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Sustainable Supply Chain Practices at Packaging Company: Analysis of Huhtamaki Environmental Sustainability

School of Technology and Innovations
Industrial Management
Master's Programme in Industrial Engineering and Management

Vaasa 2026

UNIVERSITY OF VAASA
School of Technology and Innovations
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Title of the thesis: Sustainable Supply Chain Practices at Packaging Company: Analysis of Huhtamaki Environmental Sustainability
Degree: Master of Science in Economics and Business Administration
Degree Programme: Master's Programme in Industrial Engineering and Management
Supervisor: Ines Simoes de Brito Peixoto
Year: 2026 **Pages:71**

ABSTRACT:

In global food and beverages supply chain, sustainability of packaging plays a significantly important role, since it influences the extent to which the raw materials, energy and water are consumed in production. Despite this importance, there is scarcity of longitudinal studies tracking the environmental performance of packaging manufacturers against its stated targets across multiple years. This thesis has addressed this gap.
The research has selected Huhtamaki and its performance in environmental sustainability since the company is a key supplier of packaging across the globe. Secondary data design has been used and has analysed the Annual Report from 2022 to 2025. The environmental dimensions examined in this research include greenhouse gas (GHG) emissions, renewable energy use, raw materials' sustainability and waste management. The analysis addresses the question: To what extent has Huhtamaki demonstrated measurable and consistent improvement in environmental sustainability across its supply chain operations between 2022 and 2025?
The findings show that environmental performance of Huhtamaki has improved consistently across all four dimensions during the studied years. Scope 1 and Scope 2, combined, GHG emissions reduced by approximately 40 percent against stated baseline by 2024, and this was largely driven using renewable electricity to 60.9 percent in 2025 from 24.9 percent in 2022. Landfill waste also reduced to 4.7 percent from 10 percent and recycled or renewable materials' share rose to 68 percent from 65.8 percent. Furthermore, validation was received by Huhtamaki for Science Based Targets Initiatives, since it upgraded to 1.5°C emissions target, and for its sustainability performance was awarded EcoVadis Gold Medal.
The research based on its findings concluded that Huhtamaki has demonstrated consistent environmental progress within the global packaging supply chain, but still there are some prominent gaps in Scope 3 emissions and adoption of circular packaging. This requires coordinated action across the entire supply chain.

Keywords: Sustainable supply chain, environmental sustainability, greenhouse gas, renewable energy, waste management, Huhtamaki

Contents

List of Tables

List of Figures

Abbreviations

Greenhouse Gas – GHG

European Union – EU

Corporate Sustainability Reporting Directive – CSRD

Sustainable Supply Chain Management – SSCM

Natural Resource Based View – NRBV

Triple Bottom Line – TBL

Circular Economy – CE

Fast Moving Consumer Goods – FMCG

Lifecycle Assessment – LCA

Packaging and Packaging Waste Regulation – PPWR

Science-based targets – SBTs

Virtual Power Purchase Agreements – VPPAs

Science Based Targets initiatives – SBTi

1. Introduction

Within the supply chain of soft beverage, packaging plays a crucial role of protecting the product, keeping it safe for the consumers, and ensuring convenience in terms of use (Morashti et al., 2022). However, there are numerous environmental costs associated with packaging production, and this can be attributed to the requirements of water, energy and raw materials. In fact, studies have suggested that packaging not only contributes to waste generation, but also the greenhouse gas (GHG) emissions, and material resource depletion (Qiang et al., 2024; Chandegara et al., 2015). This is the reasons that more focus and emphasis remain on the sustainability of packaging, and to address the same challenge for not just the beverage companies, but their suppliers as well. Considering this, this dissertation has exclusively focused on the ways in which Huhtamaki – a global packing company – has managed environmental sustainability in its operations during 2022 and 2025.

1.1 Contextual Background

1.1.1 Importance of Environmental Sustainability

According to numerous reports, environmental sustainability has become a necessity, rather than just being an option in the global business environment, since the focus remains on conserving the natural resources, while maintaining ecosystem for the wellbeing of the existing and future generations (Morelli, 2011). However, the ways in which the resources are being used, and the wastes it creates have been acknowledged to have serious consequences. For instance, IPCC (2023) clearly identified climate change as a serious challenge, while highlighting that the global temperatures should not be more than 1.5°C above pre-industrial levels; otherwise, it could result in climate change's severe consequences (Jan et al., 2023). To reach this particular goal, it is imperative to focus on the reduction of greenhouse gas emissions, especially in the supply chain and manufacturing.

For the future generations, the World Economic Forum (2023) identified some prominent global risks, which include climate inaction, biodiversity loss, and extreme weather (Stefan, 2023). These global risks require actions from not just the governments, but also from the consumers and investors, and more importantly the companies engaged in operations resulting to increasing GHG emissions. For the very reasons, laws have been passed requiring companies to be more careful, and to honestly report their environmental footprints, and the actions being taken for the very purpose (Gyimah et al., 2023). Not just this, studies have shown that investors have also shown greater emphasis towards environmental sustainability and have directed capital away from companies that have voluntarily or involuntarily engaged in activities resulting in poor sustainability (De Francesco & Levy, 2008; Kordsachia et al., 2022). Similar actions have been witnessed from consumers, as they are showing interest in products that are produced and packaged in most eco-friendly and responsible manner (Hanss & Böhm, 2012).

Sustainable development, according to Brundtland Commission (1987), is to ensure that the present needs are met but without compromising the future generation's ability to meet their respective needs. From packaging company perspective, this definition is critical since working towards sustainability implies engaging in packaging activities that have limited or no environmental footprint, recycling of designed packaging product, and ensuring that the customers can meet their commitments towards sustainability (Boubeta et al., 2018).

1.1.2 Supply Chain of Soft Beverages Packaging

The soft beverages industry covers not just carbonated drinks and energy drinks, but also the dairy-based drinks, hot beverages, bottled water, and juices. This makes this industry to be in constant requirement of volumes of packaging in the world, which can be in the form of pouches, bottles, cartons, and cups. Hence, it can be argued that billions of these units are produced every year, and Linton et al. (2007) argued it to have significant environmental footprint, resulting from manufacturing, transportation and

disposal. On the other hand, it has been argued that there is a misconception that environmental harm can be reduced through less packaging; however, the reality is more complex when this relationship is explored. In particular, products when packed sustainably can have positive roles, as it can extend the shelf-life of drinks and foods, which in turn can reduce food's waste (Vinh et al., 2025). This in itself accounts for approximately 8-10 percent of GHG emissions, in comparison to packing's 5% of lifecycle emissions. This implies that when products are effectively packaged, it prevents waste and spoilage, and this in turn can reduce the overall environmental footprint and harm. This makes it more important to focus on assessing the packaging sustainability.

1.1.3. Justification for selecting Huhtamaki

Huhtamaki has operations in more than 35 countries, with an annual sale of approximately EUR 4.1 to EUR 4.5 billion, and employs more than 17,000 people. This makes Huhtamaki one of the largest packaging manufacturers across the globe. In fact, Huhtamaki (2022) highlighted that the company is responsible of supplying packaging to not just consumer goods companies, but global fast food chains and soft beverages brands as well, and their products generally include; folding carton boxes, flexible packaging films, molded fiber trays, and paper cups.

Figure 1: Huhtamaki's Sales Split by Segment and Product Category (Source: Huhtamaki Annual Report (2025))

There are numerous reasons for selecting Huhtamaki for this research. The first reason is that Huhtamaki directly deals with the packaging and it delivers the packaging to not just soft beverages companies, but also FMCG, which makes the company's role significant in a vast majority of industries. The materials Huhtamaki produces on daily basis

can help in identifying whether or not the packaging it sustainable or not. The second reason is embedded in its published environmental goals for 2030, which makes it convenient to track the progress of the company on yearly basis. Third, there is sufficient audited and detailed data regarding environmental sustainability within the Annual Reports (2022-2025), and this can be systematically compared for this research. The last reason can be associated with the EU Corporate Sustainability Reporting Directive (CSRD), which made the company legally bound to report sustainability data to meet the regulatory requirements of accuracy and coverage.

1.2 Problem Statement

During the last decade, the growth in the academic literature regarding sustainable supply chain management has made it possible to critically investigate and explore into the supply chain practices and the ways in which these affect the and the ways in which these affect the environmental sustainability (Seuring & Müller, 2008; Carter & Liane, 2011; Carter & Rogers, 2008). However, there are still some gaps. For instance, companies and their respective SSCM are investigated at a single point in time, but there are limited numbers of studies focusing on the environmental performance of companies across multiple years, and against their stated targets. This makes it difficult to investigate whether or not the environmental sustainability improvements are consistent and genuine, or whether or not the results on reflects improvement for a single year. Secondly, the packing industry has not yet fully investigated, especially since the manufacturers operating in the industry have to face two challenges simultaneously. At one end, the manufacturers are required to reduce waste and emissions from their factories; on the other end, they are continually required to work towards redesigning of their products so that these can be recycled by the consumers after use. If these two challenges – product transformation and operational improvements - are considered, these have not yet been studied together. On the other hand, a vast majority of companies have published sustainability reports, and this can be attributed to the pressures from the government, investors and the consumers. However, there are still controversies surrounding the reporting of environmental sustainability claims against real

performance data. This means that there is a need to investigate into the stated goals by the company against their actual results, and across several consecutive years. This can reliably facilitate in testing whether or not the sustainability claims made by the companies are genuine.

All of the aforementioned gaps have been addressed within this research, where Huhtamaki's annual reports are critically investigated to test environmental sustainability performance during 2022 and 2025, while critically identifying whether the results match the company's target for itself in 2030 or not.

1.3 Research Aim and Objectives

The purpose of this research is to critically investigate into the environmental sustainability performance of Huhtamaki in between 2022 and 2025. This has been achieved by examining the data from the Annual Reports and has also explained the results based on already existing theories and frameworks, while triangulating the findings of this research with the wider literature. The aim of this research is supported by the following formulated objectives;

- To track to greenhouse gas (GHG) emissions of Huhtamaki in between 2022 and 2025 with specific focus on Scope 1-3, while assessing the progress of the company against its emissions targets.
- To examine the extent of renewable energy usage by Huhtamaki, and the progress it has made towards 100% renewable energy by 2030
- To assess the extent of changes in the packaging materials of Huhtamaki, while considering the share of recycled or renewable inputs, and circular packaging products' development
- To explain the findings of this research in reference to Resource Based View, Circular Economy framework, Legitimacy Theory, and Stakeholder Theory to compare and contrast the findings with broader academic literature.

Based on the research purpose, the question that this thesis intends to address is as follows;

- To what extent has Huhtamaki demonstrated measurable and consistent improvement in environmental sustainability across its supply chain operations between 2022 and 2025?

1.4. Thesis Structure

This research has been organized into the following chapters; The introduction chapter presents the research topic, while identifying the problem being investigated, followed by the research aim and objectives, and explaining the need for this research, and why it matters. The literature review chapter presents critical analysis of the wider literature available of the phenomenon being investigated, and the theories explaining the environmental sustainability in the business, followed by environmental sustainability in packaging supply chains. Lastly, the gaps in the existing literature are identified. The research methodology chapter explains and justifies the methodological choices employed in this research, which range from the philosophical foundation to the data collection and analysis techniques. The findings chapter presents quantitative environmental performance data of Huhtamaki ranging from 2022 and 2025, where each environmental dimension is independently examined, followed by critical analysis of the progress of Huhtamaki against its 2030 targets. The discussion and conclusion chapter interpret the findings of this research in relation to wider literature, followed by conclusions indicating the broader lessons for the packaging and beverage sectors' sustainable supply chain management.

2. Literature Review

This chapter offers systematic and extensive review of academic literature relevant to the phenomenon being investigated i.e. sustainable supply chain practices, but with a focus on the packaging sectors' environmental sustainability. The broad areas covered within this chapter includes; sustainable supply chain management (SSCM) development, the theories and frameworks underpinning the investment in environmental sustainability, the manufacturing and packaging supply chains' environmental performance, and environmental themes like circular economy, renewable energy and carbon emissions, followed by the role of sustainability governance and reporting. At the end, gaps have been identified, and the ways in which this research has addressed them.

2.1 Sustainable Supply Chain Management (SSCM) Development

According to Cooper et al. (1997), the study of supply chain management initiated as the ways in which companies can efficiently move the goods from the suppliers to the end customers, but with the passage of time, focus shifted towards the social and environmental consequences of the supply chains going beyond the speed and cost. In fact, Seuring and Muller (2008) conducted systematic review of 191 journal articles and found that field to be in its emerging stages, and that majority of the studies focused extensively on the behavior of individual firms, instead of complete supply chain system. In their perspective, the focus of SSCM was related to the management of materials, information and capital flow, followed by companies cooperating within the supply chain, where the purpose remains on meeting goals related to sustainable development dimensions of social, economic, and environment. Carter and Rogers (2008), in this regard, argued that the four foundations on which the sustainable supply chains depend include; culture, strategy, transparency, and risk management. This implies that without these foundations, all the initiatives taken for the environment would be short-lived and fragmented. This view has been extended by Gold et al. (2010), where it has been argued that value is not just created for the focal company through sustainable supply chain management, but also for all the actors within the supply chain tiers. The sustainable value creation idea is of significant relevance for the packaging industry,

since the material and design decisions from the manufacturers have direct impact on the sustainability performance of downstream customers, which can be in hundreds and thousands in number.

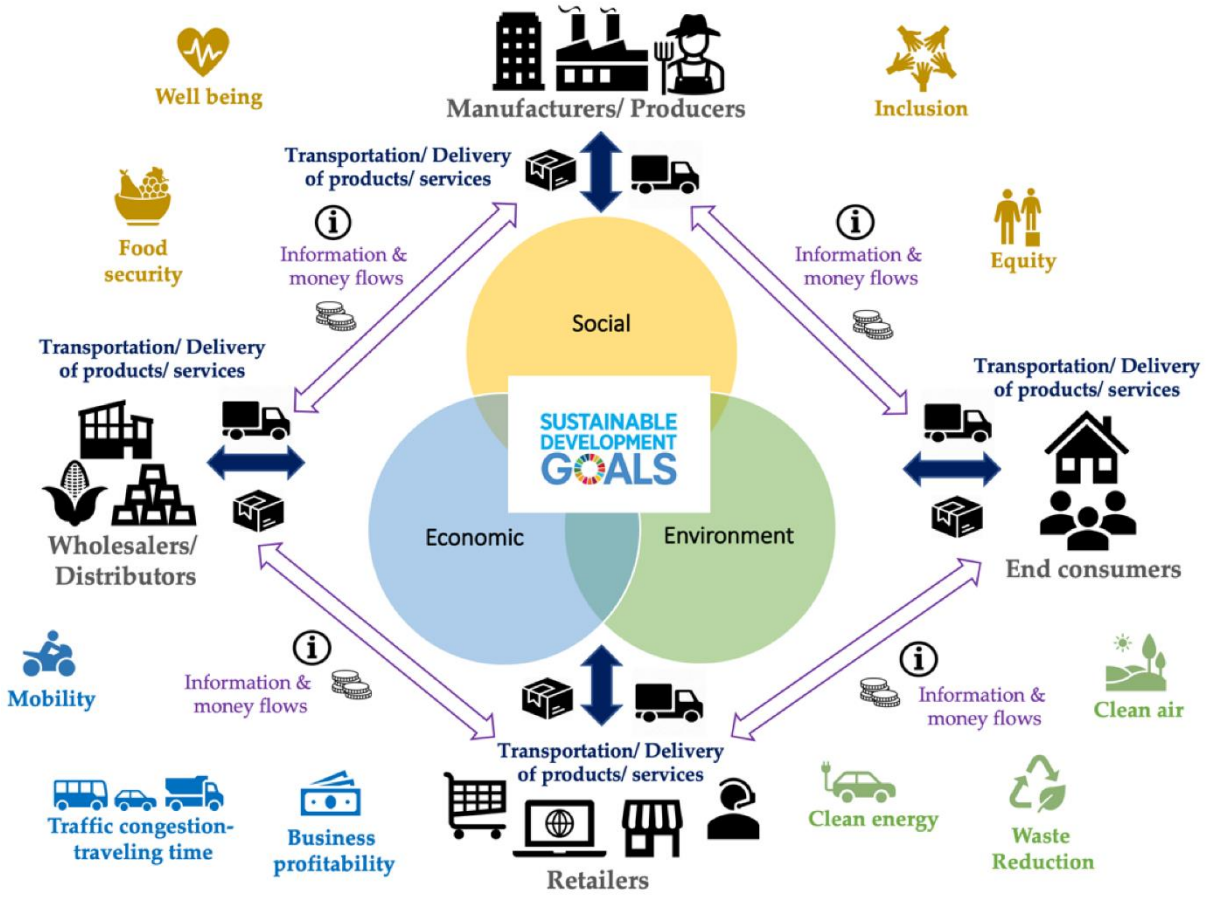

Figure 2: Sustainable Supply Chain Management (Source: Salinas-Navarro et al. (2022))

For a sustainable supply chain management to be effective, it must take account of the product's full lifecycle, which initiates from the extraction of the raw material to its disposal (Linton et al., 2007). For packaging, this lifestyle perspective holds significant importance, since the package's environmental impact does not end with leaving the factory, but also after its usage by the consumers i.e. whether it is sent to landfill or recycled. This has similar significance as how it was made. In fact, the lifecycle perspective holds importance in Huhtamaki's performance analysis in this research. More recent studies like Koberg and Longoni (2019) established that majority of the studies

have focused extensively on the dyadic relationship in between Tier-1 supplier and the buyer and have rarely concentrated on system-level conditions deeper supply chain tiers. The conditions that are ignored included the regulatory framework and the recycling infrastructure, both of which are the central aspect in making supply chains sustainable. Furthermore, the integration of empirical evidence and theory related to the field of SSCM is weak (Touboulic and Walker, 2015), which is why this research has responded by integrating 4 years of empirical data, and have triangulated the findings through the application of multiple theoretical lenses.

2.2 Theories and Environmental Sustainability in Business

2.2.1 Natural Resource Based View (NRBV)

This theory was proposed by Hart (1995) for the purpose of explaining the underlying reasons for companies investing heavily in environmental sustainability, while highlighting that some companies do not. In particular, it has been identified that companies that have invested in environmental sustainability to manage the environmental issues have ultimately experienced it to become their source of competitive advantage, and this can be attributed to the fact that there are limited natural resources, and working towards environmental issues shows the dedication and commitment of the companies to make the world a better place. The three capabilities identified by Hart (1995) included prevention of pollution (i.e. making the production much cleaner), stewardship of product (i.e. designing products with minimal environmental footprint), and sustainable development (i.e. long-term solutions for sustaining the business and the environment, as a whole). In fact, it has been identified that companies that have focused on all of these three capabilities have greater possibilities of outperforming their competitors, and this is because of their preparation for resource scarcity, changing preferences of the consumers, and stricter regulations.

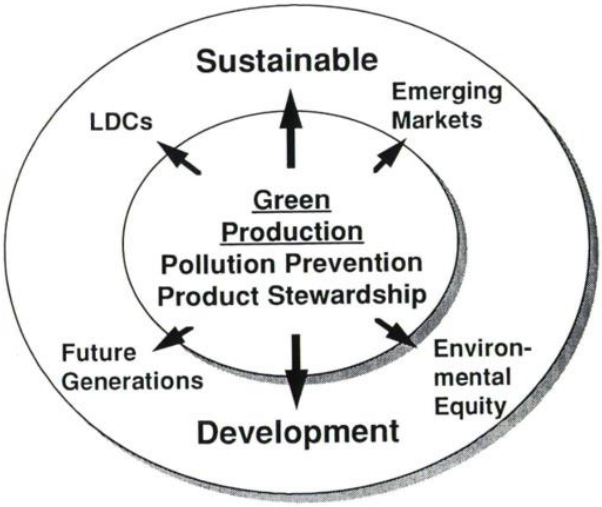

Figure 3: Natural Resource Based View of the Firm (Source: Hart (1995))

The concept and foundation of NRBV has been supported and extended by Aragón and Sharma (2003) by highlighting that it enhances the companies' capabilities of surviving in complex and uncertain environments – the conditions that packaging companies are experiencing today – given the fact that consumer sentiments and changing regulations require companies to be sustainable. Similarly, the study by Russo and Fouts (1997) empirically supported the concept of NRBV by claiming that higher profitability is directly linked with higher environmental performance, especially in the industries in their growth stages.

2.2.2 Stakeholder Theory

Stakeholder Theory underlines that a business has to pay attention to the needs and interests of several stakeholders, such as employees, customers, suppliers, and the society in which a business operates. Mahajan et al. (2023) claim that to make a business sustainable, it is necessary to coordinate all stakeholders. The needs and expectations of stakeholders can be dealt with appropriately so that they develop trust and support, which are vital towards achieving organizational objectives. In fact, Mitchell et al. (1997) argued that stakeholders are prioritized by management because of their legitimacy claim, power and demand urgency. This is particularly true for companies like Huhtamaki, where the investors hold bonds that are linked with sustainability, and

have both the urgency and power, customers have both the urgency and legitimacy because of sustainability commitments, and coercive power rests with the regulators that enforce the CSRD in European countries. The sustainability priorities of Huhtamaki can be best understood based on the importance of stakeholders.

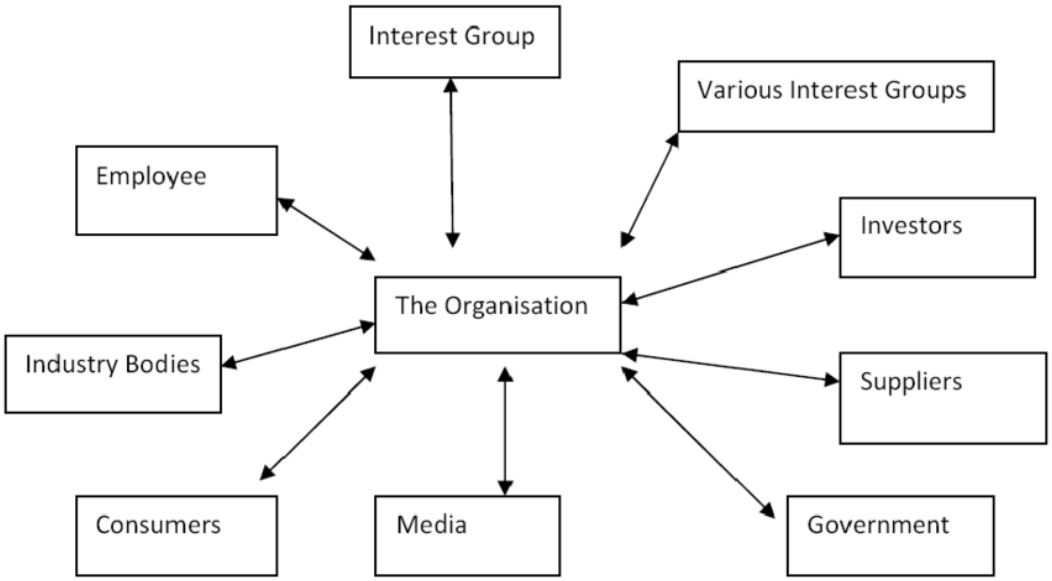

Figure 4: Stakeholder Theory (Source: Mahajan et al. (2023))

On the other hand, stakeholder theory has been explicitly applied by Bowen et al. (2001) in reference to the supply chain environmental management. The study found that companies are in better position to anticipate future demands of the stakeholders, instead of being reactive, and in return it helps in developing stronger and better sustainability capabilities, while achieving better results. This can further be corroborated through the findings of Barnett (2007), where the study found that companies with broad network and long stakeholder track records are in better position of translating these relationships into financial returns from sustainability-related investments.

2.2.3 Legitimacy Theory

This theory argues that companies must act appropriately and in accordance with the expectations of the society. This implies that companies can easily and quickly lose their legitimacy, if the social expectations are ignored, especially in reference to the

pollution and deception, which in turn can result in reputational damage. When applied to environmental reporting by Deegan (2002), the study found that regulatory pressures and public scrutiny have resulted in companies expanding their sustainability disclosures, since failure to do so could have affected their operations, as a whole. However, O'Donovan (2002) identified that companies rarely acknowledge their current gaps and only focus on their positive progress to further their sustainability narrative, but this generally exposes the companies to risk of overstating performance. On the contrary, distinction was drawn between symbolic and substantive reporting by Cho and Patten (2007), where the former is emphasizes on 'saying the right thing' and the latter concentrates greatly on showing real performance improvements. Both aforementioned concepts are significantly relevant to the case of Huhtamaki, and the analysis of its annual reports.

2.2.4 Triple Bottom Line (TBL) and Circular Economy (CE)

The framework of Triple Bottom Line was introduced by Elkington (1997), where the focus remained on measuring the performance of companies across three areas of People, Planet and Profit. Recent studies have confirmed that companies must emphasizes on all three areas simultaneously, rather than concentrating on just the profits, since doing so can create risks affecting the survival and growth of the businesses. In fact, the study by Dyllick and Hockerts (2002) argued that financial performance (Profit) and environmental efficiency (Planet) are complementary in nature, instead of generally perception of being conflicting. This has been corroborated by Eccles et al. (2014), where the study after investigating 180 companies over 18 years confirmed that companies that integrated sustainability governance had greater possibilities of outperforming their competitors financially in the long-run.

On the other hand, the framework of Circular Economy (CE) focused greatly on the product design, while suggesting that companies must ensure that the materials being used for the products must be designed in such a manner that they can be recycled, reused, or composted. Moreover, the core idea of this framework rests on retaining the

value of the material using closed loops, instead of the linear model that emphasizes on take-make-dispose (Kirchherr et al., 2017). The design strategies have been presented by Bocken et al. (2017), which included; 1. design for recyclability and 2. design for disassembly. Both of these can be applied by companies for the development of circular products. This is specifically important and relevant to the case of Blue loop mono-material packaging initiative taken by Huhtamaki.

2.3 Environmental Sustainability in Packaging Supply Chains

According to Ellen MacArthur Foundation (2013), the significant percentage of packaging accounts to lifecycle GHG emissions, when packaged consumer goods is considered (p. 14); however, the absolute output of the sector is enormous, since billions of units are produced and packaged on yearly basis for the FMCG sector. This makes the environmental impact of the packaging industry to be substantial, and this can be associated with the generation of solid waste, which Hoornweg and Bhada-Tata (2012) explicitly focused on, and found that approximately 2.2 billion tons of municipal solid waste would be generated by 2025. There is a direct connection between solid waste and packaging emissions, as a major portion of the municipal solid waste is of packaging (Schneider, 2017), which could eventually place significant pressure on the recycling system and the landfill capacity.

In the environment, packaging has a complex role, and this can be associated with its double nature i.e. preventing waste and source of waste. In particular, studies have shown that when companies invest in sustainable packaging, it can extend the shelf life of the perishable foods, which in turn can contribute in reducing the food waste (Marsh & Bugusu, 2007) which is often described as a major contributing factor of GHG emissions. Similarly, it has been argued that packaging sustainability should be evaluated by taking account of lifecycle thinking, since the total lifecycle impact of heavy packaging solutions, which can prevent spoilage, may be lower than a recyclable alternative that may fail to protect the product from spoilage. When discussing the packaging sustainability, the complexity is often ignored (Verghese et al., 2015). With specific

focus on the supply chains of beverages, sustainable packaging has been given importance by both the regulators and the major industry players, instead of single use packaging option. In this context, Rouw and Worrell (2011) argued that it is possible to achieve significant GHG savings because of using the recycled content in the beverage packaging. This is relevant and similar to the case of Huhtamaki, which uses recycled fiber in its molded fiber products.

Within the EU market, there are strict rules and regulations with regards to the recyclability standards and requirements for minimum recycled content, and these are directly from the Packaging and Packaging Waste Regulation (PPWR). This is specifically important as it represents a dramatic policy development in the packaging sector in the recent years. In this context, the study by Svanes et al. (2010) is particularly important as it highlighted the value and usage of lifecycle assessment (LCA) tools, when the packaging materials and environmental performance is considered. In fact, the study found that the results of LCA are subjective and sensitive to assumptions about the energy sources and recycling rates, and may change from region to region. This study and its findings are important for this research, since it can help to better understand the changes in the environmental performance of Huhtamaki against the performance in North America or Asia.

2.4 GHG Emissions and Carbon Management in Supply Chains

In manufacturing industry and its supply chain, the management of GHG emissions has become a central challenge, and this is the reason that GHG Protocol Corporate Standard was introduced to measure and report the corporate carbon emissions. The three scopes are: 1. Scope 1 is related to the direct emissions, 2. Scope 2 is related to purchase electricity, and Scope 3 is related to all other emissions related to value chain. In this regard, Curran (2012) argued about the difficulties in managing Scope 3 given the fact that it is dependent upon the actions of the customers and the suppliers, instead of the company. On the other hand, companies are constantly required to align their GHG commitment with the climate science, and Science-based targets (SBTs), in this

context, have been found to be the leading tool (Giesekam et al., 2021). In particular, it has been argued that when companies have SBTs validated targets, they tend to perform better in reducing their GHG emissions, in comparison with companies that do not have SBTs (Dietz et al., 2021). Furthermore, the study by Rekker et al. (2022) indicated about the flexibility within the SBTi framework, and the ways in which it facilitates in defining and bounding the Scope 3 emissions, while arguing that it can result in the exclusion of material emission categories from the targets. This is particularly relevant and importance for the case of Huhtamaki, since it has historically excluded the end-of-life product treatment from its Scope 3 target.

According to Gimenez and Tachizawa (2012), direct supplier relationship has become central aspect in the supply chain carbon management programs, while arguing that this relationship is rarely extended to second or third tier supplier. Considering this, it is important to note that when environmental risks emerging from suppliers are not effectively managed, it can have series of consequences, even ranging from mismatch between suppliers and company's needs. Furthermore, it can also affect the engagement levels of the supply chain partners, while affecting the integration of supply chain and carbon performance, as identified by Zhu et al. (2012). In particular, the study argued that when companies have stronger internal environmental management, they are in better position to extend their environmental requirements with their suppliers, which in turn helps the companies in further improving their chances of meeting their targets. Based on this argument, the internal governance maturity at Huhtamaki, which is evident from the GSSI incentives, SBTI targets, and CSRD compliance. These collectively indicated about effective and efficient engagement outcomes from suppliers in the forthcoming years.

2.5 Transitioning to Renewable Energy in the Manufacturing

When the purpose remains on reducing the Scope 2 GHG emissions in the manufacturing industry, one of the most important and powerful lever is to switch to renewable energy from fossil-based energy. In this context, the study by Luthra and Mangla (2018)

argued that manufacturers can quickly reduce their emissions by energy transition and acknowledged it as the highest leverage action. Similarly, renewable energy has been regarded as a critical enabler to reducing GHG emissions in the corporate sector; however, Kiefer et al. (2019) argued about the cost and availability, and tied both of these factors with the geography. This implies that countries with well-developed renewable grids can offer companies with renewable energy at lost cost and with convenience, in comparison to companies operating in parts of Africa, Middle East and Asia, where fossil-fuel dependent grids are commonly available.

Accessibility of renewable energy has remained a central challenge for companies, but this has been addressed through Virtual Power Purchase Agreements (VPPAs). These agreements have emerged as an important mechanism through which companies can directly access renewable energy generator, but at a fixed price. In this context, the study by Hvelplund (2006) indicated that under these contracts, the source of the physical electricity is different given the fact that the local grid conditions are unfavorable for companies, but the financial incentives and support are targeted towards new renewable capacity. Similarly, it has also been highlighted that multinational companies, or those companies that are well-established within their sector, are particularly the target for VPPAs, and this can be attributed to their financial credibility and scale of operations, which in turns allows them to engage in long-term contracts, but may not be similarly applicable for companies with smaller operations (Hockerts and Wüstenhagen, 2010). Small companies are also important, since they have also adopted solar energy as part of their sustainable initiative, but since they cannot afford VPPAs, they are still playing their role as part of their planet dimension of TBL.

In similar context, the study of Bateman et al. (2016) and its findings are noteworthy, as the focus of the study remained on understanding the ways in which multinational companies and their respective supply chains have managed Scope 2 emissions. The research found about accessibility to renewable electricity is one of the greater barriers in emerging markets, and the other barriers include; upfront capital requirement for

the installation of onsite renewable energy generators, private renewable contracts' regulatory restrictions, limited market development for VPPA, and weaker grid infrastructure.

2.6 Material Sustainability and Circular Economy in Packaging

Over the recent years, the packaging industry has experienced a radical and fundamental circular economy transition, which according to Geissdoerfer et al. (2017) is best described as a systemic shift towards closed-loop system that prioritizes maintaining material value for as long as possible. This implies that previously the focus has been on linear production and consumption. This transition has been instrumental for the packaging companies, since the products are designed specifically considering the targets of recycling, composting and reusing, which in turn can support the much-needed infrastructural development. This is also important for the recyclability of the packaging, as argued by Hopewell et al. (2009), where the study showed that plastic package and its respective actual recyclability is dependent on the sorting ability of the local collection system, as well as the capability of handling the material at the reprocessing facilities, and the availability of the market for the recycled output. From this perspective, it can be argued that there will be zero recycling value for a perfectly designed recyclable package, if the local system does not have the capability of processing it. This brings the argument towards the Cup Collection Programmed by Huhtamaki, which can be argued to be quite effective, since the company has been cooperating and collaborating with different waste management companies and municipalities for the development of recycling infrastructure; hence, it can be argued as strategically important initiative and can be directly compared with the product design innovation in terms of importance.

According to Geyer et al. (2017), approximately less than 9 percent of all the plastic manufactured till date has been recycled, which makes this as a systemic failure, and the lack of proper recycling infrastructure can be pointed out as the core reason for the plastic pollution. Such statistics also helps in understanding as to why sustainable pack-

aging companies are finding it difficult and challenging to achieve better recycling rates. On the other hand, the study by Lederer et al. (2022) argued that major determinant of the packaging recycling rate is the consumer behavior, particularly their willingness to sort and deposit the packaging in correct manner, in addition to the quality of the infrastructure. This can be further elaborated in reference to the findings of Rao and Holt (2005), where mature recycling markets were identified to have better financial and strong environmental results, and these results were the result of engaging in green supply chain practices. This may be the reason that the recycling of fiber has higher recycling rates, and more specifically in the case of the fiber-based product portfolio of Huhtamaki, which had over 98 percent of recycled material rates i.e. during 2022 and 2025.

2.7 Manufacturing Supply Chains and Waste Management

Within the field of environmental supply chain management in manufacturing, the concept of waste reduction and management remains significantly important and relevant. This has been specifically highlighted and elaborated in the study of Srivastava (2007), where the author identified three domains of green supply chain management, which included; changing products to reduce the waste (design), reduction of waste in the production (operations), and lastly the management of waste after usage (reverse logistics). A vast majority of the research has been related to the operations domain, where lean manufacturing principles are commonly applied for the purpose of waste reduction. This can be supported with the findings of King and Lenox (2001), where the study found consistent positive relationship in between better financial performance and less waste. This implies that when companies engage in operations, their focus on priority should remain on wasting less material, since doing so can facilitate in greater profits and operational efficacy. In fact, this also supports the idea that within the manufacturing operations, cost savings and environmental improvements often go hand in hand. This has even been elaborated and highlighted in Huhtamaki's own reporting i.e. Annual Reports, where it has clearly been shown that reduction in waste has resulted in operational efficiency gains.

The goals related to environmental waste reduction are closely aligned with lean manufacturing principles (Hermann et al., 2008), since both of the green and lean approaches prioritize the elimination of waste. At one end, the focus of lean remains on the waste generated during production that has a negative impact on efficiency, and on the other hand, environmental waste remains the focus of green approach as it causes harm. This can be argued as the underlying reason that lean-green approaches are commonly integrated within manufacturing, as both reinforce each other. Moreover, the study by Abualfaraa et al. (2021) identified some of the technologies commonly integrated within the manufacturing operations, where digital monitoring technologies remained the center of attention. In particular, the research highlighted that digital monitoring technologies in the form of automated control systems, real-time data dashboards, and sensors are critical in improving the effectiveness of manufacturing waste reduction programs, as these can immediately identify the rise in the waste levels against the predefined targets. This is also important aspect for Huhtamaki, as identified in its 2030 goals that the company intends to achieve zero waste to landfill.

2.8 Sustainability Governance and Reporting

Sustainability governance is all about the ways in which companies set their targets, manage their performance, and reports its results. Based on this particular aspect, the concept of sustainability governance has remained the center of regulatory and academic attention. In this context, Eccles et al. (2014) highlighted the companies that have placed significant importance on integrating their sustainability governance are in better position of achieving environmental metrics and financial returns. This integrated governance and its key features include; reported data's independent external verification, executive pay linked with the sustainability performance, and environmental goals embedded in the core strategy of the company.

For larger companies, the recent step from the European Union in the form of Corporate Sustainability Reporting Directive (CSRD) has ultimately transformed the ways in

which sustainability has been reported (Baumüller & Grbenic, 2021). In particular, companies are now required to disclose their environmental data under European Sustainable Reporting Standards (ESRS) for double materiality assessment, which can help in identifying the topics related to social and environment, and their respective importance for the company and its stakeholders (Elidrisy, 2024). The findings of de Villiers and Sharma (2020) are noteworthy, since the focus remained on mandatory sustainability reporting. The study found consistently better environmental outcomes as a result of mandated disclosure, when compared against voluntary reporting. This implies when companies are legally required to disclose, their reports are more complete and reflect clear and consistent performance.

A leading external validation mechanism is Science Based Targets initiatives (SBTi), especially for the corporate climate targets. In fact, it has been found that emissions are reduced faster by companies that are SBTi-validated (Dietz et al., 2021); whereas Rekker et al. (2022) identified some weaknesses. First, SBTi is for validating the setting targets, and not the actual achievement of results; second, flexibility within the Scope 3 boundaries, which means that the selection of base year can make the targets easier or harder in terms of achievement. These limitations have been given significant considerations when critically reading the SBTi disclosures by Huhtamaki. On the other hand, there has been a growing interest in third-party sustainability ratings - MSCI ESG scores, CDP and EcoVadis – as these are signals of supply chain sustainability credibility. Considering this, Serafeim and Yoon (2022) indicated that companies with better ESG ratings are generally assumed to have current and predictive value, and with better future environmental performance. This can be linked with the EcoVadis Gold Medal of Huhtamaki in 2025, followed by CDP B rating for climate, water and forests. This not only signals current performance, but also the likelihood of the company to experience continued improvements in the future.

2.9 Gaps in the Literature

After reviewing the literature, it has become evident that there are 3 prominent gaps, each of which has been separately highlighted below;

The first gap is embedded in the nature of the study. There are numerous studies, but review of the literature has confirmed about the shortage of longitudinal quantitative studies tracking the environmental performance of a single packaging company against their own stated science-based targets. A vast majority of the studies related to SSCM have relied either on qualitative case studies or cross-sectional data. Though, these are important and can capture the moment in time, but these lack the ability of capturing the change trajectory.

Second, the case of packaging sector has been underrepresented within the literature of SSCM, when compared against different sectors like retail, electronics, and automotive etc. This gap becomes significant if critically viewed from the fact that packaging has a central role in the environmental performance of FMCG and beverage supply chains. Furthermore, studies focusing on the interaction between operational environmental performance (i.e. energy, waste, and water) and product design innovation (recyclable formats and circular economy) are particularly rare.

Third, a vast majority of the existing studies that have examined the sustainable supply chain practices are based on the perspective of FMCG company or beverage manufacturer, instead of presenting the perspective of tier 1 packaging supplier. This is particularly relevant given the fact that the environmental choices of packaging supplier i.e. product design, energy sourcing and material selections are pivotal in shaping the sustainability profile of the entire downstream supply chain. This means that a focusing on the sustainability performance from the vantage point of the supplier can offer a complementary and different perspective in comparison to the literature that is purely focused on dominant brand-owner.

This research has addressed the aforementioned gaps by engaging in a longitudinal quantitative analysis of the annual reports of Huhtamaki from 2022 to 2025, where instead of focusing on the brand-owner perspective, the focus has been on the packaging supplier, and the study intends to systematically track the performance across GHG emissions, energy, materials, and waste simultaneously.

3. Methodology

This methodology chapter has focused on critical justification of the philosophical, strategic and technical decisions undertaken based on the design and execution of this research. The chapter has been structured in alignment with the Saunders et al. (2007) Research Onion model, where the research design has been conceptualized as series of concentric layers i.e. from the outermost layer focusing on the philosophical assumptions to the inner most layer of data collection and analysis technique. Each layer has presented justifiable and deliberate decision, and the purpose of using this structured approach is to ensure critical rigor, transparency and coherence throughout the chapter. The following table has presented the onion layer, choice adopted and key justification for doing so;

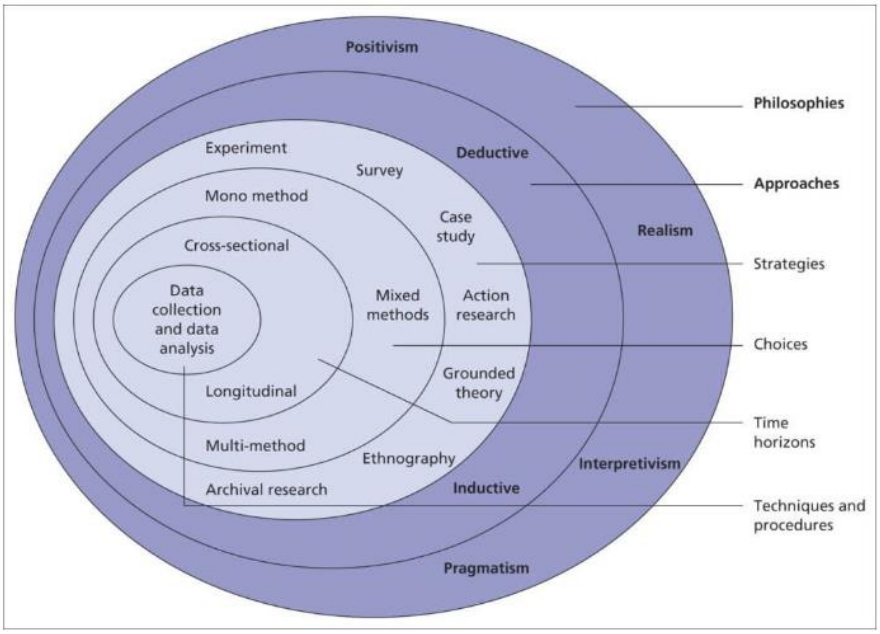

Figure 5: Research Onion Model (Source: Saunders et al. (2007))

Table 1: The Research Onion Model Applied to This Study

Onion Layer	Choice Adopted	Key Justification
Philosophy	Interpretivism	Subjective Analysis
Approach	Inductive	Established NRBV, Institutional Theory, CE frame-

		works tested against data
Strategy	Archival / Case Study	Annual Reports as archival data; single case study
Methodological Choice	Qualitative analysis supported by statistics and data	Numerical KPIs; trend analysis; no subjective interpretation required
Time Horizon	Longitudinal (2022–2025)	Trajectory-focused objectives; four consecutive reporting periods
Techniques	Content Analysis + Trend Analysis	KPI extraction, analysis based on key areas, themes formulation

3.1 Research Philosophy

3.1.1 Positivism Paradigm

In the Research Onion, the research philosophy is the outmost foundational layer that embodies the assumptions of the researcher about the nature of the reality, the nature of knowledge, and the relationship in between the subject and researcher during the study. A total of five broad philosophical positions have been identified by Saunders et al. (2017), which include positivism, critical realism, interpretivism, postmodernism, and lastly the pragmatism. Considering this research and its objectives, the positivist philosophical stance has been selected, and this can be attributed to the fact that this stance holds reality as objective, and knowable through series of empirical measurements and observations. The positivism or positivist stance is appropriate based on the subject matter reasoning i.e. the environmental sustainability performance of Huhtamaki, which constitutes quantitative and independently audited key performance indicators (KPIs). These KPIs include the waste-to-landfill ratio, renewable energy share that is commonly expressed in percentage, and lastly the GHG emissions that is expressed in tCO2e. The aforementioned KPIs are measurable and objective, and free from the interpretation of the researcher. Moreover, the research question and objectives are focused primarily on the degree to which the target has been achieved, the

rates of change, and measurable trends, all of which are analytical tasks that can only be achieved through quantitative data.

3.2 Research Approach

3.2.1 Inductive Reasoning

This layer in the Research Onion is concerned with the flow of reasoning, which can be either or from data to theory, or from theory to data. Both of these approaches are fundamentally different, but since this research has already laid out the plan of proceeding from quantifiable data to theoretical propositions, inductive approach to reasoning is more suitable for this research. This is also embedded in the fact that this research intends to use the data from Huhtamaki's Annual Reports, and they analyze the data based on theories, mentioned in Section 2.3, to address the research question. This is completely different from deductive reasoning, where the focus remains on moving from theoretical propositions to empirical data. This approach would have more appropriate for a study that intends to offer a new theory or make amendments in existing theories; however, this is not the case in this research.

There are three reasons embedded in the appropriateness of inductive reasoning for this research. First, there is abundance of theories and frameworks available with regards to corporate environmental sustainability and SSCM like the Natural Resource Based View (NRBV), Stakeholder theory, Legitimacy theory, and Triple Bottom Line framework and Circular Economy framework. Secondly, the research objectives and their structure are inherently inductive, where each objective has specifically targeted a phenomenon to be explored, while ensuring that it is sufficiently evaluated against the theoretical expectations. The last reason is embedded in the nature of this research, which is longitudinal secondary data, and it aligns perfectly with the inductive approach, since the focus remains on systematically comparing the observed outcomes against the predicted patterns in the theories. Though, abductive reasoning can be considered as a contingent possibility because of the emergence of unexpected data patterns, but this research has primarily adopted deductive reasoning for this research.

3.3 Research Strategy

3.3.1 Archival Analysis and Single Case Study

This research is based on the archival research in a single case study of Huhtamaki. According to Saunders et al. (2017), archival research is applicable where the purpose remains on analyzing administrative records, secondary data sources and published documents, which not only is limited to regulatory filings, but also entails annual reports from companies, and their sustainability disclosures. The data sources being used in this research are the Annual Reports of Huhtamaki of the years 2022, 2023, 2024 and 2025, which entails data related to environmental KPIs, strategic sustainability narratives, target progress updates, and sustainability governance disclosures. The reports have been produced in compliance with the CSRD/ESRS mandatory requirements (from 2024), TCFD recommendations (from 2023), and GRI standards (2022-2023). Within this research, single case study design has been combined with the archival strategy, where Huhtamaki has been treated as a unit of analysis. Moreover, in accordance with Stake (1995) distinction between instrumental and intrinsic case studies, it can be argued that the case of Huhtamaki falls within the distinction of instrumental, since the company has been selected for testing and elaborating on the environmental sustainability theory and broader SSCM.

However, there is a misconception about single case studies and their respective results to be ungeneralizable, as challenged by Flyvbjerg (2006), where the researcher argued about the careful selection of case, and the fact that it can offer theoretical and analytical generalization. This can also be attributed to the fact that the selected company is among the largest packaging manufacturers in the world and has a centralized role in the global beverage supply chain, as well as the availability of verified and comprehensive sustainability disclosures; hence, it can be argued that the use of single case study can enhance the analytical generalization for companies, especially the FMCG-serving packaging companies. However, it must be clarified that the findings of this research can be inherently assumed to represent the case of all the companies operat-

ing in the market, or even the packaging manufacturers because of the infrastructure and regulatory context. This has been further elaborated and discussed in the limitations section in Chapter 5.

3.4 Methodological Choice

3.4.1 Quantitative – Mono methods

This research is based on qualitative design, which Creswell and Creswell (2017) has characterized as a collection and analysis of subjective information, where there is no requirement of mathematical and statistical techniques application. The application of qualitative methods, in this research, can be justified based on the research objectives; the objective related to the environmental sustainability performance of Huhtamaki and its analysis based on theories, and since the research objectives are intended to work towards the extent to which the targets have been achieved, rates of change, and trend identification – all of these tasks require comprehensive analysis, followed by subjective interpretations. In this research, secondary qualitative data is sufficient to address the research objectives.

3.5 Time Horizon

Longitudinal time horizon has been used within this research, and this is evident in the use of 4 consecutive years of data from the annual reports. Furthermore, longitudinal design is different when compared against cross-sectional design, which focuses on a single point of time, but this may not be applicable of relevant in this research. This can be argued as the result of the requirement to analyze the change over time. The 4 year time-frame used within this research has both analytical and practical reasons. This research has covered the mandatory CSRD reporting (2024 onwards) and CSRD voluntary reporting (2022-2023), which implies that this research has focused on the comparison of the reporting quality before and after the changes in the law. It has also covered an external change, which were in the form of renewable energy contracts activation, post-pandemic recovery, and inflationary pressures. All of these collectively have enhanced the context and meaning in environmental performance data.

3.6 Data Collection and Analysis Technique

The data in this research has been collected through the Annual Reports content analysis, which Krippendorff (2018) argued as a research method involving the careful reading of the documents, followed by careful identification of the needed information, and recording it in a manner that is both consistent and concise. In this research, the focus of the researcher has remained on identifying and reading the annual reports carefully before following the data points to be extracted on annual basis. The data points included;

- total energy consumption
- electricity from renewable sources
- Scope 1 and Scope 2 GHG emissions
- recycled or renewable material percentage
- fiber materials percentage from recycled or certified sources
- landfill waste share
- recycling of non-hazardous percentage, and

After the collection of the data, year-on-year changes were calculated for each of the aforementioned indicator. Both percentage changes and absolute changes were calculated. For the GHG emissions, the company's baseline year was taken into consideration, which allowed comparing it with the Huhtamaki 2030 targets, while identifying the extent to which the targets have been met. This comparison of stated targets and actual performance has been the center of analysis in the following chapter, and this has further been explained and critiqued in the Discussion using academic theories and literature.

3.6.1 Explanation of Derived Calculations

The figures presented within the findings chapter are not directly disclosed within a single location in the Annual Reports and were primarily derived by the researcher through the use of arithmetic operations across different report sections. The following

subsections explain each derived calculation in a transparent manner, as to verify and reproduce the methods.

3.3.1.1 GHG Reductions

With regards to GHG reduction percentages for Scope 1 and 2, it is important to mention that 2019 Annual Report of Huhtamaki mentioned about 764,000 tCO2e as estimated baseline combined Scope 1 and 2 and were disclosed in the Annual Report of 2022. The year-end figure in 2022 was approximately 681,000 tCO2e, which represented a cumulative reduction of roughly 11 percent i.e. 83,000 from the baseline. The absolute Scope 1 and 2 reductions, as per 2023 Annual report, disclosed were 115,100 tCO2e or 17 percent during the year. This brings the cumulative reduction to 201,100 tCO2e from 2019 base and represents 26.3 percent of 764,000 tCO2e baseline. This figure has been taken directly from Annual Report of 2023, and this implies that these were not independently calculated.

The ~40 percent by 2024 was derived using the Annual Reports. Newly activated VPPA arrangements, as identified in 2024 Annual Report, were estimated to additionally reduce approximately 80,000 tCO2e during the year. If this figure is added into 201,100 tCO2e, which was already achieved by 2023 i.e. 281,000 tCO2e cumulative reduction, it represents approximately 37 percent of the baseline i.e. 764,000 tCO2e. In addition to this, the Annual Report of 2024 clearly mentioned that Scope 1 and 2 emissions were reduced by approximately 40 percent from 2019 baseline. The figure in findings chapter reflects the disclosed statement, and the researcher noted this as consistent with the arithmetic derived above.

3.3.1.2 Waste to Landfill

Though, the 2022 Annual Report did not explicitly mention the landfill percent in numeric values, but it mentioned about waste to landfill, and that it decreased by 10 percent in comparison to 2021. This has been reflected in the findings chapter and within the table. Moreover, within the table, the disclosure has been reflected in the table as ~10%+ entry, which was derived from Annual Report 2022 alongside 2021 comparative

disclosure, instead of extracting precise figures from the report. For 2023 (8.2%), 2024 (5.5%), 2025 (4.7%) figures were directly disclosed in the Annual Reports respectively, and the researcher did not derive them.

3.3.1.3 Non-Hazardous Waste Recycled

The percentage for non-hazardous waste recycled or composted, as per 2024 Annual Report, was +90%, but the primary disclosure section had no single precise percentages. In this context, it can be argued that the entry of >90% in the table is direct transcription of disclosed range, instead of a figure derived by the researcher.

3.3.1.4 Renewable Electricity Percentages

The shares of all renewable electricity figures i.e. 60.9% (2025), 59.5% (2024), 41.7% (2023), and 24.9% (2022) were directly available within the respective Annual Reports. The researcher did not apply any arithmetic derivation to these figures.

3.3.1.5 Material Circularity

The shares of all recycled or renewable figures i.e. 68.0% (2025), 66.3% (2024), 66.1% (2023), and 65.8% (2022) were directly available within the respective Annual Reports. The researcher did not apply any arithmetic derivation to these figures. The same is being stated for the certified or recycled fibre share figures, as these were directly disclosed, and not derived.

The aforementioned classification has confirmed that the Annual Report disclosures were the primary source of data for the tables. Cumulative GHG reduction and their respective percentages for 2024 were derived calculations, but this can be validated from the narrative disclosure in 2024 Annual Report of Huhtamaki. Disclosure ranges or directional statements have been presented where there were no precise figures, but these were not research estimations but were from the Annual Reports.

3.7 Research Quality, Ethics, and Limitations

The quality of the research is ensured by collecting data directly from the company and its annual reports, since the data used in this research is extracted directly on the audited documents that are publicly available. This means that there are no significant ethical concerns surrounding this research, especially since not a single person was observed, surveyed or interviewed; hence, consent and privacy issues are not applicable in this research.

However, it is important to mention that this research has only selected and covered Huhtamaki, and the research relies heavily on the data collected from the annual reports, which can be argued as a limitation of this research. Though, the data is reliable and relevant, it is important to mention that the calculation methods for some measures have changed over the years, which has led to comparability issues. Similarly, the application of secondary quantitative data analysis has not captured the lived experiences of sustainability professionals within Huhtamaki, or the internal management discussions surrounding the phenomenon. Hence, there are the limitations of the research, and these have been individually and collectively discussed and acknowledged within the research, especially throughout the analysis.

4. Findings

This chapter presents environmental performance data analysis from 2022 to 2025, which was extracted from the annual reports of the company. The four areas of environmental performance that has mainly been focused upon include the greenhouse gas emissions, renewable energy use, raw materials sustainability, and waste management. This is presented in different sections, and the results have been compared against the 2030 targets of Huhtamaki.

4.1 Performance Summary

The analysis of the four key areas reflected significant and consistent improvements in environmental performance of Huhtamaki. This is important since during these four years, the company's financial performance was not always growing; in particular, the net sales of the company was EUR 4,169 million in 2023 in comparison to EUR 4,479 million in 2022, and a partial improvement was reflected during 2024, as the net sales increased to EUR 4,126 million, and a modest growth in the following year. However, the environmental sustainability aspects showed considerable improvements on yearly basis, despite the changes in the revenue. From this aspect, it can be argued that within the operations of Huhtamaki, sustainability has become a fixed part, instead of being something that changes with the growth of the business.

4.2 Greenhouse Gas Emissions

4.2.1 Scope 1 and Scope 2 – Direct and Indirect Emissions

Within the sustainability program of Huhtamaki, the environmental measure that is most closely tracked was the greenhouse gas (GHG) emissions. The company within its annual report has reported 3 types of emissions, as discussed in section 2.5, which are; Scope 1, Scope 2, and Scope 3. Scope 1 is concerned with the emissions resulting from the company's equipment and factories. Scope 2 is concerned with the emissions from the electricity bought, and Scope 3 is concerned with the emissions from the disposal of products by the customers, and from the suppliers. The most common method of

measuring these are in tons of CO2 equivalent or simply tCO2e. The science based targets (SBT) established by the company regarding the reduction of Scope 1 and Scope 2 emissions combined was 27.5 percent by 2030, and this has been measured against 2019 as the baseline. SBTs are goals for emission reductions, and are generally calculating based on climate science, which helps in highlighting the strategies and practices that must be adopted to limit global warming.

In the year 2022, the combined Scope 1 and Scope 2 reductions reported by Huhtamaki was 2.4 percent, when compared against 2021, and this implies that the company saved approximately 16,800 tons of CO2. Despite the production of greater goods during the year, the reliance on renewable electricity and the efficiency improvements adopted by the company led to significant emissions reduction. If 2019 is taken as the baseline, approximately 11 percent of the Scope 1 and Scope 2 emissions have been reduced, which accounts to almost 81,800 tons of CO2.

The year 2023 represents much larger improvements, and this is reflected in 17 percent decline in Scope 1 and Scope 2 emissions, and these had an equivalency of approximately 115,100 tons of CO2. Furthermore, the product's emission per ton also reduce by 9 percent, and based on this, it can be identified that approximately 563,000 tCO2e were the combined emissions of Scope 1 and Scope 2. Based on the 2030 targets, this year was substantial as these reductions in emissions made the company 7 years ahead of the schedule of reaching 27.5 percent. The major driver for this reduction can be attributed to the use of renewable electricity i.e. to 41.7 percent in 2023 against 24.9 percent in 2022.

In 2024, 40 percent cumulative reduction was reported from the baseline of year 2019. More importantly, the annual report of the year indicated about the activation of a renewable electricity contract that could further reduce 80,000 tons of CO2. Furthermore, Huhtamaki's renewable electricity usage increased to 59.5 percent.

In 2025, Science Based Targets initiative (SBTi) gave Huhtamaki the approval for a new target i.e. 50.44 percent reduction in both Scope 1 and Scope 2, and that too by 2030, which can be argued to be a lot stricter when compared against previous years. Furthermore, instead of using 2019 as the baseline, the new baseline introduced was 2022, and the improvements were to be measured based on 2022 baseline. This can be argued to be more ambitious and in alignment with the 1.5°C climate target, if compared against the previous 2°C goal. According to the Annual Report of Huhtamaki for 2025 revealed that the renewable electricity usage increased to 60.9 percent and the total energy usage was approximately 2,288 giga watt hours (GWh).

4.2.2 Scope 3 – Supply Chain Emissions

Scope 3 is significantly difficult for Huhtamaki to control, as the emissions are from external suppliers and the materials purchased from them, which accounts for approximately 57 percent of the total (Annual Report, 2023). Similarly, the report identified that the second factor that has major contribution in Scope 3 emissions is the consumers, who throw away the packaging product after consumption, and they account for 31 percent. The remaining Scope 3 emissions are from the commuting of employees, travel for business purposes, and transportation.

Scope 3 emissions during 2022 increased by 3 percent because of the 6 percent increase in material purchased from the suppliers, as well as the recovery of business travels right after the COVID-19 pandemic. The 2023 Annual Report indicated about significant 11 percent reduction in Scope 3 emissions, and this was acknowledged as the result of 10 percent reduction in the material purchases, which was the result of decline in production volumes. 2023 is an interesting year for Huhtamaki, since it launched its 1st supplier program, where the key suppliers were required to establish their emission targets based on science. In fact, the suppliers were required to ensure that 70 percent of their spending were for the very goals established by them, and this was to be done by 2026. During the remaining years of 2024 and 2025, emissions reduction was given more importance during both the years, as more recycled materials

were used in the production. During 2025, Scope 3 targets were set to 25 percent to be achieved by the year 2030, and the baseline established was 2022, which covered business travels, transport, and purchased goods.

4.3 Renewable Energy Use

To reduce carbon emissions, Huhtamaki switched its operations to renewable electricity, and during 2022, the percentage of renewable electricity used accounted for 24.9 percent, which increased to 60.9 percent by 2025. This implies that the percentage doubled within just 4 years.

The targets were achieved using Virtual Power Purchase Agreements, as a tool, which as previously mentioned is a control through which the company purchases electricity generated in a certain amount from solar and wind farms i.e. renewable sources, but without having direct physical connections. Such contracts are of significant importance, as it contributes in increasing the usage of renewable electricity, even in regions where the energy infrastructure and grids relies heavily on fossil fuels.

The first VPPA contract of Huhtamaki was with North America in 2022, which covered approximately 25-30 percent of the electricity in North America in comparison to Europe's 80 percent of renewable electricity coverage. With both of these contracts together, the Annual Report of 2022 confirmed about the global share increasing to 24.9 percent. Significant improvements were reported in the following 2 years i.e. 2023 and 2024, where the increase in share increased from 41.7 percent to 59.5 percent, respectively. This can be acknowledged as the result of new contracts activation. The Annual Report of 2024 indicated about a significant a new VPPA in 2024, which was expected to reduce 80,000 tons of CO2. However, 2025 witnessed slower progress i.e. increase from 59.5 percent to just 60.9 percent in the year, and this was due to no new contracts, as majority of the deals were already in place in North America and Europe, and to achieve 100 percent would require new contracts in developing and emerging markets like Africa, Middle East and Asia.

The following table presents information about the energy, emissions and material data extracted from the Annual Reports i.e. (2022-2025).

Table 2: Energy, Emissions and Material Data (Source: Huhtamaki Annual Reports (2022-2025))

Indicator	2022	2023	2024	2025
Total energy use (GWh)	2,348	2,185	2,193	2,288
Renewable electricity (% of total)	24.9%	41.7%	59.5%	60.9%
Scope 1+2 reduction vs 2019 baseline	~11%	~26.3%	~40%	New 2022 baseline
Renewable or recycled materials (% of total)	65.8%	66.1%	66.3%	68.0%
Certified or recycled fiber (% of fiber)	98.0%	98.7%	98.5%	>98%
SBTi target level	Well-below 2°C	Well-below 2°C	Well-below 2°C	1.5°C (validated)

4.4 Sustainable Raw Materials

The materials at Huhtamaki are tracked using two measures, where the first is the share of materials used in production to be either recycled or renewable, and the second measure is related to the fiber-based materials' share, which comes from certified recyclable or sustainable sources.

During the year 2022, Huhtamaki accounted for 65.8 percent of either recycled or renewable materials and 98 percent of the fiber materials were from recycled or certified sources. According to the Annual Report (2022), the company even introduced new paper-based ice cream container, where instead of using plastic was based on water-

based coating; hence making it 95 percent recyclable and bio based within the United States.

During 2023, the recycled or renewable materials' share slightly increased from 65.8 percent to 66.1 percent, and same can be said for fiber, which increased to 98.7 percent from 98 percent. However, this year Huhtamaki worked towards three important developments embedded in its Blue loop range, where single material was used for new flexible packaging product, instead of its traditional approach of gluing several layers of materials together. The purpose here was to ensure that this packaging can easily be recycled in waste streams, and that too in standard manner, since multi-layered laminates cannot be recycled in standard waste streams.

During 2024, the company's share of recycled or renewable material increased to 66.3 percent, but the fiber measure witnessed reduction to 98.5 percent from 98.7 percent. In the United Kingdom, Huhtamaki introduced takeaway boxes that were made from renewable materials, which were compostable and recyclable. More importantly, the figure jumped to 68 percent, and new product by the same of Pro-Dairy was introduced specifically for dairy products and yogurt. The Pro-Dairy had less than 10 percent plastic and was developed in consideration with the paper waste streams in the European countries.

4.5 Waste Management

The two waste measures tracked by Huhtamaki include; all waste percentage sent to landfill and non-hazardous production waste's percentage that is composted or recycled. 2030 goal of Huhtamaki is to ensure that landfill waste is reduced to 0, and approximately 85 percent non-hazardous waste is recycled.

During 2022, the percentage of composting and recycling the non-hazardous waste accounted for 75.2 percent, and 10+ percentages was reported for landfill waste, but it important to mention that the landfill waste was lower in comparison to 2021. On the

contrary, the share of recycled waste increased to 79.4 percent, and landfill waste reduced to 8.2 percent, respectively.

Explicit data was reported during 2024, where landfill waste reduced to 5.5 percent, and it represented 2.7 percentage points when compared against previous year. Similarly, the recycling rate of non-hazardous waste was greater than 90 percent. On the contrary, 4.7 percent landfill waste was reported, and recycling of non-hazardous waste was reported to be 84.6 percent, and it indicated that the interim target of 85 percent was near achievement. The Indiana factory in the United States had particularly notable achievement, where zero waste to landfill by recycling was reported, and it implied that unrecyclable waste was being converted into energy.

This has further been explained through the following table;

Table 3: Waste Data (2022–2025) (Source: Huhtamaki Annual Reports (2022-2025))

Indicator	2022	2023	2024	2025
Non-hazardous waste recycled (%)	75.2%	79.4%	>90%	84.6%
Waste to landfill (% of total waste)	~10%+	8.2%	5.5%	4.7%
Energy intensity (MWh per sellable ton)	2.1	2.1	N/A	N/A

4.6 Sustainability Governance and Reporting

During the four years studied in this research, it was found that the ways in which sustainability has been managed and reported drastically changed. For instance, during the year 2022, sustainability at Huhtamaki was managed from Group level, and the

seniors' managers pay was directly linked with the sustainability performance indicators. The measures used by the company included; Scope 1 and Scope 2 total emissions, recycling share of non-hazardous waste, Eco-Vadis score of the company – an independent sustainability rating agency. However, this was changed in 2023, where the company aligned its reporting with a climate risk international reporting framework i.e. Task Force on Climate Related Financial Disclosures (TCFD). In addition to this, Huhtamaki also started preparing for the Corporate Sustainability Reporting Directive (CSRD) in European Union, followed by launch of a formal program with a purpose of encouraging and engaging the key suppliers to work towards the development of science-based emission targets.

The mandatory CSRD reporting was in 2024, which implied following European Sustainability Reporting Standards (ESRS), where it was mandatory for the companies to important social and environmental topics for Huhtamaki and its stakeholders. This double materiality assessments result in the identification of the following environmental topics;

- Biodiversity
- Water withdrawal
- Energy usage
- Climate change (GHG emissions)

During 2025. Gold Medal was received by Huhtamaki for its exceptional sustainability performance, in addition to the validation of SBTi of 1.5°C targets. The sustainability management responsibility was shifted to individual business segments from the Group headquarters, which eventually resulted in the direct accountability of local teams. However, the Group retained the role of oversight and coordination. More importantly, the pay measure for executives was linked to the GHG emissions, which was to be announced in the first quarter of 2026.

Table 4: Governance and Reporting Changes (2022–2025) (Source: Huhtamaki Annual Reports (2022-2025))

Area	2022	2023	2024	2025
Reporting framework	GHG Protocol, GRI	TCFD alignment added	CSRD / ESRS (mandatory)	CSRD/ESRS + 1.5°C SBTi
External rating	EcoVadis (improving)	EcoVadis (improving)	EcoVadis (improving)	EcoVadis Gold Medal
SBTi standard	Well-below 2°C	Well-below 2°C	Well-below 2°C	1.5°C (Dec 2025 validated)
Governance level	Group HQ	Group HQ	Group HQ	Segment-level (decentralized)

5. Discussion

5.1 Theoretical Analysis

5.1.1 Natural Resource Based View

Hart (1995) developed and published Natural Resource Based View (NRBV) as an extension of Resource Based View (RBV) by Barney (1991). The purpose of this theory was to understand the reasoning for investment in environmental sustainability, as compared to previous RBV, which argued that companies with environmental limits must focus on three specific capabilities, which included; cleaner operations (i.e. pollution prevention), products designed in such a way that it causes less harm (product stewardship), and long-term solutions for healthier planet (i.e. sustainable development). In fact, Hart (1995) argued that once companies can achieve competitive advantage by developing all these capabilities, which in turn facilitates in better performance over competitors in the long-run.

The strategy adopted by Huhtamaki clearly depicts all three capabilities. In particular, the renewable electricity and efficiency in energy have enabled the company in its objective of cutting GHG emissions. This clearly depicts the case of pollution prevention. The packaging range of mono-material in Blue loop and the paper cups for Pro-Dairy reflects product stewardship capability, since both have been designed by Huhtamaki in such a way that it can be recycled after use. This ensures that the packaging does not get sent to the landfill sites but instead are recycled. The Virtual Power Purchase Agreements (VPPAs) reflects sustainable development capability since these agreements ensure funding for solar and wind farms. This has shifted away the focus from certificates for renewable electricity. Moreover, Aragón Correa and Sharma (2003) argued that when companies develop proactive environmental strategies, it offers such companies with numerous benefits, despite complexity and uncertainty within the business environment. From Huhtamaki's case, it can be established that during 2022 and 2025, the company experienced numerous complexities and uncertainties in the form of post-pandemic disruptions, pressure from consumers, changing prices of raw

materials, and new EU laws. This implies that the pro-activeness demonstrated by Huhtamaki would pay off, as established in this theory. In fact, the company was able improve its sustainability performance and even maintained its profitability simultaneously.

The study by Russo and Fouts (1997) was based on 243 companies, and the authors established that higher financial profitability was directly linked with higher environmental performance, especially in industries that are in their growth phase. For Huhtamaki, the sustainability investment became a financial strength for the company, despite being costly. However, Buysse and Verbeke (2003) argued that environmental investments and its competitive benefits are not automatic, but depends on the customers' demands, regulators' pressure, and industry's structure. For Huhtamaki, the competitive benefits are evident and visible in the form of contracts from global beverage brands, as part of their commitments to sustainability, which can be argued as a commercial link that cannot be measured directly despite it being a reality.

5.1.2 Stakeholder Theory

Freeman (1984) developed this theory, and it argued that companies should concentrate on managing their relationship with all groups that are affected or be affected by its activities. Stakeholders, the group, are not just in the form of investors, suppliers and regulators, but also in the form of communities, employees, and customers. Mitchell et al. (1997), in this context, argued that three factors are considered by managers to prioritize the stakeholder groups, which include, their power of the company, legitimacy of their claim, and the urgency of their attention. This logic has been demonstrated within the sustainability actions taken by Huhtamaki. In particular, the sustainability-linked bonds of the company are held by investors, which mean that they have direct financial power, and failure of missing the sustainability targets can in fact lead to an increase in interest rates on EUR 500 million bonds (Huhtamaki, 2025b). This makes it evident that power and urgency are with the investors, and this makes them high-priority stakeholders. In addition, the brand-owner customers also have power

because they source the packaging of Huhtamaki, and the company must respond to their legitimate sustainability demands given their purchasing decisions and their respective effects on the business and its performance.

Two of the supply chain environmental management approaches discussed by Bowen et al. (2001) included; proactive and reactive, where the former reflects responding to immediate demands, and the latter anticipates the future stakeholder needs. The case of Huhtamaki reflects pro-activeness, as evident from Blue loop, where the program was developed and implemented for recyclable packaging ahead of the regulatory requirements, instead of being a response to existing law. It has also been argued that companies with long-track records and extensive networks on stakeholders can convert this relationship into financial returns (Barnett, 2007), and century-long history of Huhtamaki in the packaging sector as well as its customer network spanning across the globe provides this capacity.

5.1.3 Legitimacy Theory

Suchman (1995) developed legitimacy theory, and it argues that the wider society must accept the activities and operations of the business. This means that if the society accepts that the operations of the company are in accordance with their expectations i.e. contributing positively to the environment and society, and following the laws and regulations, it can continue to operate based on the social license. However, the legitimacy is threatened if the society doubts that the intentions of the company. Given this aspect, the legitimacy seeking behavior is evident from the case of Huhtamaki, given its progressive expansion on the sustainability reporting i.e. full CSRD mandatory compliance in 2024 from just GRI based voluntary disclosure in 2022. Huhtamaki presented the report credibly, which was further verified by third parties, and this in turn resulted in stronger legitimacy. This can be corroborated from the findings of Deegan (2002), where it has been highlighted that regulatory pressure and external scrutiny results in environmental disclosures. This is evident in the form of CSRD rollout.

An important distinction was drawn by Cho and Patten (2007) and argued that companies have been leveraging sustainability reporting as a symbolic tool, and this implies that companies claiming that their operations are sustainable, when they are not. However, the case of Huhtamaki is different from being symbolic, as evident from the preceding chapter, where the company's disclosures were backed by measurable and consistent improvements across every environmental indicator. From this perspective, it can be argued that Huhtamaki's disclosures are not merely symbolic sustainability. On the other hand, it has also been argued that companies have focused greatly on presenting their progress and their respective stories, instead of acknowledging the current gaps. This is quite visible in the annual reports of Huhtamaki, despite this genuine progress can be confirmed based on the underlying statistics.

5.1.4 Triple Bottom Line and Circular Economy

The Triple Bottom Line, as a framework, as introduced by Elkington (1997), and this framework argues about measuring a business performance against the areas of People, Planet and Profit. The environmental domains cover the Planet dimension tracked and analyzed within this study; whereas the adjusted EBIT margin of Huhtamaki i.e. 9.4 percent in 2023, and its recovery towards 10-12 percent long-term target presents the Profit dimension. In similar context, the study by Dyllick and Hockerts (2002) argued that being financially successful and environmentally responsible are not opposite. In simpler words, Huhtamaki has focused all its attention on the People, Planet and Profit dimensions, and because of it has been trusted by the investors and customers, innovative and resource efficient. This confirms that the company is more likely to be and remain profitable in the long-run, and this can be attributed to previously mentioned aspects.

On the other hand, the application of circular economy offers an understanding of product design strategy of Huhtamaki, where the materials are used as long as possible, since these are designed in such a manner that these can be recycled, reused and repaired. This corroborates with Kirchherr et al. (2017), where the core idea was identi-

fied as implemented by Huhtamaki. On the contrary, design for disassembly was identified as critical circular design principle by Bocken et al. (2017), which argues about products that can be easily broken down for recycling. If the case of Blue loop of Huhtamaki is considered, it can be argued that it reflects this principle, since single material has replaced complex multi-layer laminate, and the packaging can be recycled and separated by already existing waste system.

5.2 Discussion

5.2.1 Huhtamaki's GHG Performance

The GHG results of Huhtamaki shows Scope 1 and 2 reductions by approximately 26.3 percent since 2019-2023 and by 2024 it was roughly 40 percent. Based on this, it can be argued that GHG reduction trajectory of Huhtamaki notably exceeds the pace typically documented in SSCM literature. In this context, Gimenez and Tachizawa (2012) categorised supplier management practices in terms of monitoring and collaboration and found monitoring being the primarily compliance driven. Based on this, it has been argued that a majority of companies have relied on compliance-based supplier monitoring, instead of proactive collaborative sustainability development. If this is considered, the analysis shows that the trajectory of Huhtamaki is opposite, since its targets and programs are science-based, and proactive rather than being reactive.

When Scope 2 reduction at Huhtamaki is considered, it can be argued that the primary driver for it was renewable electricity adoption, especially in the form of VPPAs. In this context, IEA (2023) highlighted that the global contracted capacity exceeded 300 gigawatts because of power purchase agreements in 2022, which directly implies that VPPAs for renewable electricity procurement are among the leading mechanisms through which companies can decarbonize their electricity supply. Furthermore, the study by Bachus and Lim (2023) is worth mentioning as it indicated about Scope 2 reductions through VPPAs, as these are aligned with science-based-target initiatives, and net zero commitments, and this is perfectly aligned with Huhtamaki's case. Based on

the preceding analysis, it has become evident that the VPPA strategy of Huhtamaki is well-aligned with the best practices evidence on Scope 2 emission reduction.

There is a prevalent gap in between the progress of Scope 1 and 2, against Scope 3, which also requires careful examination. In this context, it was concluded by Seuring and Muller (2008) that addressing upstream Scope 3 emissions are most difficult in terms of management, since companies have limited control over the ways in which the materials are sourced or energy is generated by the suppliers. In addition, Caniels et al. (2013) insisted of moving beyond science-based targets for suppliers, and this was attributed to the fact that emissions reductions cannot be guaranteed unless this commitment is supported by financial incentives and data verification. This in the case of Huhtamaki and its Scope 3 program presents a risk, since 70 percent of the spending by suppliers, as part of 2026 target, are not the output metric, but it is an input metric. Gold et al. (2010), in this context, argued that supply chains can only create sustainable values through actions across multiple tiers within the supply chain, rather than just concentrating on the focal company. Despite the Scope 3 of Huhtamaki moving in this direction, it still requires numerous initiatives to ensure that multiple tiers of supply chain are involved simultaneously.

5.2.2 Huhtamaki's Renewable Energy

During 2025, the share of renewable electricity grew to 60.9 percent from 24.9 percent in 2022, which can be argued as significant improvement for Huhtamaki even against the average of the manufacturing companies operating on global scale. In fact, IEA (2023) reported that 30 percent of the electricity was procured using renewable sources. This is in accordance with the findings of Bachus and Lim (2023), where the authors concluded the significant role of VPPAs for companies to reach renewable electricity levels that could not be possible to reach in isolation. This mechanism was applied by Huhtamaki. During 2024 and 2025, the percentage point of growth was just 1.4 percent, and this reflected a slowed pace of growth, despite 7-17 percentage point gains after 3 years. This is exactly the S-shaped curve of technology adoption, as de-

scribed by Rogers (2003), where it was established that more targets are required for later gains; whereas large-scale contracts can lead to easy and quick early gains. This has also been confirmed that accessibility to renewable electricity for global supply chain are restricted because of the emerging market manufacturing sites. This can be attributed to weaker grid infrastructure, and less developed VPPA markets. This can be further explained in reference to the Asian and Middle Eastern factories of Huhtamaki, and the constraints that it may had to face without VPPAs.

The concepts of 'greening Goliaths' and emerging Davids' was introduced by Hockerts and Wustenhagen (2010), where the former is for gradual environmental performance improvements experienced by established companies; whereas the latter is used for newly established companies that is based on sustainability. From this perspective, Huhtamaki can be argued as Goliath, because of contract-based and careful transition of renewable energy, instead of radical transition. This is the reason for the limited pace of innovation, but despite this, it has offered Huhtamaki with predictability and stability. Hockerts and Wustenhagen (2010) further acknowledged that large scale environmental improvements can be achieved by Goliath simply because of their size, and that such companies infrequently lead radical transformation. This finding can be linked with the slower commercial penetration of Blue loop, since it requires cooperation from the customers, time and market development for transforming the product portfolio.

5.2.3 Huhtamaki's Material Sustainability

During 2025, Huhtamaki share of recycled or renewable materials increased to 68 percent from 65.8 percent in 2022, and this depicts a slower growth i.e. just 2.2 percentage points during the last 4 years. This is justified based on the findings of Geissdoerfer et al. (2017), where the authors argued that in the manufacturing sector, the transition of circular economy is time consuming because of the changes in recycling infrastructure, specifications from the customers, production machinery and design of product simultaneously. This is further corroborated from Koberg and Longoni (2019), where

circular supply chain implementation was found to be time consuming, and this was attributed to the gap in between market readiness and design intent.

The study by Esposito et al. (2018) highlighted three constraints with respect to FMCG sector and circular economy adoption. The first constraint is the cautiousness of the brand owners about the reaction of the consumers to unfamiliar packaging; the second is related to retailer's ability of packaging in accordance with the performance standards that recyclable alternatives can match; and lastly the difference of recycling infrastructure across countries. The last constraint implies that a product that can be recycled in Germany may not be recyclable in Asian countries given the infrastructure. All the constraints are also applicable to the Blue loop flexible packaging; hence resulting in slower penetration rate across the globe. This corroborates with the findings of Geyer et al. (2017) that less than 9 percent of the plastic waste is recycled across the globe, and this can be further associated with the unavailability of the recycling infrastructure. This implies that without sufficient level of reprocessing system, landfill sites may become full despite perfectly designed recyclable packaging. Considering this, the Cup Collection Program of Huhtamaki works with different stakeholders like the retailers, waste management companies, and even municipalities for recycling infrastructure, which can be argued as a strategic necessity. This is primary due to the market infrastructure gap that can be addressed through this program, instead of just resolving the product design gap.

5.3.4 Hautamaki's Waste Management

During 2025, the company reported 4.7 percent of the waste generated resulted in landfill, which previously was greater than 10 percent. Similarly, during the same period, the recycling of non-hazardous waste increased to 84.6 percent from 75.2 percent. Both measures reflect consistent improvement. This can be supported by the findings of King and Lenox (2001), where it was argued that less waste from companies reflect greater profitability and improved efficiency, which also shows that operational efficiency and environmental improvements often go hand in hand. If the experience of

Hautamaki is considered, cost reduction benefits are presented alongside waste reduction in the annual reports. On the other hand, Srivastava (2007) argued about the areas in which value creation occurs in green supply chain management, and these include; reverse logistics, operations, and product design. Given the case of waste management at Huhtamaki, it can be argued that it falls within the operations category. This can be further illustrated through Marion, Indiana, where the company reported water reduction by 55 percent and 0 percent waste to landfill. This also confirms that if given sufficient attention from management, it is possible to achieve targets at a single site.

6. Conclusion

6.1 Conclusion

The purpose of this research was to critically investigate into the environmental sustainability performance of Huhtamaki in between 2022 and 2025. For this purpose, secondary data from Annual Reports during 2022-2025 were analyzed based on already existing theories and frameworks, while triangulating the findings of this research with the wider literature. The objectives are as follows, as well as the key findings in reference to these objectives;

1. To track to greenhouse gas (GHG) emissions of Huhtamaki in between 2022 and 2025 with specific focus on Scope 1-3, while assessing the progress of the company against its emissions targets.

With regards to GHG emissions, it was found that Huhtamaki has made significant progress in reducing its environmental footprints. From just 2.4 percent decline in 2022 in Scope 1 and 2 emissions, the company during 2025 reduced 50.44 percent in both Scope 1 and 2. Furthermore, the company also changed its baseline to 2022, and the SBTis were more ambitious and aligned with climate targets. With regards to Scope 3 emissions, Huhtamaki during 2022 was only able to reduce it by 3 percent, but since these emissions are primarily from external suppliers and the materials purchased, Huhtamaki revised its targets to 25 percent to be achieved by 2030. From this perspective, this objective has been sufficiently met.

2. To examine the extent of renewable energy usage by Huhtamaki, and the progress it has made towards 100% renewable energy by 2030

To reduce carbon emissions, Huhtamaki switched its operations to renewable electricity, and during 2022, the percentage of renewable electricity used accounted for 24.9 percent, which increased to 60.9 percent by 2025. This implies that the percentage doubled within just 4 years. This was fundamentally achieved by relying on VPPAs. In particular, the first VPPA contract of Huhtamaki was with North America in 2022, which covered approximately 25-30 percent of the electricity in North America in

comparison to Europe's 80 percent of renewable electricity coverage. More importantly, the company achieved 60.9 percent of renewable electricity by 2025, which depicts that the company has been working towards the achievement of renewable energy goals. This also confirms that this objective was sufficiently met.

3. To assess the extent of changes in the packaging materials of Huhtamaki, while considering the share of recycled or renewable inputs, and circular packaging products' development

During the year 2022, Huhtamaki accounted for 65.8 percent of either recycled or renewable materials and 98 percent of the fiber materials were from recycled or certified sources. The shares slightly increased to 66.1 percent during 2023, and the share of recycled or renewable material increased to 66.3 percent in 2024. This reflects that the company has constantly been working on changing the packaging material in alignment with the circular design, while simultaneously working towards sustainable plastic packaging, as evident from Pro-Dairy, which was designed specifically for dairy products and yogurt.

4. To explain the findings of this research in reference to Resource Based View, Circular Economy framework, Legitimacy Theory, and Stakeholder Theory to compare and contrast the findings with broader academic literature.

First, the Natural Resource Based View is supported by the strong performance of Hautamaki. Environmental capabilities were invested in the form of waste reduction, circular product design and renewable energy, and Hautamaki's combined investments in these areas resulted in stronger market positioning and maintained profitability, especially as a sustainable packaging supplier. This implies that environmental investment with sufficient level of focus and commitment can transform into genuine business strength.

Second, the institutional pressures in the form of industry standards, investor's expectations, and EU laws have accelerated the environmental governance of Hautamaki.

However, the company not only complied with the pressure, but instead used it as a platform for the development of environmental capabilities that go beyond the requirements of law. This combination of genuine commitment and compliance is what has separated Hautamaki, a high performer, from the average ones in the industry.

Third, environmental progress in the form of GHG reduction required action across multiple areas. Though, Hautamaki's material circularity progress is slower than expectations, but its GHG reduction progress is strong. Despite this, it can be argued that performing good in one area but poor in another can affect the long-term sustainability of Hautamaki. This is in line with the findings of Seuring and Muller (2008), where it has been argued that environmental sustainability requires parallel progress across not just waste, but also materials and emissions, and it should not be sequential focus.

Last, packaging sustainability cannot be solved by a packing company like Hautamaki in isolation. Instead, the progress is heavily dependent upon the regulators, recycling companies, customers, producers of raw materials, and energy suppliers. This has been described as creating shared value by Porter and Kramer (2011); whereas Gold et al. (2010) argued it to be a defining feature of genuinely sustainable supply chain. The most important sustainability challenge for Hautamaki in near future should be the mass adoption of circular packaging products, and this can only be achieved with system-wide cooperation.

Conclusively, Hautamaki has shown consistent, measurable, and genuine environmental progress in between 2022 and 2025. The operational waste has significantly reduced; product innovation is moving in the right direction, emissions have drastically reduced, and maturity in governance. Despite this, the main challenge for the business is within the reduction of Scope 3, followed by validated net-zero pathway, and adoption of circular packaging. For the future, the company should focus on closing these gaps proactively and at the regulatory and climate environment demands.

6.2 Significance and Rationale of the Research

6.2.1 Practical Significance

This study and its findings have focused on offering packaging company's managers with clear and actionable insights by showing the quick improvements within the environmental management areas like switching to renewable energy, followed by areas that would take considerably longer like reducing Scope 3 or transforming the materials for packaging. In addition, the research and its findings have explicitly identified the effective management tools for real environmental progress, which can be applied within the manufacturing companies focusing greatly on environmental performance improvements within the context of supply chain.

6.2.2 Academic Significance

This contribution of this research has numerous academic implications. Firstly, this research and its findings are based on longitudinal quantitative analysis of Huhtamaki's environmental performance during 2022 to 2025, and not only covers the voluntary reporting, but also entails mandatory CSRD disclosure. This data-driven analysis is rarely available within the SSCM literature, which has focused greatly on qualitative case studies and surveys (Seuring and Muller, 2008). On the other hand, this research has tested numerous theories and frameworks against Huhtamaki's real performance data. This can facilitate in bridging the gap in between the theoretical frameworks and reality. Moreover, this research has responded to the need for quantitative and empirical grounded SSCM research, where rather than focusing on self-reported survey responses, the analysis is based on 4 years of independently audited sustainability data. Lastly, this research has offered new evidence on how the speed of performance improvements and quality of environmental data is affected as a result of mandatory sustainability reporting laws. This is specifically important given the fact that CSRD is recently introduced across the European Union.

6.2.3 Global Development and Policy Significance

For the policy makers, this research has offered insights and practical evidence on the ways in which market-based instruments and corporate sustainability reporting laws can encourage and push the companies towards environmental performance improvements. In fact, the findings of this research make it directly relevant to ongoing debates surrounding product recyclability standards, carbon pricing mechanisms, and mandatory disclosure frameworks. On the other hand, by connecting numerous United Nations Sustainable Development Goals I.e. Partnership for the Goals (SDG-17), Climate Action (SDG-13), and Responsible Consumption and Production (SDG-12), this research has demonstrated the ways in which private companies can work towards the achievement of global targets and making measurable contributions by bringing changes in their day-to-day supply chain operations.

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