environmental practices in energy and water consumption. The companies track and report the water and energy consumption levels. Besides, some companies

The participants especially talked about the benefits of producing their electricity (P3, P8, P11).

*“To produce energy correctly and to consume it correctly. In a way, I think this is an environmentalist approach because different studies are being carried out, such as you can save energy when the machine works with 90% capacity, not full capacity, or you can save better energy when the machine does this or that” (P3).*

*“Investments are made to reduce environmental harm. As I said, we use natural gas to produce our energy” (P4).*

*“Our energy and water consumption are monitored online. Energy reports are made annually. In the same way, water is tracked and reported in our environmental performance reports.” (P11).*

#### **5.4.2 Research and Development Projects**

In research and development projects, studies were generally carried out on the product. In these studies, how and where the innovative raw material or product should be used, redesign conditions, innovations in the processing are mentioned. In order to understand each subject in detail, the participants gave examples of their projects and practices.

##### **5.4.2.1 Innovative Green Products**

All kinds of biobased raw materials and products were evaluated under the name of innovative green products. Participants talked about their work and practices and exemplified them. Participants mentioned the production of innovative products

and raw materials such as biodegradable bags, bio-renewable pp, biobased ink, pigment obtained from nature, lacquer that provides a bacterial wall, compostable ink, and biopolymers.

*“Toilet paper is produced from wood, trees are planted, these trees grow very fast, those trees are cut down and new ones are planted. Some resources renew themselves with the wisdom of nature” (P1).*

*“A film manufacturer has environmentally friendly packaging. They get an opp-style film using 70 percent natural plants. In particular, they obtain polyethylene or polypropylene-style materials by using vegetable-based fibers and use them in their production” (P2).*

*“But especially the use of biocompatible or more plant materials is on our agenda and within our strategic goals” (P5).*

*“The projects such as the use of natural materials for semi-synthetic semi-natural purposes... There is the plant battle by COCA-COLA. You can find it on the internet. In-Plant Battle's half of the material is made of bio pet, and the other half is made of normal pet materials. Therefore, 50% of the packaging uses fossil resources and 50% of natural materials” (P10).*

#### **5.4.2.2 Production and Processing Related Projects**

Participants talked about processing innovations and innovative practices in the environmental field. It turned out that the most popular practice in the packaging industry is the down aging production application.

Downaging application causes less product usage in production with double-sided stretching. Thus, cost advantage is provided and it helps to reduce the number of products that may create environmental waste. This production process indirectly affects the carbon footprints of the products (P1, P9).



*“There is a significant trend in terms of reducing costs, these are called down aging practices. But downaging is something that is under development. Therefore, you can pack more units with the same product you put on the market because some products are disposed of by incineration. At that time, your carbon footprint is getting higher.” (P1).*

#### **5.4.2.3 Redesign of Product**

Redesign of the products is another issue discussed by the participants. The participants talked about formulation changes in product design, product re-modification, and herbal film production. Some companies mentioned specific projects such as separating the print on the packaging and reusing the packaging, producing paper from tobacco dust. Reducing packaging weights and reducing packaging thickness are also considered as a redesign of the packaging products (P3, P4, P5, P8).

Changes in the formulation are one of the most commonly preferred practices by companies. One of the purposes of this is to provide a cost advantage for companies and indirectly provide environmental gains.

*“If a product produced with the wrong Pantone code in an ink factory it cannot be used, it can be made available by converting it to the closest color. In this way, we will both provide a cost advantage and reduce the amount of product that will be released into the environment as waste” (P5).*

*“For example, in our latest study, by reducing the film thickness of the stretch material that we wrap the products placed on the pallet, both less packaging consumption in environmental terms and cost reduction were achieved” (P8).*

### **5.5 Waste Management**

The participants gave critical information about the waste management system in their company. Under waste management category, there are eight subcategories

determined according to the interviews: waste sorting, decomposition at source, recycling, reusing, scraping, zero waste, water purification and water consumption.

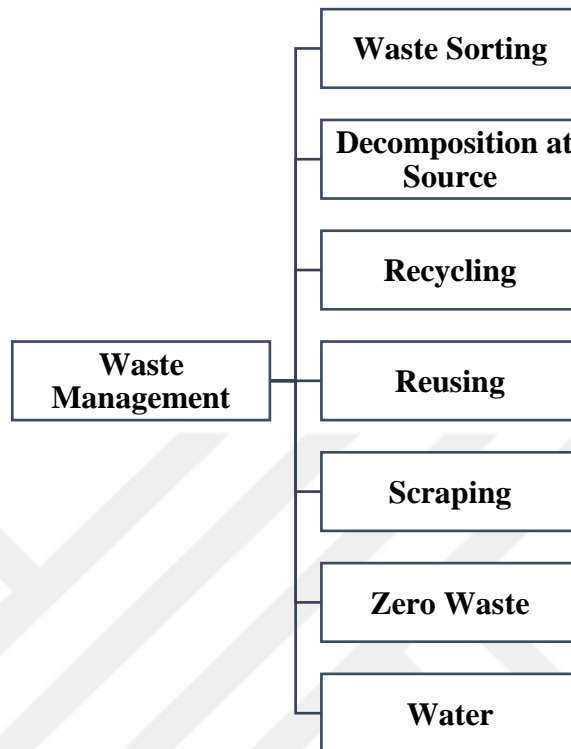


Figure 7. Codes of Waste Management

Waste management system is related to the environment and it helps to increase environmental awareness directly. A participant said that *“In order to ensure sustainability, the waste management system must be planned very well (P1).”*. In addition, it is a compulsory system for creating a competitive advantage because the system provides benefits for the companies. However, there are some problems in waste management.

Participants also reported that waste is a positive input for companies, which they return in cash at the time of sale.

*“The waste management system provides cost savings for the production process because when the waste is separated well, we can reuse the product in the process or when we sell the waste we can earn money from them.” (P3).*

Waste management is a comprehensive subject and participants gave different information for the companies’ perspective and implementations. Therefore, the categories are explained and the topics are detailed in this study.

### ***5.5.1 Waste Sorting***

The participants have handled the waste sorting subjects with implementations of the companies, problems and benefits. Generally, the participants explained the waste sorting operation and practices of their companies. They also focused on the financial aspects of waste sorting and the awareness level of the companies’ and employees.

Waste sorting has a significant role in the waste management system due to being the first step of the waste management system. More importantly, it is a determinant factor whether the company can get any value out of the waste processing or not. This is the fundamental process to eliminate and classify the wastes. Decisions such as recycling, reusing and scraping operations decisions are taken within this process. According to the waste sorting topic.

*“If the problems of waste sorting can be solved correctly and the waste sorting operation can be managed well, waste sorting provides the benefits for the companies” (P7).*

The companies separate waste sorting zones, and try to utilize separated waste dustbins. Moreover, as another trend, companies turn their waste into energy. We also find out that some companies prefer to work with licensed waste sorting facilities and they do engage in waste sales operations. The waste management process is generally

as follows: (1) wastes are collected in waste zones and separated waste dustbins, (2) operational decisions are made for wastes and the wastes are separated for reusing, recycling, turning into energy and scraping, (3) the licensed companies collect the separated wastes (P3, P4, P6, P8, P11). Wastes are sorted by companies' employees and proper equipment (P5) and most of the companies have their own waste sorting management operation (P8).

Waste sorting system provides the benefits for the companies and the benefits are categorized as *environmental, financial and social* (P3). For example, if waste sorting operations can be planned well, carbon emissions and consumption of energy will decrease (P7). In addition, the correctly separated waste is salable, it provides money flow and creates competitiveness (P3, P1).

*“The sorting and the sale of waste financially supports companies” (P7).*

Also, the waste sorting operation increases the companies and employees' awareness (P1, P2, P4, P5).

The correct sorting of waste is the most critical issue within this operation but it can cause problems. The problems arise when the wastes are not kept in the appropriate area or when there is non-compliance with the waste sorting process. In addition, if the waste is not being sorted correctly, licensed waste management companies may increase their service fee due to the increase in the logistics operations costs and the number of employees. Therefore, the costs increase for waste management companies and this is reflected in the producer and consumer companies (P1,P3,P5,P7).

### ***5.5.2 Decomposition at Source***

Decomposition at source is an issue that is tried to be applied in waste management. The participants start to make sure the well-designed plan for the

separation at source. However, Turkey is in a situation that does not have legal regulations on unbundling at its source and has a deficit in this regard (P10).

The issue of segregation at source is quite problematic in Turkey. In many places, household waste, plastics, cans, glass are all thrown together. Unfortunately, we do not have such separation in household waste. In companies we have some progress. (P10, P11).

*“If we can't separate it at the source, there are many issues such as contamination, mixing of polymers, mixing of paper with polymer in the separations we make later” (P10).*

All waste producers need to start waste management at the source because waste management begins with separation at the source (P4, P7).

### **5.5.3 Reusing**

Reusing is a very important parameter within the waste management decision according to the participants.

*“Think about it, you are reusing something instead of purchasing it when you need it. Thus the products are not thrown into the environment as waste and consumed in production. Therefore, provide advantages in every environmental and financial respect” (P1).*

*Reuse option depends on the type of the material. For instance, virgin raw materials which are expensive, need maximum recovery so those materials cannot be easily reused. Therefore, it is tried not to create waste in such materials (P7). In cigarette manufacturers, they aim to minimize the tobacco waste because of the raw material prices. In this regard some of the participant companies stated that they use tobacco dust to produce cigarette paper (P4). Another example can be given from the*

plastics packaging sector. Almost ninety percent of the waste is being reused. (P1, P3).

#### **5.5.4 Recycling**

Companies separate all their wastes and send them to the contracted waste organizations. Thus, they start the operation for recycling and reuse. The first purpose of this operation is to reduce costs, reduce the amount of virgin raw materials used, and provide a competitive advantage. Another aim is to reduce the impact on the environment by considering environmental factors (P1, P2, P3, P4, P7, P9).

Products such as plastic, glass, cardboard, tin, and aluminum are the most suitable products for recycling. There are steps to be taken in the field of recycling in order to protect our environment and the world. Although the importance of individual environmental practices is great, the practices of companies in this area are more effective (P1, P3).

*“Since we have adopted the concepts of zero waste management system and waste minimization in packaging and packaging, recyclable materials are used” (P6).*

The biggest problem in the recycling operation is that most of the time it is not possible to fully recycle the wastes and this problem provides a number of disadvantages (P1, P3). Cardboard is recycled, but not all of its fibers are used. Another example is that plastic waste can also be recycled, but when plastics have a different polymer structure or cannot be separated from the ink, they cannot be recycled and they have to be disposed (P3, P9).

The recycling process and waste separation operations also directly affect licensed waste collectors.

“Receiving high-volume waste, compressing, and separating well, are all factors that determine energy consumption, labor, and all logistics-like costs” (P7).

### **5.5.5 Scraping**

Most of the participants care about the scrapping stage and set up their scrapping department for this job. The teams carry out the operation during the disposal or sale of the products (P1, P3, P4, P5). The decision to scrap depends on whether the product has expired, whether the product is reusable or recyclable (P7, P8, P11).

*“Scraping criteria such as expiration date, suitability of product structure, and repairability are examined while making the scrapping decision” (P7).*

One of the problems we experience in our scrapping department is when we see that some of the raw materials we bring to meet customer demands are useless for us at the end of the trials. In addition, some products may deteriorate over time without being allowed to be used and this increases our waste rate and moves us away from our zero-waste target. (P1, P3, P7).

### **5.5.6 Zero Waste**

Research and development are carried out for the improvement of environmental performance. The primary purpose of the companies in this field is to ensure waste minimization and to establish a zero-waste management system (P5, P6).

The more responsible companies and individuals in the zero waste operation, the faster the zero waste practices in Turkey will progress. As of 2022, all companies have to go through the zero waste management and waste minimization process (P6).

*“Companies are willing to have a zero-waste certificate in order to increase their prestige and invest in the future situation, and in this process, they provide zero waste requirements” (P11).*

### **5.5.7 Water Purification**

Water is classified as direct and indirect input for companies. Water consumption rates create areas where companies can create projects (P4, P11).

*“Water is an important factor both in terms of cost and accessibility, so our company management pays particular attention to water management” (P9).*

Companies have various practices to reduce water consumption, increase efficiency and gain advantages in this field. Water use and polluted water issues have been evaluated, and water and waste-water management systems have been established by companies (P4, P8, P11).

The companies have established water treatment plants. In addition, companies use water in the most efficient way with the projects of recycling water, using recycled water in their processes, prevention of water losses, and groundwater (P3, P4, P11).

### **5.6 Co-creation**

As a result of the interviews, three topics emerged in the area of co-creation: supplier development, and supplier involvement. Three different topics mentioned by the participants were detailed with projects, training, and workshops.



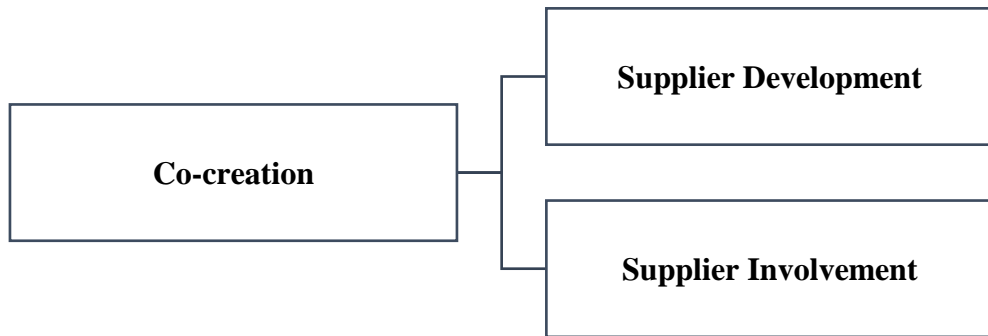


Figure 8. Codes of Co-creation

### ***5.6.1 Supplier Development***

Training suppliers and customers is at the forefront of partner developments. Manufacturers and raw material providers in the packaging industry attach importance to joint development. The business relationships are developed and the aim is being set as to create environmental value together. Participants state that the most significant thing in this developmental stage is the partner relationship (P2, P7).

*“We think of them as business partners rather than suppliers or customers. We are neither their supplier nor they are our supplier. We are on the same wave. That is why we don't have a supplier-customer relationship. We move forward in the style of business partners” (P2).*

Recycling companies are also very active in developing partners. These companies also organize workshops and training to create value with their customers.

*“Each process is different from the other, the formation, separation at source, system, management, and intake of each waste are different. We provide training according to each company's system” (P7).*

### **5.6.2 Supplier Involvement**

Participants talked about the importance of involving partners in the process. In particular, it was stated that productivity increased with the inclusion of manufacturers' suppliers in the production process. The participants stated that some improvements and advantages were achieved by including the suppliers in the process.

Involving suppliers in the process of redesigning products is a viable effort to create value together. Almost all participants work with their suppliers, especially in determining product designs. The participants reported that the partners could not have difficulty in designing the product with environmental dimensions (P2, P3, P9, P10).

*“We gather as three suppliers and one customer. I am giving an example that we will make a product. For example, a new design will come together. We unite as a packaging company, another company as an ink marker, and a seller as a finished product customer. There is a discussion on how we should make this package, how we should design it, can we print it, can they produce their cylinders, can they give their ink, can they have it applied” (P2).*

*“Our supplier had a suggestion that is a process called deinking. By applying lacquer to the film that has been printed with ink, you can purify it from the ink and use it as a film again. Or you can cut it small like a masterbatch and use it in film production” (P3).*

In addition, some manufacturers try to encourage their customers or suppliers to use or prefer environmentally friendly products.

*“We are trying to encourage them to use them like this. We try them first, so our pressure will be good. On top of that, you can gain some added value. Now you can present your advertisement saying that the inks are more suitable for nature and can dissolve in nature and we are trying to encourage them and ensure the compatibility of those inks” (P2).*

Participants also talked about projects with partners and institutions such as universities.

*“We conducted such a study with one of the largest beverage companies in the world. We produced our product on bottle labels. The bottle labels used by one of these beverage companies are polypropylene, but the bottle itself is polyester. They have such a process. In this process, they have to separate the bottle label and the bottle. We wanted to make a polyester label on the polyester bottle without the need to separate it, and we made this label from recycled polyester.” (P1).*

*“One of our customers requested that the level of ink used for paper and cardboard packaging should have a low carbon footprint. At this stage, we worked with the university experts on the methods of calculating the damage of these volatile organic compounds to the ozone layer” (P5).*

The inclusion of partners in the process also increases productivity throughout the company and provides cost advantages. In order to increase the efficiency of production and to use environmentally friendly materials, support is received from customers and suppliers in this regard (P1, P2, P3).

*“My machine can receive 21 packages in the layout section, while the customer's machine is suitable for placing 14 packages. We explain the issue to our customer. We say that the price we give will be high and you will buy fewer packages and you will pay more money. In this way, we are taking steps to bring their investments to a more normal level or to increase their profitability. In this way, we not only save energy on an environmental level but also increase efficiency and make a profit in every sense.” (P2).*

### ***5.7 Supplier Selection***

The participants talked about the importance of environmental aspects in supplier and partner selection. They put emphasis on how significant environmental certificates of partners are. Besides they also mentioned about the environmental terms in the contracts made with partners. The problems experienced during supplier selection.

Furthermore, there can be some business customer interventions in supplier selection to manufacturers. Some companies stated the effects of central purchasing decisions on supply choices (P1, P2, P3, P8, P9).

*“Purchasing decisions are made centrally. We've been working with the same suppliers for too long and are unable to make changes. I don't think the center is concerned with the environmental dimension of the supplier when choosing a supplier” (P4).*

In companies whose purchasing decisions are made by the center, environmental factors are given more importance. Environmental issues were included in the purchasing and sales contracts of these companies (P2, P9). However, in the Turkish companies, environmental terms are mostly neglected in the contracts. Environmental issues cannot be a criterion in supplier selection (P1, P3).

In some cases, suppliers of manufacturers are chosen by their customers. This can cause problems and environmental issues cannot be selected as criteria by the manufacturer.

*“We cannot choose our supplier; we have such a problem. Our customer tells us who we will work with” (P2).*

### 5.8 Environmental Certifications

During the interviews, the participants talked about the certifications they have, the requirements of the relevant certifications, ensuring certification continuity, the audits passed and the positive conditions provided by the certifications. Another issue that was mentioned was the problems experienced during the acquisition of certifications.

In the interviews, it was revealed that the companies have ISO 14001, ISCC, or zero waste certificates. It was informed by the participants that companies that do not have environmental certifications but have high environmental awareness also carry out joint studies with environmental consultancy companies.

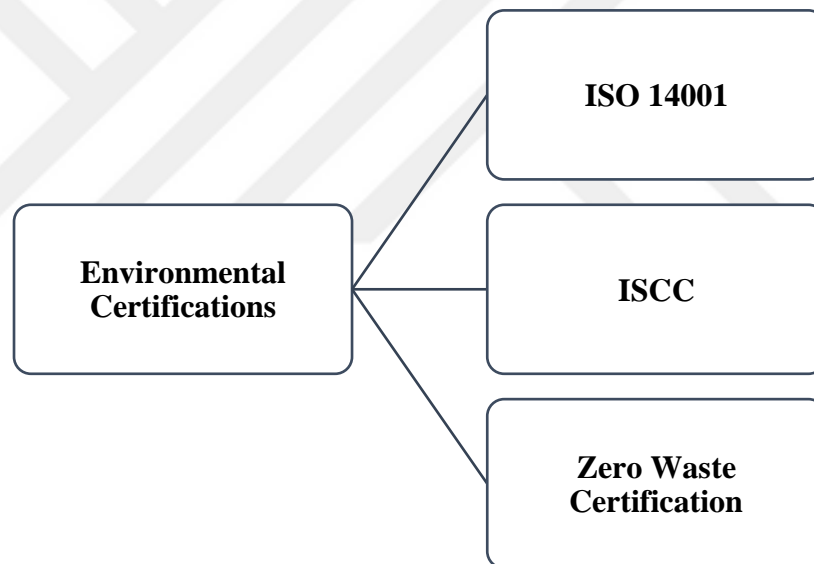


Figure 9. Codes of Environmental Certifications

Experienced and potential problems during the application process and sustainability of comprehensive certifications are also mentioned (P1, P6).

*“ISO 14001 is not related to recycling or reuse. These certificates are mostly related to environmental pollution, but the usage areas of the product may*

*pollute the environment. For example, you produce varnish, but the varnish you produce mixes with the water outside, polluting the water. Our product may cause damage to the environment by its usage area. However, our company is responsible for the environment. It meets the requirements of 14001 on issues such as water use, flue gases, paint spillage, or solid waste separation, but the product you produce may not be like this” (P1).*

*“In the process, products and services may change. There can be changes in the vehicles, machinery, equipment used. The type of energy or the technology may change.” (P6).*

International Sustainability and Carbon Certification (ISCC) is another certification that companies have in the environmental area. Participants talked about what this certificate is, its requirements, control, and declaration (P1, P9, P10).

*“ISCC is a certification process for recyclable products. Required to use recycled material in production and to declare it in use” (P1).*

The company at the time of application of ICSS declares the documents indicating that the materials received have entered the company and the product used in production are essential to prove that it uses recycled raw materials in production. With the ICSS document, information flow is provided about where the products are purchased, under what conditions they are purchased, and what the contents are (P1).

Another document, the zero waste certificate, is a document that almost every company that works on waste separation and projects wants to receive. With the existence of this certificate, the waste separation operation is registered. Companies also document that they provide minimum waste rates (P3, P5).

Companies organize internal audits to solve the problems that arise and to ensure the continuity of the certifications. It is also subject to external audits by the organizations to which the certificates are issued (P2, P5).

*“We are not given such information that a preliminary audit will take place. Control is instantaneous. ISO inspectors come without notice. In addition to all these, we have internal auditors for ISO” (P2).*

The certificates obtained also provide benefits to the companies. The certifications of the company are a factor that increases employee loyalty and awareness. Certificates help to take faster action to the problems and to solve the problem (P1, P6, P8, P11).

*“Since each process has procedures and the job descriptions are determined, problems are resolved faster in the company” (P6).*

*“It is very important that it provides awareness by conveying the system's understanding to people through such standards” (P8).*

### **5.9 Legal Issues**

Participants talked about legal regulations, applicability in existing ones, gaps, future regulations, and taxes on packaging issues. In the ongoing practices of the companies, the deficiencies of the state's sanctions, incentives, or environmental issues are discussed. The legal regulations implemented by the state in this area and the points that are seen by companies in these regulations are exemplified. Companies are based on the necessity of fulfilling the legal regulations. The participants talked about the audits they had with the legal regulations and by whom they were audited.

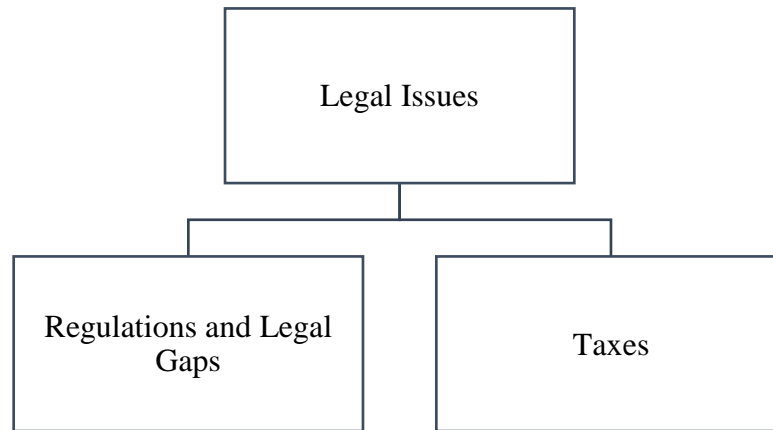


Figure 10. Codes of Legal Issues

### ***5.9.1 Regulations and Legal Gaps***

Participants talked about a few regulations studied and how these regulations relate to environmental factors. A few applications that were implemented in Europe but not in Turkey and the benefits of these applications to the packaging industry were also mentioned (P7, P9, P11). The participants talked about the regulation to be made and how packaging companies will be affected by these regulations. An example is given of how these regulations will be implemented. The implementation of the deposit system was the most obvious example given in this area.

*“The deposit system will be available. A deposit will apply to beverage packaging. Customers will give and receive special additional money to them. When they take their empty packaging, they will get their money back” (P11).*

The legislation and requirements established by the Ministry of Environment and Urbanization are known by the participants and in-house organizations are organized accordingly (P1, P2, P3, P6). In addition, respondents think that laws should force companies more on environmental issues. The increase in legal obligations will ensure the development of environmental cultures of companies and increase the rate of environmental practices (P1, P3).



Participants provide firm-wide practices to meet existing legal requirements and ensure regulatory compliance. In addition, all existing legal regulations are supervised by the Ministry of Environment and Urbanization, and authorized institutions.

*“Legal requirements are fulfilled by creating processes, procedures, instructions, and related documents for the implementation of the legislation. Wastes are separated at the source, and disposal of hazardous wastes is done through licensed companies. OHS and environmental measurements (noise, vibration, emission, chemical, dust, water analysis) are made through accredited institutions” (P6).*

Some participants stated that the state does not have sufficient legal practices on issues such as the spread of separation at the source and the use of recycled raw materials in production (P1, P3).

*“The rate of legal regulations needs to be increased. What is on the agenda is now the issue of the introduction of recycled materials into packaging packages. There is no legislation yet, but these issues should be enacted. Unless it is enacted, it will be difficult for this awareness to be established in Turkey” (P1).*

Recycling companies also stated that they should act in accordance with legal regulations.

*“We have licenses such as packaging waste collection sorting facility license and hazardous waste collection sorting license. Environment and urbanism give us authority in this sense” (P7).*

### 5.9.2 Taxes

The participants talked about the tax application, which is called "recovery participation and share". In addition, the participants used the Turkish abbreviation "GEKAP". This tax application is related to how it is evaluated and how it is declared (P4, P5, P6, P7, P8, P11). While defining the GEKAP application, the participants pointed to the regulation published by.

*"Determination, declaration, collection, and monitoring of the recovery contribution fees to be collected from the sales points for bags from the products included in the Annex-1 list of the Environmental Law, and from the marketers/importers for other products. is the regulation published in the Official Gazette dated 31/12/2019 and numbered 30995 (4th repeated) in which the administrative and technical procedures and principles regarding the provisions to be followed by the marketers/importers for other products are determined" (Ministry of Environment and Urbanization,2021).*

The participants mentioned that all kinds of packaging used are measured and classified, and taxes are paid to the state accordingly.

*"We are subject to the GEKAP regulation. We make our statements periodically. We are taxed for packaging waste released to the market within the framework of GEKAP regulation" (P8).*

### 5.10 The Proposed Conceptual Model

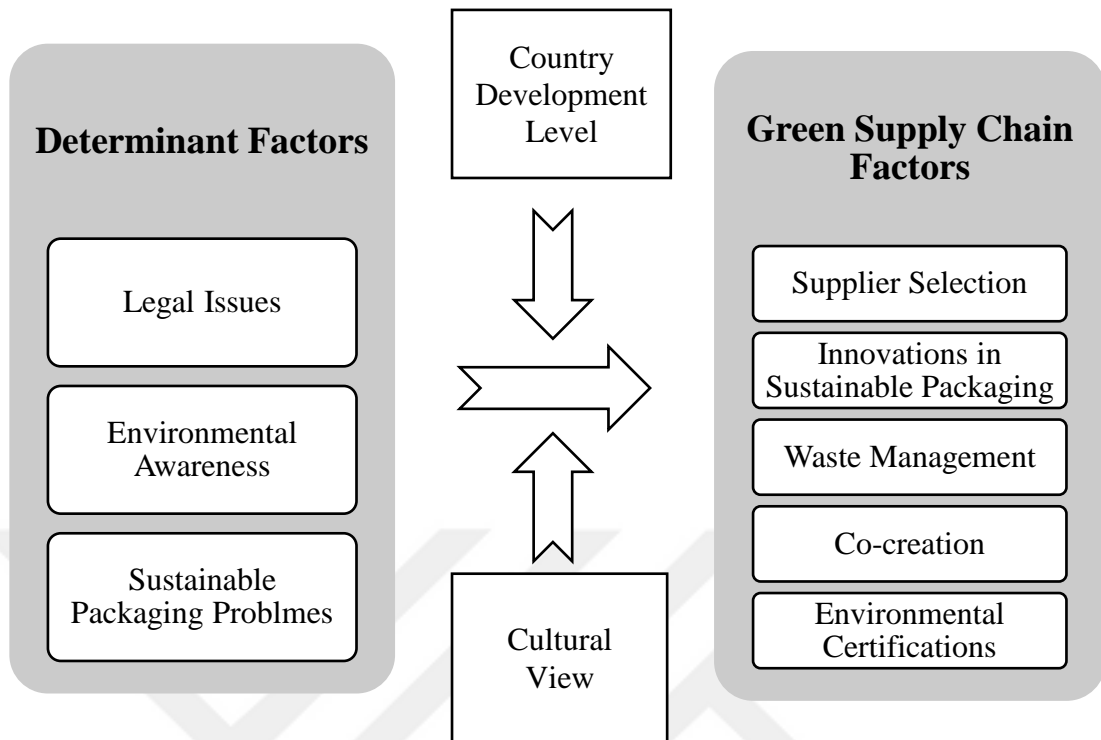


Figure 11. The Proposed Conceptual Model

In our proposed conceptual model, we argue that the legal enforcement and incentives, the level of environmental awareness on both consumer and company sides, problems faced both in sustainable packaging material and production all affect the level of green supply chain practices that the packaging companies are involved in. All those factors determine the degree of sustainable innovations, waste management, green certification, green supplier selection and co-creation levels in the industry. Based on the findings, we also suggest the relations among the determinants and the green supply chain practices do vary based on the country's development level and cultural view.

## CHAPTER 6: CONCLUSION

### *6.1 Theoretical Contribution*

In this study, we put the lenses on the packaging industry. Within the industry with multiple level players, we examined the GSCM applications, value co-creation and collaboration, and waste management issues. Additionally, this thesis provides insight for the environmental certifications and legal issues in the packaging industry.

In line with previous literature (e.g. Shue et al., 2005), our findings revealed green purchasing practices of the packaging industry and the problems faced. In the literature there are some studies focusing on sustainable design, remanufacturing, and reuse (e.g. Perotti et al., 2012) in different industries. This study contributes to the field by focusing on the packaging industry.

More specifically, the literature related to packaging generally focuses on the food packaging part (Wang et al., 2016) and neglects a holistic view for the entire packaging industry. Besides, when the literature is examined for sustainable packaging, the plastic packaging has been studied by several researchers (Mathiyazhagan, Hag and Baxi, 2016). As another contribution, we chose different packaging manufacturers in the sector and interviewed with the participants related to plastic, glass, and metal packaging.

Regarding co-creation, we provide a better understanding of the value creation in the packaging industry. With this study, we present collaborative practices developed among the supply chain partners. In line with Neghina et al., (2015) and Karpen et al., (2012), the co-creation of the value was reinforced by the comments of the participants. However, it has been observed that the literature remains untouched in the field of value co-creation in GSCM, more specifically for packaging supply chains.

## ***6.2 Managerial Contribution***

Although the packaging industry is widely studied from the perspective of plastic packaging, there is not a significant amount of information about how other types of packaging manufacturers are affected by green practices, how they create waste management systems, and what kind of value they create with their supply chain partners. Based on this gap, one of the aims of this study is to understand the green supply chain practices of the packaging industry and how the packaging supply chain partners do create value together.

The findings of this study have several important implications for practitioners. Both packaging manufacturers and suppliers, customers, and service providers in the packaging industry can benefit from the results of this study.

The results of this thesis show how companies with high environmental awareness take green supply chain decisions and manage their green practices. The findings also revealed that multinational packaging manufacturers and suppliers have higher environmental awareness. They make innovative investments, and are in search of new raw materials compared to Turkish companies.

Since the producers cannot control the prices of environmentally friendly products, consumers mostly do not prefer buying those due to high prices, even though they want to exhibit environmental behavior. Likewise, no matter how environmentally friendly the companies want to act, the cost is the first factor that is taken into consideration.

Findings revealed that innovation is a key issue in achieving green goals in the packaging industry. Companies should keep pace with the latest developments. We provide insight for the problems faced. By focusing on the problematic areas better green practices would be generated in the packaging industry. In addition, companies should create value together with their supply chain partners. Supplier development and supplier involvement practices would be beneficial to achieve those goals and to have higher value creation within the supply chains.

Companies increase their awareness and green practices by obtaining environmental certifications. Therefore, ISO 14001, ISCC, and Zero waste certificates should be obtained by companies.

### ***6.3 Limitations***

The practices of the green supply chain, although essential to a green environment, may have a limiting effect on the realistic involvement of participants due to its broad scope. In any case, information assortment from the field setting was added to expand the outer legitimacy.

One of the limitations of the study can be the lack of information regarding innovative investments. The reason for this is that there are very few innovative investments in Turkey. Further studies should focus on innovative material in sustainable packaging. Additionally, other green dimensions such as material condition, and quality of material should also be investigated in the context of green practices.

The literature focuses on plastic packaging and food packaging. Due to covering all the types of packaging in this study, the limited literature can be taken as a limitation.

As another limitation, we used the grounded theory method in the data analysis part. We did not utilize Nvivo and Maxqda software programs in the data coding process.

### ***6.4 Further Study***

To address the need of measuring the perception of companies regarding the green supply chain dimensions, a specific scale can be developed for packaging manufacturers. Additionally, in future studies, a specific study can also be applied to the manufacturers of raw materials for the packaging industry. In this way, the co-creation between packaging manufacturers and the raw material suppliers can be

understood more clearly, and green practices and supply chain decisions can be detailed.

Besides, since legal regulations and certifications are dynamic variables, they can be detailed in future research. Future research could explore the impact of industry-specific information and government regulation on overall assessments and qualifications.

The effects of online shopping on the packaging institute should be examined. E-commerce is developing day by day and is becoming widespread among people. The fact that people cannot find time to physically shop increases the demand for the area. Since each product is packaged in itself and repackaged for cargo, it automatically increases the usage rate related to packaging.

Covid 19 pandemic situations influence the packaging industry due to the rise of hygienic consumption concerns, so that area can be a further research avenue for the packaging industry. In order to better understand the impact of the pandemic on the packaging sector, the increase in the packaged goods consumer consumption during the lockdown period can be given as an example. In addition, the restrictions in restaurants and hotels have reduced the use of industrial packaging..

In further studies, reverse logistics in the packaging industry can be explored. Besides the effects of legal variables and certifications in the packaging industry can be investigated in detail. Moreover, the relationship between waste management and the packaging industry, and the effects of consumer behavior on green supply chains can be addressed.

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