



Vaasan yliopisto
UNIVERSITY OF VAASA

Eemeli Tikkanen

Balancing Sustainability Goals and Cost Efficiency in Procurement

A Case Study on Polycarbonates in Case Company

School of Technology and Innovation

Master of Science in Technology

Industrial System Analytics

Vaasa 2025

UNIVERSITY OF VAASA**School of Technology and Innovation**

Author:	Eemeli Tikkanen		
Title of the thesis:	Balancing Sustainability Goals and Cost Efficiency in Procurement: A Case Study on Polycarbonates in Case Company		
Degree:	Master of Science in Technology		
Discipline:	Industrial System Analytics		
Supervisor:	Inês Simoes de Brito Peixoto		
Year:	2025	Pages:	113

ABSTRACT:

Sustainability is increasingly shaping global industries, placing growing pressure on organizations to align sustainability goals with cost-driven performance. While regulation increases in sustainable matters, stakeholders' expectations evolve, driving organizations into facing several trade-offs between sustainability goals and cost-efficiency. This thesis evaluates how organizations balance the matters in procurement, using polycarbonates as a lens to single case-study, and aims to generalize the findings to broader scale in relating materials. The thesis evaluates the setting from case company's point of view which operates in electrification industry, where technical performance and price are key factors for material choices.

The thesis is conducted as a single case-study, where qualitative semi-structured interviews in the case company and nearby stakeholders are combined with quantitative raw-material data analysis. This approach enables a comprehensive overview of how decision-making and material choices are influenced by the desired sustainable transition. The study is supported by the use of academically credible sustainability and procurement tools and frameworks such as Lifecycle Assessment (LCA), Lifecycle Costing (LCC), the Kraljic Purchasing Portfolio Model, the Dynamic Capabilities View, and the Triple Bottom Line. These tools and frameworks enable to consider how procurement compromises can be supported by them and how supply chain strategies can be developed within the transition.

The results of the thesis indicate that whereas bio-based and recycled polycarbonates will provide long-term options, the high initial costs and variability in price, availability and properties keep them mostly as a theoretical option as for now, but possibly not for long. Shifting to sustainable materials requires reconfiguration of several processes and thorough testing and validation. This highlights the importance of strategical approach and timing. The research supports the literature about sustainable procurement material transitions and the relating challenges and opportunities. It also provides concrete insights on how executing the transition strategically could enable and unlock certain market advantages. In the end, thesis highlights the importance of collaboration and the fact that concrete incentives need to be in place so that the everyday activities could be aligned with the organizational sustainability goals.

KEYWORDS: Polycarbonates, Sustainable Supply Chain Management, Strategic Procurement

UNIVERSITY OF VAASA**School of Technology and Innovation**

Author:	Eemeli Tikkanen		
Title of the thesis:	Balancing Sustainability Goals and Cost Efficiency in Procurement: A Case Study on Polycarbonates in Case Company		
Degree:	Master of Science in Technology		
Discipline:	Industrial System Analytics		
Supervisor:	Inês Simoes de Brito Peixoto		
Year:	2025	Pages:	113

ABSTRACT:

Kestävästä kehityksestä on tullut keskeinen muutosta ohjaava tekijä globaalissa teollisuudessa ja se asettaa yrityksille paineita muokata heidän strategiansa sisällyttämään taloudellisen suorituskyvyn lisäksi ympäristöystävällisiä tavoitteita. Kun sääntely tiukkenee päästö- ja kestävyysasioissa, sidosryhmien odotukset myös kehittyvät ja yritysten on tehtävä enemmän monimutkaisia kompromisseja kestävyden ja kustannustehokkuuden väliltä. Tämä päättötyö arvioi miten organisaatiot tasapainottelevat kestävien tavoitteiden ja kustannuspaineiden kanssa hankinnassa, käyttäen polykarbonaatteja tapaustutkimuksen esimerkkimateriaalina. Tutkimus tarkastelee tilannetta kohdeyrityksen näkökulmasta, joka toimii sähköteollisuuden alalla, jossa tekninen suorituskyky sekä hintataso näyttelevät suurta roolia tärkeysjärjestyksessä, kun pohditaan tapoja edistää kestävien arvojen asioita.

Tutkimus on toteutettu yksittäisenä tapaustutkimuksena, jossa yhdistetään puolistrukturoidut haastattelut kohdeyrityksessä ja sen sidosryhmissä, sekä kestävien raaka-ainevaihtoehtojen pohjalta tehty data-analyysi. Tämä monimenetelmällinen lähestymistapa auttaa saamaan kokonaisvaltaisen ymmärryksen sekä päätöksentekotavoista, että materiaalien markkinatilanteesta. Tutkimuksen tukemiseen on käytetty akateemisesti kriittisiä päätöksentekotyökaluja ja viitekehäksiä, kuten Lifecycle Assessment (LCA), Lifecycle Costing (LCC), the Kraljic Purchasing Portfolio Model, the Dynamic Capabilities View, sekä the Triple Bottom Line. Nämä työkalut auttavat tukemaan sitä, miten hankinnan kompromisseja voidaan tehdä ja miten hankintastrategioita voidaan muodostaa kestävästä siirtymän yhteydessä.

Tutkimuksen tulokset viittaavat siihen, että vaikka biopohjaiset ja kierrätetysti valmistetut polycarbonaatit tarjoavat mahdollisen pitkän aikavälin vaihtoehdon, niiden korkeat alkuvaiheen kustannukset, sekä materiaalien ominaisuuksien, saatavuuden ja hintaluokkien yleistettävä kilpailukyvyttömyys pitää ne suurilta osin vielä teoreettisena vaihtoehtona, vaikkakin tilanteen odotetaan muuttuvan lähitulevaisuudessa. Siirtymä vaatii useiden prosessien merkittävää uudelleenmukauttamista, sekä kattavaa testaamista ja hyväksytysprosessia, mikä entisestään korostaa siirtymän tarkan suunnittelun ja ajoittamisen tärkeyttä. Tutkimus tukee kestäviin tuotantoketjuihin liittyvää kirjallisuutta kartoittamalla kestävästä siirtymästä liittyvien materiaalivaihdoksiin liittyviä haasteita ja mahdollisuuksia. Se myös tarjoaa konkreettisia käytännön näkemyksiä siihen, miten suunnittelulla sekä strategisella ajoituksella voidaan luoda markkinaetua kestävyden ottaessa yhä isompaa sijaa globaaleissa organisaatioissa. Lopulta tutkimus korostaa, että organisaation sisällä kestävästä siirtymän läpivieminen vaatii oikeiden olosuhteiden lisäksi yhteistyötä ja oikeita kannustimia, jotta organisaation kestävyteen liittyvät tavoitteet saadaan jalkautettua jokapäiväiseen päätöksentekoon.

KEYWORDS: Polycarbonates, Sustainable Supply Chain Management, Strategic Procurement

Contents

1	Introduction	8
1.1	Background and Context	8
1.2	Research Problem, Objectives and Questions	10
1.3	Scope of the Study	12
1.4	Limitations	13
2	Literature Review	16
2.1	Foundations of Sustainable Procurement	16
2.1.1	Cost Efficiency and Sustainability: A Balancing Act	17
2.1.2	Sustainability Metrics and Procurement Tools	19
2.2	Strategic and Operational Dynamics of Procurement Transitions	26
2.2.1	Timing and Strategic Transitions in Sustainable Procurement	26
2.2.2	Full Lifecycle Considerations in Sustainable Procurement	28
2.3	Sustainability of Plastics and Polycarbonates	30
2.3.1	Polycarbonates	32
2.3.2	Emerging Innovations within Polycarbonates	33
2.3.3	Polycarbonates in Europe	34
2.4	Regulatory and Stakeholder Environment	35
2.4.1	Institutional and Policy Pressures on Sustainable Procurement	36
2.4.2	Key Regulatory Frameworks and Directives	38
2.4.3	Regulatory Context: National and Global Perspectives	41
2.4.4	Stakeholders in Sustainability	42
2.4.5	The Role of Incumbent Companies in the Sustainable Development	44
3	Methodology	47
3.1	Research Design and Data Collection	47
3.2	Qualitative Interviews	49
3.3	Quantitative Data Analysis	53
3.4	Case Company	55
3.5	Reliability and Validity	55

4	Results	57
4.1	Insights from Qualitative Interviews	57
4.1.1	Organizational Alignment and Sustainability Implementation	59
4.1.2	Customer Demands and Market Pressure	61
4.1.3	Supplier Engagement and Documentation Challenges	62
4.1.4	Technical and Certification Barriers	64
4.1.5	Material Availability, Risk, and Pricing	66
4.1.6	Timing and Strategic Opportunity	68
4.2	Raw Material Data Analysis	70
4.2.1	Comparison Between Different Subcategories of Sustainable Plastics	71
4.2.2	Sustainable Polycarbonates vs. Current Plastic Choices	72
4.2.3	Simplified Annual Difference of Sustainable vs. Traditional Plastics	73
4.3	The Summary of Key Findings	75
5	Discussion	78
5.1	Organizational Readiness and Cross-Functional Alignment	78
5.2	Incentivization and KPI Importance	80
5.3	Collaboration with Suppliers and External Stakeholders	81
5.4	Strategic Opportunities and Risks in Sustainable Transitions	84
6	Conclusion	87
6.1	Summary of Key Findings	87
6.2	Connecting Findings to Purpose	89
6.3	Practical Recommendations for the Case Company	91
6.3.1	Increase Collaboration in Sustainable Procurement	92
6.3.2	Embed Cross-Functional Awareness into Sustainability Readiness Efforts	93
6.3.3	Introduce a “Green Credit” Mechanism to Support Sustainable Procurement Decisions	94
6.4	Contribution to Theory and Practice	95
6.5	Limitations, Future Research Suggestion and Last Thoughts	97
	References	100

Appendices	112
Appendix 1. Interview Guide	112

Figures

Figure 1, Paradigm Funnel (adapted from Berthon & Nairn, 2003, p. 57).	13
Figure 2, Triple Bottom Line (adapted from Zak, 2015, p. 253).	22
Figure 3, Kraljic Portfolio Model categorizing procurement items into four categories (adapted from Kraljic, 1983 as cited in Verheyden, 2003)	23
Figure 4, Conceptual framework combining in a theoretical timeline external pressures, strategic orientation, and decision tools in sustainable procurement (adapted from Chowdhury, 2021; Caniëls & Gelderman, 2005; Elkington, 2004; European Commission, 2018; Nikitchenko et al., 2016; Teece, 2022).	25
Figure 5, Low Carbon Procurement as a factor (adapted from Correia et al., 2013, p. 61).	29
Figure 6, Different sustainable subcategories (analysed data from the case company)	72
Figure 7, Polycarbonate category sustainable alternatives against currently used (analysed data from the case company)	73
Figure 8, Theoretical annual average cost per raw material (analysed data from the case company)	74

Tables

Table 1, Interview participants and information	50
Table 2, Summary of the key findings (data from the interviews and data analysis)	75
Table 3, Perception differences across internal and external functions (data from interviews).	76

1 Introduction

Sustainability has risen as an important factor in global business, and it has an increasing amount of affect in decision-making in global organizations. This shift displays a global effort to address environmental challenges, which is why integrating sustainability principles into processes in large organizations is essential (Singh et al., 2024, p. 2). Procurement decisions directly impact on areas such as resource utilization and environmental compliance. However, achieving sustainability goals requires tackling limits set by traditional performance metrics such as cost-efficiency and cost-reduction. Higher up-front costs of sustainable alternatives often cause challenges on aligning environmental goals with financial (Nikitchenko et al., 2016, p. 15).

The thesis explores sustainable procurement by addressing how organizations can navigate sustainability, monetary and operational goals, and how organizations can proceed to effectively implement sustainability in their operations. This is studied through a single case study using polycarbonates as a lens to provide detailed insights, while aiming to generalize the obtained information to larger shifts in sustainability. While the positive influence of sustainability-related initiatives is clear in improving organizational reputation and future-proofing its operations, short-term competitiveness in pricing remains crucial. Moving towards greener material choices calls for good planning and understanding of the market. Adapting in smart way is important for keeping a competitive position while also shifting priorities more towards sustainability (Bening et al., 2021 as cited in Gothar & Schanz, 2024, p. 4; Picuno et al., 2021, p. 1).

1.1 Background and Context

Sustainable procurement, where environmental, social, and economic considerations are incorporated into the given purchasing decisions in different organizations, has drawn great interest in recent years (Nikitchenko et al., 2016, p. 13). Organizations often are driven to adopt sustainable principles due to mounting pressure from stakeholders,

consumers, and regulatory bodies (Chowdhury, 2021, p. 38). Frameworks such as the European Commission's Circular Economy Action Plan highlight the need on reducing dependency on virgin materials by increasing the use of recyclable and recycled content and promoting sustainable alternatives (European Commission, 2018, p. 5). While such frameworks provide a clear roadmap for achieving sustainability on various levels, they often come with financial obstacles that may be unrealistic to meet within organizations' own traditional procurement performance goals such as aspired cost reductions (Lemos, 2020, p. 12). The tension shows larger challenge in modern supply chain management: reconciling the immediate costs of adopting sustainable practices while managing the cost structure of the supply chain (Nguyen and Le, 2022, p. 799-800). Procurement plays a key role in aligning organizational operations and goals with sustainability related matters, bridging the gap between short-term decisions and long-term strategies (Foerstl et al., 2010, p. 120; Bianchini et al., 2019, p. 2-3).

The examined case company operates in the industrial electrification sector, where procurement decisions on materials such as polycarbonates hold an important functional role. This is due to required properties which hold strong strategic importance. However, the production processes of virgin polycarbonates, which are known to be reliant on fossil-based inputs, contribute significantly to environmental challenges such as greenhouse gas emissions (European Commission, 2018, p. 5-6). The known utility of polycarbonates versus the environmental footprint of the most utilized types of polycarbonates underscores the need for more sustainable alternatives such as bio-based or recycled variants in the industry in general (Martínez et al. 2019, p. 779). The challenges surrounding polycarbonate procurement highlight the larger dilemmas of integrating sustainable materials into supply chains.

One of the clearest challenges for most organizations lies in reconciling sustainability objectives with financial imperatives (Singh et al., 2024, p. 1). Sustainable materials often have higher initial costs and logistical complexities, making their adoption a challenging task (Pacheco & Clausen, 2024, p. 947). This raises a critical question to be considered:

under what circumstances should sustainability of products take priority over cost-efficiency? Addressing this dynamic is crucial for meeting regulatory requirements while simultaneously managing and ensuring long-term competitiveness for both the given organization and industry in general.

1.2 Research Problem, Objectives and Questions

Procurement practices have a significant organizational role in employing strategies that align with emerging sustainability standards but also remain competitive in the given market. There is both internal pressure from within the organizations and some level of external pressure from the stakeholders such as suppliers, consumers, and regulators, to advance the transition. As sustainable alternatives still generally cost more in the short term, this tension forms the basis of the research addressed in the thesis. Polycarbonates are a widely used class of thermoplastics and thus exemplify this duality, as the material is valued for its important properties such as heat resistance and optical clarity. However, the reliance on fossil-fuel based inputs and the producing emissions as a byproduct of production is an evident cause of environmental challenges. Therefore, the transition towards sustainably made polycarbonates seems like an evident choice but is not easy to implement because the mentioned restrictions and challenges. Procurement's performance is often judged with financial metrics, which complicates the shift to more sustainable alternatives. These challenges do demand careful planning, where trade-offs are considered while transitioning towards more sustainable materials and ensuring regulatory compliance.

This thesis aims to effectively study the dynamics relating to balancing act through the lens of the case company's procurement of polycarbonates. By addressing set objectives, the study seeks to provide insights and practical suggestions into how organizations can manage the dual priorities of sustainability and cost efficiency. Objectives are divided into company and research objectives to clarify the desired outputs from both points of view. The objectives of this study are:

Company Objectives:

1. To examine trade-offs in meeting internal and external sustainability mandates and maintaining cost competitiveness in the procurement of polycarbonate materials.
2. To analyse conditions under which sustainably produced polycarbonates achieve the price and technical performance that justify the adoption in the company's supply chain.

Research Objectives:

3. To explore theoretical interplay between sustainability mandates and cost competitiveness in procurement, contributing to the broader understanding of sustainable materials' adoption in industrial supply chains.
4. To identify market dynamics and lifecycle cost implications of integrating sustainably produced materials, addressing gaps in existing literature on sustainable procurement strategies.

To address the determined objectives in an organized way, the thesis is guided by the set research questions. The questions are derived from the objectives and will act as a basis for the conducted study. These questions are examined through a qualitative single case study approach focusing on procurement related activities within the case company. The questions help turn theoretical goals into a framework that supports the research analysis. This thesis seeks to address the following primary research question:

- How do sustainability goals and regulatory frameworks influence procurement decisions for polycarbonate materials?
- What are the practical challenges and opportunities in transitioning to sustainable polycarbonate materials in the case company's procurement strategy?

1.3 Scope of the Study

The study focuses on the case company's procurement strategies and decision-making in the electrification industry, through an examination of polycarbonate materials. The scope of the thesis is deliberately confined to the procurement process, especially the decision-making strategies surrounding polycarbonates, but also includes considerations of the effects of the given procurement choices on nearby functions. The study does not extend to the technical details of thermoplastics and polycarbonates, to ensure the usability and accuracy of the chosen scope.

The thesis employs a funnel approach, which starts its focus from case-specific details and gradually widening to broader insights. The paradigm funnel, as described by Berthon and Nairn (2003, pp. 54-65), is a conceptual tool that can enable researchers to study challenging research landscapes by systematically refining insights, from narrow empirical focus towards more abstract and broad theoretical generalizations. In the context of this thesis, the case-company specific examination of polycarbonate procurement decisions acts as a theoretical starting point, enabling deeper examination of sustainability-related trade-offs. However the findings emerge, they can be considered in a wider context of procurement strategies, illustrating how organizations are able to navigate similar dilemmas by integrating sustainability into sourcing decisions. By using this method, the study aims have day-level procurement challenges and problems contribute to a larger understanding of sustainable supply chain decision-making. This narrowing helps link daily decisions to broader theory and practice while also aligning with the principles of systematic inquiry within supply chain management research.

Figure 1 illustrates a Paradigm Funnel, which in this case serves as a structural framework for analysing the given research from explicit, observable aspects all the way to implicit core assumptions. By applying the given funnel approach to the thesis, the study systematically examines how procurement teams react and reconcile sustainability-related matters and ambitions with financial realities and imperatives, while ensuring that the

insights from the case-company specific view, can be used for broader theoretical and strategic consideration.

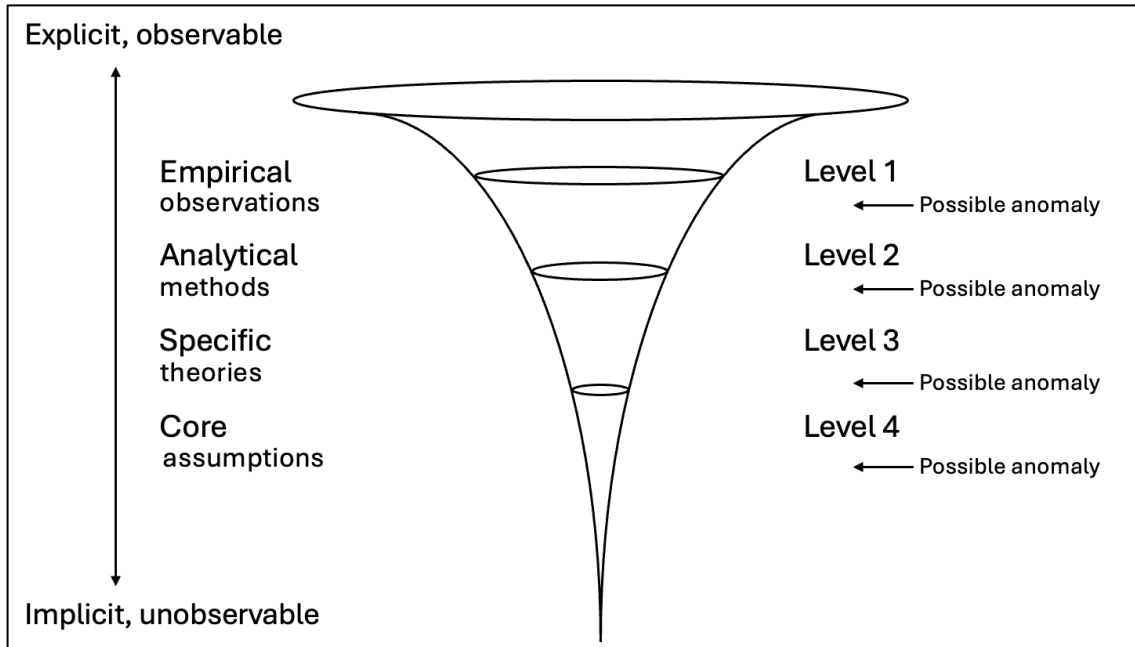


Figure 1, Paradigm Funnel (adapted from Berthon & Nairn, 2003, p. 57).

1.4 Limitations

Regardless of the narrowed scope and research approach, the thesis and the study has certain limitations. Limitations are defined by USC Libraries (2025) as aspects or characteristics of the given study that may eventually affect the interpretation of the findings. Limitations may lead to some findings losing relevance if conditions change or time evolves. As for this study, first significant limitation can be named to be the case-specific nature of the study. As the study is conducted with a single case company, with specific focus on polycarbonates as a subgroup within plastics, the thesis may generate some aspects of the findings to be completely effective only in the given context. So even though in the case of this thesis, the polycarbonates act as a lens to observe the situation, it may restrict and narrow some views on the findings. Single company focus also emphasizes the need for critical thinking on evaluating the results as the results and more

specifically the input data of the study, is highly influenced by the current situation within the given organization as well as the status of the sustainable transition the company is currently in. It is to be noted, that companies and organizations with a different pace or status in the transition may see and act differently.

The second limitation of the research is the subjective nature of sustainability as a concept. Many matters within the sustainability, are constant conflict of interests: whether it is the comparison between sustainable actions and profits or comparing competing suppliers' offers. There are always two sides to a story which is extremely evident in the case of sustainability transition. Parties and organizations, that most significantly benefit on the use of traditionally produced plastic materials with evident environmentally downsides often downplay the negative trade-offs involved, whereas the sustainability driven parties often disregard the higher price tags of green alternatives. So, to enhance the effectiveness of the study, it is important to acknowledge such differences influenced by the interests and possibilities for economic gains for some parties of the conversation.

Third limitation to be mentioned in this section of the thesis is time. As previously stated, the sustainability transition in general can viewed to be well underway and to be constantly shaping the market dynamics. The constant development of new ways to produce and recycle sustainable materials positively influence the lifecycle management and technological advancements allows for completely new ways to do different procedures are great things for sustainability. Those matters still create some evident challenges for the researching perspective. The present dataset represents the most recent availability, but evidently restricts brooders and more generalised analysis. This means that some of the findings may not be applicable in as the situation evolves. It is important to note, that most of the development means the decreasing amounts of things justifying the use of virgin materials as sustainable materials and alternatives becomes cheaper and more widely available through advancements in technology and research. This thesis aims to set an example on how the current situation may be studied while considering the always evolving market of plastics raw materials.

Last important limitation to note is the relevancy and quantity of data available for the research. Due to sustainable raw materials becoming realistic option for production only in the recent years, concrete inquiries with actual pricing have only been starting to take place. This illustrates how relevant the topic currently is but adds a layer of challenge to conduct broader relevant data analysis on the matter. While more data and more importantly data from longer periods of time, would have enabled for historical trendline data-analysis, it is not possible with the realities and available data for this research. Whilst this is a limitation, it is simultaneously great to acknowledge that there are no better-suited datasets available for this study, and it thus increases the accuracy of the findings.

2 Literature Review

The literature review aims to provide a theoretical basis for the study. This chapter establishes grounds for exploring key concepts which relate to areas such as sustainable procurement, the use of polycarbonates, prioritisation of sustainability with cost realities and relating stakeholders and regulatory bodies. As organizations face increasing pressures relating to environmental and social factors, sustainability related matters have growing importance on organizations procurement strategies (Singh et al., 2024, p. 5). The shift addresses regulatory realities and stakeholder expectations while offering chances to obtain competitive advantage against other organizations in the same market.

2.1 Foundations of Sustainable Procurement

Sustainability nowadays is an important aspect of contemporary procurement practices. This shift highlights the importance of including sustainable measures into procurement strategies. As a concept, sustainable procurement can be seen as seeking determined sustainable development objectives (WCED, 1987 as cited in Walker & Phillips, 2009, p. 1). According to UCLA's Sustainability department (2024), the most often used definition for sustainable development is from the UN World Commission on Environment and Development: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Therefore, sustainable procurement can meet traditional procurement-related objectives and goals without compromising sustainability-related aspects. This principle is also seen in the ISO 20400 guidance on sustainable procurement, which phrases it as "procurement that has the most positive environmental, social and economic impacts possible over the entire life cycle, and that strives to minimize adverse impacts" (ISO 20400:2017, p. 1). The standard highlights that sustainable procurement must strive to consider all environmental, social, and economic outcomes over the product or service life cycle, and not only treat these given factors as secondary to cost or efficiency.

In the context of procurement, sustainability as a term was knowingly first introduced in the United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, 3–14 June 1992 in a formal manner (Nikitchenko et al., 2016, p. 8). This can be seen as an important milestone after which sustainability has risen as a key principle and value within organizations' strategies. According to Nikitchenko et al. (2016, p. 75), matters such as principles, policies, and practices should be considered by organizations that strive for sustainability. Said matters should align with values such protecting the environment, preventing the degradation of ecosystems and improving the quality of life for customers, staff, and local communities. The organizations have a real opportunity to drive and guide consumer behaviour by making most of the situation (Nikitchenko et al., 2016, p. 8). According to Foerstl (2010, p. 118), sustainable procurement is heavily linked to different dimensions of sustainability, which are environmental, economic, and social. It can be summarized as minimizing environmental harm while seeking long-term economic stability and enhancing the social responsibility. Therefore, procurement practices often involve thorough evaluation of the three dimensions to ensure that goods and services fulfil the sustainable needs and goals of them (Nikitchenko et al., 2016, p. 12; ISO, 2017, pp. 1–2).

2.1.1 Cost Efficiency and Sustainability: A Balancing Act

The challenge of sufficiently incorporating sustainability into procurement strategies highlights the complex trade-offs, that organizations need to consider (Nikitchenko et al., 2016, p. 33). The act of balancing cost efficiency with sustainable actions often requires re-thinking traditional habits and to introduce new decision-making frameworks (Pacheco & Clausen, 2024, p. 956). This includes a thorough evaluation of the life cycle impacts of the given materials, considering long-term over short-term benefits, and using innovative solutions to reduce the environmental footprint. These efforts are often made more complicated by external pressures and challenges such as market dynamics, regulatory frameworks and shifting consumer preferences, all of which can be seen to have indirect or direct impacts on the options organizations have available on such

situations. The research for more sustainable alternatives exemplifies the broader need for innovation in areas such as material production, where advancements in any size or scope can have significant impacts on addressing the environmental concerns (Wnuczek & Podkoscielna, 2021, p. 40). This further underscores the dependencies between key concepts related to the balancing act, such as sustainability goals, technological advancements, and economic realities within the procurement strategies.

The common dialogue highlights the importance of collaborative approaches as well as stakeholder engagement in working towards positive outcomes (Nikitchenko et al., 2016, p. 19). Balancing competing demands by shaping procurement strategies is conducted in collaboration between parties such as suppliers, regulators, and end-users all in a unique way (European Commission, 2018, p. 5). The advancements within technology and materials science are enabling procurement strategies to become more sustainability focused (Plastics Europe, n.d.; Singh et al., 2024, p. 5). Alternatives such as bio-based materials, recycling technologies and lifecycle assessment tools can all be seen as pathways in reducing the negative environmental impacts of productions and optimizing the use of available resources (Nikitchenko et al., 2016, pp. 7-8; p. 51). These initiatives not only directly affect the sustainability level of given production but also can be seen to create cost efficiency opportunities and synergy strategies and product differentiation (Bianchini et al., 2019, pp. 1194-1195). Such considerations are especially important for organizations that utilize materials like thermoplastics in production, which requires both technological consideration as well as green assessments.

Sustainable procurement involves actions such as managing trade-offs between sustainability and cost-efficiency. Organizations are often faced with a challenge of justifying the higher up-front costs, which are often a side effect of switching to more sustainable material alternatives. This is regardless of if it would put the organization in the better market position in the future due to it being hard to determine and predict. According to Pacheco & Clausen (2024, p. 947), these trade-offs become more relevant in the industries where cost competitiveness is a primary driver, forcing procurement teams to

balance sustainability goals with operational viability. A key aspect of this balancing is the uncertainty surrounding sustainable alternatives, such materials like as bio-based or recycled materials. While these options often promise reduced environmental impact, they can come short in terms of cost stability, performance reliability, or supply chain integration. This can be due alternatives can being produced in less proven environments.

Additionally, the economic feasibility of sustainable procurement is often restricted by the customer preferences. Customers often are environmentally conscious, but lower pricing frequently overrides the willingness to pay premium for sustainable alternatives. This misalignment causes tension for organizations, who aspire to advance sustainable transition, be compliant on regulations and maintain competitive pricing (Nikitchenko et al., 2016, p. 15). Integrating lifecycle assessment tools enables the given organization to start using evaluations such as total cost of ownership for sustainable alternatives, where factors such as durability and recyclability are considered (Nikitchenko et al., 2016, p. 50-52). However, even with using such tools, the decision-making process is rarely straightforward one. This is due indirect benefits of sustainability such as positive brand reputation and better future compliance being hard to quantify in financial ways. Achieving the right balance needs objective viewing of the given situation and use of suitable frameworks and tools. Such tools need to balance short-term procurement measures with long-term strategic objectives, helping companies manage the challenges of sustainable procurement effectively (Nguyen & Le, 2022, p. 799).

2.1.2 Sustainability Metrics and Procurement Tools

Sustainability tools and metrics are essential to accurately evaluate and make enhancements as well as help decision-making process within the procurement. Key tools help to navigate different trade-offs, manage data, and provide objective viewpoints on challenging situations. The use of tools and metrics can help to strengthen the basis on how the decisions are made and to clarify the reasoning behind the given decisions. The tools in the scope of this thesis include Lifecycle Assessment (LCA) and Lifecycle Costing (LCC),

as well as strategic frameworks like the Kraljic Purchasing Portfolio Model as well as Dynamic Capabilities View and Triple Bottom Line. Among the tools, sustainability is often related to different metrics in the organizational level. According to Hristov & Chirico (2019, pp. 1-5), the Key Performance Indicators (KPIs) play a key role in implementing the organizational strategy and the inclusion of sustainable KPIs or at least sustainable considerations in existing KPIs can be seen as an important step towards increased sustainability. They state that creation of sustainable value is a significant aspect to acknowledge. KPIs importance was emphasized also by Strunk et al. (2022, p. 15) stating, that sustainable KPIs fulfils the requirements of internal and external stakeholders to aid the sustainable transition. KPIs can be viewed crucial in guiding procurement decisions as a concrete incentive on decision-making.

2.1.2.1 Lifecycle Management

LCA is a methodology, which is used to assess the environmental impacts of given products during the entirety of the lifecycle, which includes the origins of the raw material through the possible recycling of the product at the end of lifespan (Nikitchenko et al., 2016). LCA supports sustainable procurement by helping organizations identify the long-term environmental costs and benefits of a given product. However, its adoption can be challenging, as justifying decisions based on LCA findings may be difficult due to the complexity of environmental impacts and the longer timeframes involved (Orfanidou et al., 2023). LCC complements LCA by including financial metrics, such as purchasing costs, operational costs, and end-of-life costs. This enables procurement teams to assess both environmental and financial implications of their decisions (Nikitchenko et al., 2016). While LCA and LCC provide quantitative tools for sustainability evaluation, frameworks such as Triple Bottom Line can help realise the results to organizational goals.

2.1.2.2 Triple Bottom Line

The Triple Bottom Line (TBL) is a sustainability framework, which is used to evaluate corporate performance based on the three selected dimensions: economic (profit), social (people), and environment (planet) as viewed in figure 3 (Elkington, 2004, pp. 1-3). The organizations, which adopt the TBL as a part of operations, also often adopt energy efficient technologies, invest in local communities, and enforce ethicality in labour practices, to ensure that value is created beyond financial profits (Birsan, 2024, p. 28). However, it is well acknowledged, that evaluating social and environmental performance of a organization is much more difficult than financial performance, which highlights the need for more complex and specific metrics (Slaper & Hall, 2011, p. 4). According to Brisán (2024, pp. 6-29), to address the given problem, organizations utilize existing reporting standards such as Global Reporting Initiative (GRI) as well as Environmental, Social, and Governance (ESG) to track progress. There are many successful examples of known organizations adopting TBL principles. Brisán states that Toyota and Tokmanni have both reported lower carbon emissions and improved supply chain sustainability, demonstrating that it very well is possible to contribute to sustainability while maintaining profitability.

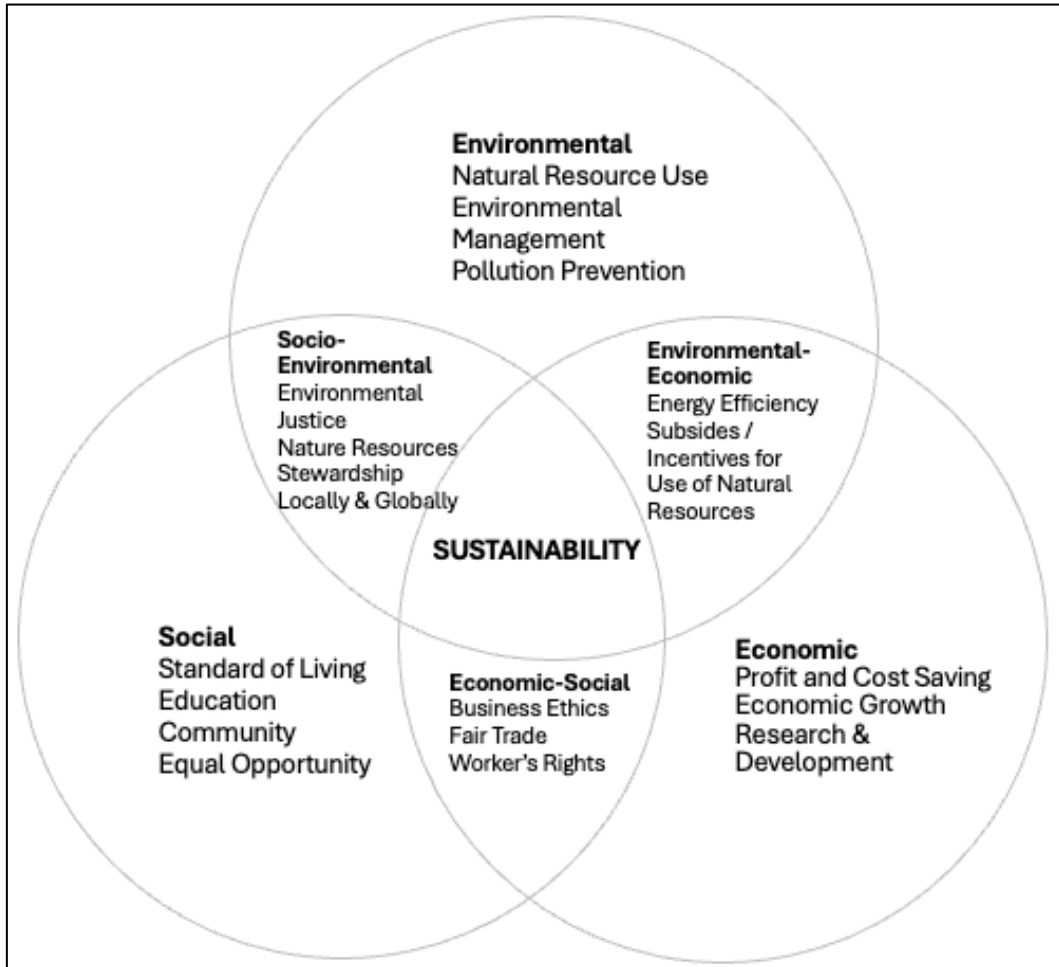


Figure 2, Triple Bottom Line (adapted from Zak, 2015, p. 253).

2.1.2.3 Kraljic's Purchasing Portfolio Model

Kraljic's Purchasing Portfolio Model is a tool developed to be used to help in the classifying of suppliers and purchasing items based on risk and impact on profit (Kraljic, 1983, as cited in Caniëls & Gelderman, 2005, p. 141). The model displayed in figure 2 works by dividing the compared items or options into four main categories based on two criteria: profit impact (low or high) and involved supply risk (low or high) (Caniëls & Gelderman, 2005, p. 142). It categorizes given items into strategic, leverage, bottleneck, and non-critical, guiding procurement strategies (Verheyden, 2003, p. 26). These categories help to identify the possible opportunities and threats in the purchasing and supplier choices. Bianchini et al. (2019, p. 1196) exemplifies the model by stating, that strategic items that

have high profit impact and high risks in supply require the most attention and may be most beneficial in long term partnerships, whereas non-critical items may be managed utilizing lower amounts of resources. By using the Kraljic matrix organizations and procurement teams may be able to develop tailored strategies for managing suppliers, have critical objective layout to aid in supplier choices and ensure the effective resource allocation, which may reduce risks in procurement. The model can be seen as especially effective in dynamic market environment, where supply risks can be seen to fluctuate.

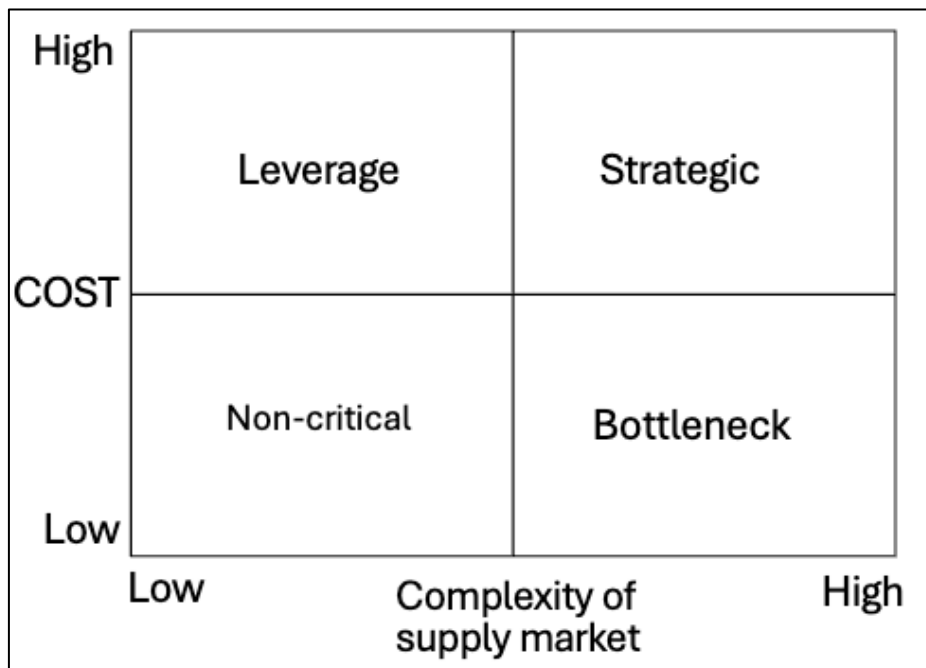


Figure 3, Kraljic Portfolio Model categorizing procurement items into four categories (adapted from Kraljic, 1983 as cited in Verheyden, 2003)

2.1.2.4 Dynamic Capabilities View

The Dynamic Capabilities View (DCV) is a framework, to enable understanding on how organizations can adapt to external changes, which includes sustainability-related external pressures, by adjusting the available processes and resources (Teece, 2022, p. 119). This perspective highlights how when properly managed, organizations can sense, seize, and reconfigure resources as a response to evolving external standards and demands,

including technological advancements as well as shifting market dynamics (Teece, 2022, p. 119; Cezarino et al., 2018, p. 95). In the given sustainability context, DCV highlights the importance of considering the adoption of sustainable practices into the procurement strategies. By adapting the main principles of dynamic capabilities, such as ability to innovate and implement environmentally friendly practices, organizations can be better prepared to external challenges (Cezarino et al., 2018, p. 96). For example, capabilities such as adaptive risk management and sustainably driven innovations enable organizations to align with regulatory changes while maintaining competitiveness in the market. According to Cezarino et al., (2018, pp. 93-94), building these capabilities allows the organizations to transform the sustainability-related external pressures into opportunities. The application of DCV in the sustainability context is often done through structured frameworks as well as methodologies. According to Caldana et al. (2015) as cited in Cezarino et al. (2018, p. 97) Triple Bottom Line framework is often used, which categorizes economic, environmental, and social sustainability capabilities, which allows organizations to assess and develop their sustainably driven dynamic capabilities in an organized manner. Also, organizations utilize the capability mapping and Soft System Methodology (SSM) to identify critical sustainability factors involved and integrate them as a part of the decision-making process (Cezarino et al., 2018, p. 93). Within these approaches are qualitative assessments, case studies, and structured analysis tools to ensure the continuous movement onwards to tackle external sustainability pressures.

2.1.2.5 Integration of Sustainability Tools into a Conceptual Framework

To structure the theoretical foundation, Figure 4 illustrates a conceptual synthesis of the tools and strategically relevant influences which could lead to procurement decision-making. The model is constructed based on the reviewed literature mentioned earlier in the thesis and tailored to the given context of the research. The framework aims to illustrate in a simplified manner, how external pressures, organizational capabilities, and decision-making tools could shape the conditions leading into the procurement decision of sustainable materials. The model is grounded in literature and contextualized to reflect

the given dynamics faced by the case company. It shows how external institutional as well as stakeholder pressures could end up shaping the organizational strategic orientation through approaches like Dynamic Capabilities View and Triple Bottom Line (Teece, 2022; Elkington, 2004). These strategic orientations inform the use of the given operational evaluation tools, such as Lifecycle Costing, Lifecycle Assessment and Kraljic's Portfolio Model, which all can support decision-making on material sourcing.

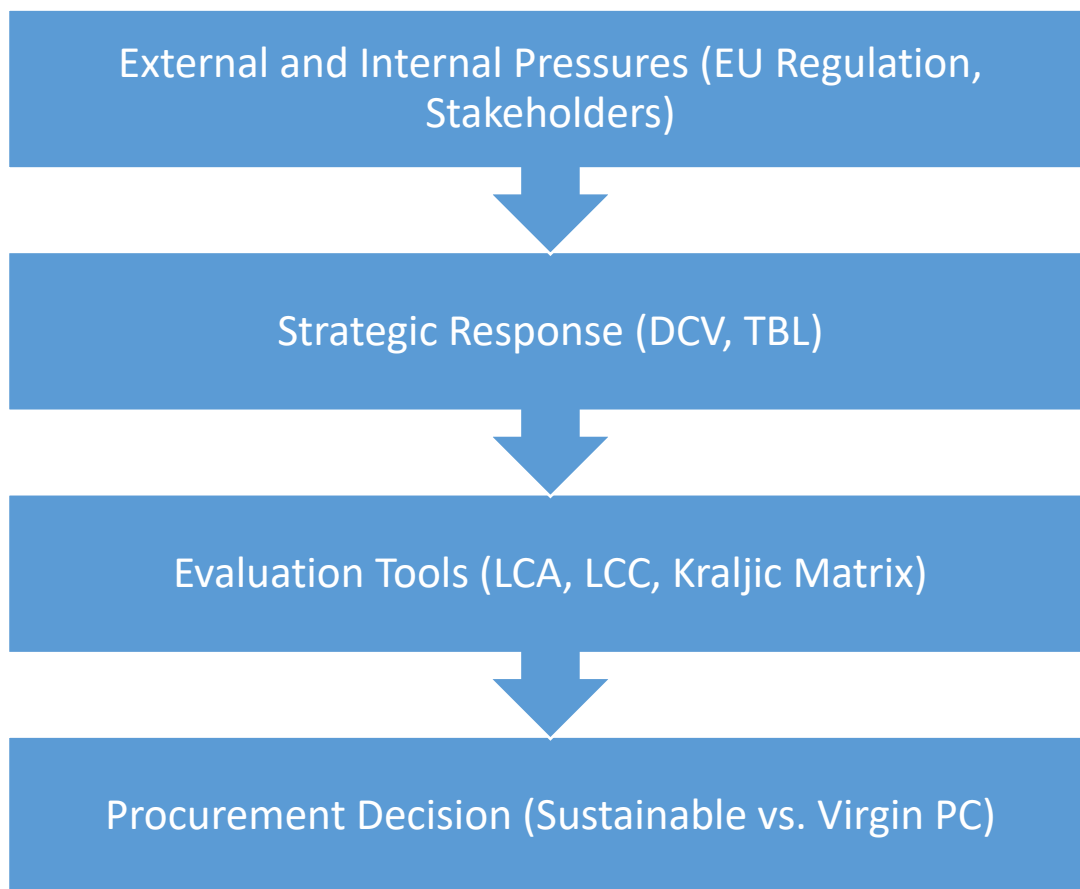


Figure 4, Conceptual framework combining in a theoretical timeline external pressures, strategic orientation, and decision tools in sustainable procurement (adapted from Chowdhury, 2021; Caniëls & Gelderman, 2005; Elkington, 2004; European Commission, 2018; Nikitchenko et al., 2016; Teece, 2022).

By visualizing the orientation and order of these tools and frameworks, the example of figure 4 provides a way to understand the decision-making process and analyse how sustainable materials could be implemented in a considered and systematic manner. It also supports the thesis's research structure by linking theoretical components to concrete

empirical investigation. This figure illustrates how external sustainability pressures influence strategic processes and procurement decision-making through chosen tools and frameworks. Even though Figure 4 displays a clear flow, the included frameworks are used in slightly different levels offer complementary views. LCA and LCC focus on product level and cost, whereas TBL and DCV highlight the broader strategic and organizational adaptation. Combining upsides from these tools enables for better analysis on procurement decisions, where short-term cost pressure is against sustainability goals.

2.2 Strategic and Operational Dynamics of Procurement Transitions

Procurement decisions are a consequence of various factors including internal and external influencers as well as reacting to market dynamics. From strategic timing and technological advancements to regulatory developments, the changes in procurement strategies and actions must be balanced with operational realities and profitability while acknowledging organizations sustainability goals. This section explores the broader forces and factors influencing procurement and strategic transitions, beginning with the strategic timing of sustainable initiatives, and later addressing full lifecycle considerations which essential for informed decision-making in organizational level.

2.2.1 Timing and Strategic Transitions in Sustainable Procurement

Transitions regarding sustainability require sufficient organizational shifts across multiple dimensions, which include technology, business models, and stakeholders' interaction (Markard et al., 2012, as cited on Patala, 2022, p. 13). The given transitions are often started with localized small-scale experiments, which are gradually used to prove their viability, where timing plays crucial role to maintain business continuity (Saari, 2021, p. 4). The gradual nature of these transitions often requires the strategic alignment with the current market dynamics and evolving sustainability-related regulations (Saari, 2021, p. 8). A key framework to understand these transitions is the socio-technical systems

approach, where the key focus is on technological advancements, business practices, and the relevant social norms shaping the procurement landscape (Saari, 2021, p. 8). Strategic models may also prove to be useful, where model like Multi-Level Perspective (MLP) is used to describe how niche innovations destabilize established systems and even influence on broader societal structures (Geels, 2011, p. 1). The process can be seen to be facilitated by the involvements of various stakeholders, which includes customers, suppliers, policymakers, and others who influence the supply chain environment (Kuźniarska et al., 2023, p. 205).

Dynamic capabilities can also be seen as crucial aspect on managing sustainable transitions. The organizations must adopt their related internal processes and even resources in the external sustainability pressures, including regulatory actions and customer expectations (Foerstl et al., 2010, 121). Early adaptation of sustainable practices such as being the frontrunners on transitioning towards sustainably made alternatives may give competitive advantage, while delaying the transition might increase risks as the environmental regulations get stricter (Vehmas et al., 2024, p. 1488). Effective communication on intentions and plans is crucial across the involved stakeholders. Consumers for example are increasingly aware of the sustainability-related issues and expect transparency regarding the social and environmental impacts of their consumed or used products (Vehmas et al., 2024, p. 1498). Companies that align their procurement decisions in line with the projected sustainability advancements and approaching regulation changes, can be viewed to have stronger market position, than those with shorter scope in the decision-making.

Sustainable transitions are not only about replacing existing technologies, but it also includes systematic changes involving culture, institutions, user practices and infrastructure. According to Köhler et al. (2019, p. 2), these transitions require long-term efforts, including various factors such as regulators, organizations, civil society and involve tensions around stability and change. This framework underlines on why such transitions in industrial procurement face difficult trade-offs and require coordinated strategic

planning, beyond isolated solely product-level decisions. As found in research, the success of sustainable shifts depends on not only technical feasibility and utilization but also on alignment of interests, regulatory direction, as well as socio-political momentum (Köhler et al., 2019, pp. 2-3).

2.2.2 Full Lifecycle Considerations in Sustainable Procurement

Managing and accessing the sustainability of a supply chain does not only include the selection of the most sustainable materials available but rather requires more broad review of overall environmental effects of each option (Carbon Trust, 2006, p. 2). A key limitation in procurement decision-making can be defined as an overemphasis on material sustainability while overlooking the direct or indirect negative environmental effects and the emissions associated with sourcing, transporting, and producing the given material (CIHT, 2023, p. 14). For example, bio-based or recycled materials contain in general lower embodied carbon, but depending where and how they are manufactured, and what kind of energy and power is utilized in the manufacturing and transporting of the goods, the environmental impact of these better alternative materials may be worse than the traditional virgin choices (Shaked et al., 2015, pp. 243-245). It is thus important to view the big picture, when comparing the options.

A whole-lifecycle approach (often referred as WLC as Whole Lifecycle Carbon) is used to integrate emissions and other environmental impacts across raw material extraction, production, transportation, use and the end-of-life disposal (CIHT, 2023, pp. 20-21). The Greenhouse Gas (GHG) Protocol categorizes given emissions into Scope 1, Scope 2, and Scope 3, where the last illustrates and represents indirect supply chain emissions, which often is responsible for the largest share of product's carbon footprint (GHG Protocol, 2024, p. 25). To successfully assess all the included aspects, the used procurement strategies must incorporate actions to account for Scope 3 emissions to ensure that the reductions are measured and assessed across the whole value chain, rather than just at the point of material selection (CIHT, 2023, pp. 14-15). Aspects, such as transportation

emissions can offset some or even most of the benefits obtained from choosing the more sustainable material alternative if the choices are not made with wider considerations (Carbon Trust, 2006, p. 3). A study conducted on low-carbon procurement further highlights that the emissions linked to logistics, suppliers' energy choices and material processing can significantly outweigh the reductions which are achieved using material alternatives (Correia et al., 2013, p. 59). Thus, highlighting shorter supply chains, may end up being the most crucial factor when in the pursuit of fewer emissions across the supply chain.

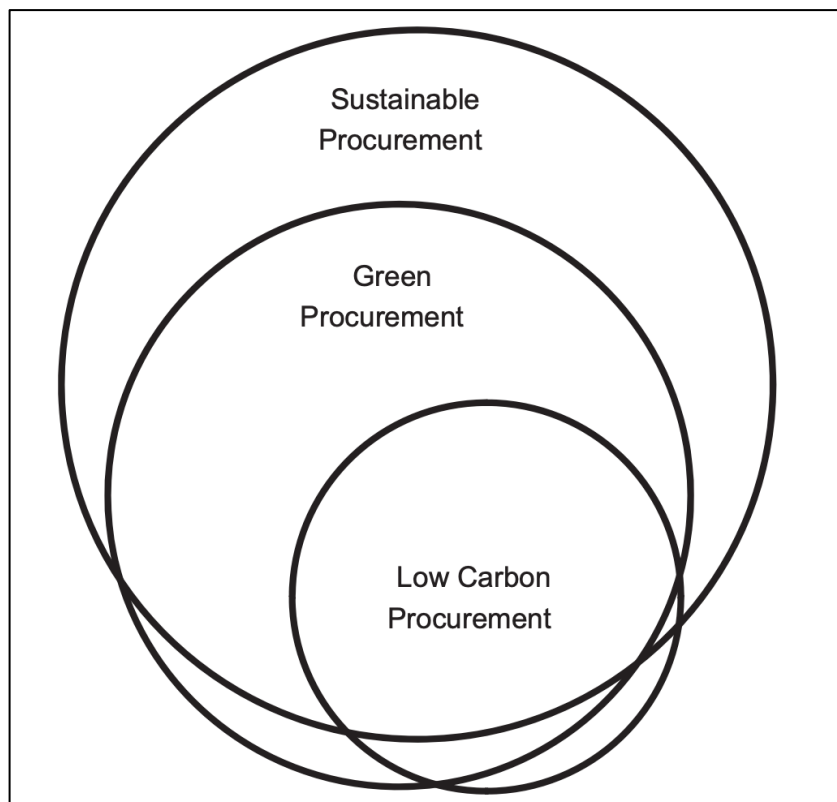


Figure 5, Low Carbon Procurement as a factor (adapted from Correia et al., 2013, p. 61).

According to Correia et al. (2013, p. 61), a key usable framework for understanding these known trade-offs is Low Carbon Procurement (LCP), which specially focuses on reducing the carbon emission throughout the whole supply chain rather than solely prioritizing the material sustainability. Thus, as illustrated in the figure 5, LCP is a subcategory of Green Procurement which itself is a subcategory of the studied Sustainable Procurement.

LCP emphasizes the importance of emission reductions across all sections: sourcing, manufacturing, transportation, and the usage of the given product, rather than any single one of the listed (Correia et al., 2013, p. 61). To also address the said challenges related to the overall evaluation of the supply chain, previously mentioned LCA and LCC has been identified as excellent tools to assess the sustainability of procurement strategies (Nikitchenko et al., 2016, p. 50-52). It is still important to note that some of the known frameworks use and focus only on material attributes alone rather than the total lifecycle carbon dioxide emissions, which can create a gap between compliance and total true sustainability (Correia et al., 2013, p. 61). Therefore, incorporating lifecycle-based procurement criteria into policy frameworks is considered vital for closing this gap. Further consideration can be the hidden environmental costs, which includes externalities such as water consumption, biodiversity loss and even social impacts that may not be reflected in other models (Nikitchenko et al., 2016, p. 14-15).

2.3 Sustainability of Plastics and Polycarbonates

Plastics have become an essential material across various industries due to its impressive versatility, durability, and cost efficiency. Since the mass production of plastics began in the mid 20th century, plastics have taken the place of various even more traditional materials such as wood, glass, and metal in various use cases, such as packaging, construction, and medical applications (Ryan et al., 2015, p. 5). The material's lightweight structure and the versatility in processing possibilities has made it a key part of modern supply chains, reducing transportation costs while enhancing product durability (UNDP, 2024, p. 5). Despite properties that make plastics valuable, the production and implementation of it holds long term environmental challenges. Most of the widely used plastics are traditionally produced from fossil-based raw materials, contributing to greenhouse gas emissions and resource depletion (Erdei-Derschner, 2020, pp. 60-61). Additionally, the slow degradation of the material leads to long-lasting plastic waste, with low amounts of the waste being recycled (UNDP, 2024, p. 49). This has led regulators and companies

to increase their focus on sustainable solutions, as well as finding better ways to recycle and therefore enhance the sustainability of the material's lifecycle.

In response to the unsustainable nature of the widely adopted material, circular economy principles have widely been promoted to enhance the sustainability of plastics as a material group. The EU Circular Economy Action Plan is one example and attempt to increase recycling rates, waste reduction, and increased use of recycled materials (European Commission, 2018, p. 11). Similar initiatives have led the companies, to be more encouraged to shift towards more environmentally friendly alternatives, such as bio-based and recycled options, to minimize the negative environmental impacts while maintaining the product performance (Wang et al., 2023, p. 2162). Even with these known efforts, economic realities remain the main barrier for broader adoption, as sustainable solutions and alternatives often come with higher initial production costs as mentioned in previous chapters.

Beyond the regulatory challenges, technological advancements have played an important role in making plastic alternatives more and more sustainable. Innovations such as chemical recycling and bio-based alternatives increase the possibilities of reducing dependence on the current fossil-based plastics. In chemical recycling, the waste material is broken into its original monomers, which then allows for higher quality reuse of the recycled material (Mooji & Muller, 2021, p. 40). Bio-based plastic alternatives are produced from renewable resources such as plant oils and industrial byproducts, which enable ways to decrease the negative environmental footprint of produced product (Cui et al., 2019, p. 40). Despite evident advantages and enhancements, the transition towards the wider use of the given plastic type remains complex. Organizations with possibilities to adapt this material type must balance the environmental responsibility with financial realities, as consumers knowingly prefer still the lower price point in purchased end products (Wang et al., 2023, pp. 2162-2164). This tension highlights the ongoing dilemma in procurement strategies, where sustainable materials must compete with the traditional alternatives, which most often and especially currently might not be realistic.

2.3.1 Polycarbonates

Polycarbonates are a subclass of thermoplastic used in variety of applications across industries (Martinez et al., 2019, p. 778). However, the traditional production process often is dependent on at least some amount of fossil-based inputs, which contributes significantly to environmental challenges such as greenhouse gas emissions (European Commission, 2018, pp. 5–6). Polycarbonates are often referred as PC, and classed within the thermoplastic polymers, due to being able to easily be moulded and transformed as a raw material (Abdulhadi et al., 2024, p. 2). According to Caldwell (2022, p. 3) thermoplastics are a class of polymer substances, which can be malleable or mouldable after reaching certain temperature and solidifies after cooling down. Most thermoplastics can also be defined to have large molecules. According to (Martinez et al. (2019, p. 778), polycarbonates are known for their mechanical strength, transparency, as well as thermal stability. Martinez also states that which is why polycarbonates have become a pivotal material for numerous applications ranging from the automotive and construction industries to medical devices and electronics. The properties of polycarbonates, including high impact resistance, low levels of water absorption, and great dielectric attributes, make them especially suitable for use cases, where durability and precision are required (Wnuczek & Podkoscielna, 2021, p. 39). The commonly known versatility of polycarbonates extends to applications such as glazing solutions and energy efficient buildings due to the high thermal resistance (Kua & Lu, 2016, pp. 910-914; Mohammed et al., 2023, pp. 955-957).

According to Abdulhadi et al. (2024, p. 2) polycarbonates are composed of Bisphenol A (BPA), which is a building block for epoxy resins. Producing traditional virgin polycarbonates is primarily conducted by achieving reaction of the BPA with phosgene through a process of interfacial polycondensation or melt transesterification (Wnuczek & Podkoscielna, 2021, pp. 40-41). The production and use of virgin polycarbonates present significant environmental concerns, especially due to the toxic nature of the phosgene

and BPA's role as a xenoestrogen, which can harm endocrine functions (Wnuczek & Podkocielna, 2021, pp. 40-41). These drawbacks have sparked significant efforts to develop bio-based alternatives to be used in similar applications. The alternatives have been proposed to utilize renewable feedstocks as the main source to enhance the sustainability of the material (Cui et al., 2019, p. 40). The research for sustainable alternatives displays the need for innovation in material production and how it is used, as advancements can significantly address ecological concerns (Alvarez & Rubio, 2015, pp. 160-165). Other alternatives such as recycling technologies, and LCA tools offer pathways to reducing environmental impacts and optimizing resource use (ISO, 2006 as cited in Kua & Lu, 2016, p. 911; Mooji & Muller, 2021, p. 39). These initiatives has ability to advance sustainability and also create cost-efficiency opportunities, synergy strategies, and product differentiation (Bianchini et al., 2019, pp. 1194–1195).

2.3.2 Emerging Innovations within Polycarbonates

The advancements within technology and materials science are enabling procurement strategies to become more sustainable (Plastics Europe, n.d.; Singh et al., 2024, p. 5). Traditional polycarbonates are versatile and widely used but are associated with significant environmental challenges such as greenhouse gas emissions during production process as well as through usage and reliance on finite resources (Cui et al., 2019, p. 40). To address said problems, research and industrial efforts have focused on developing sustainable alternatives as well as improving recycling possibilities to align with circular economy principles and reduces harmful ecological footprint of polycarbonate usage (Picuno et al., 2021, p. 1; Mooji & Muller, 2021, p. 39).

One of the more known alternatives as of now is bio-based polycarbonates. According to Cui et al. (2019, p. 40), bio-based polycarbonate alternatives produced from carbon dioxide (CO₂) and renewable feedstocks have gained increasing interest during the latter 2010s. Leveraged feedstocks include for example plant oil, industrial byproducts such as crude glycerol, and fatty acids (Cui et al., 2019, p. 40). These materials and byproducts

are used in the production of biodegradable polycarbonate plastics which demonstrates the possibility for more sustainable options for traditional BPA-based materials (Cui et al., 2019, p. 40). Furthermore, catalytic systems and polymerization makes it easier to produce bio-based polycarbonates, resulting in high molecular weights, which directly enhance performance and extends the applicability (Greiner et al., 2016 as cited in Wang et al., 2023, p. 2171).

According to Mooji & Muller (2021, p. 39), recycling technologies have also contributed to the improvement of sustainability levels of polycarbonates. Also, mechanical recycling methods for example allows the reuse of polycarbonate waste in certain conditions, where there is not sufficient degradation in material properties. Recycled polycarbonates have been successfully applied into the production and use of appliances such as concrete reinforcement, where they aid in enhancing compressive strength while decreasing the total material density (Martinez et al., 2019, p. 779). In equivalent way, chemical recycling processes have aided in increasing the sustainability level of polycarbonates through breaking the waste into monomeric components allowing the reuse of materials in high quality (Mooji & Muller, 2021, p. 39). Another area of advancement is the integration of granular aerogels into the polycarbonate panels in some appliances, particularly in improving thermal insulation (Moretti et al., 2018, p. 408). Recycled plastics and thus also polycarbonates are divided into post-industrial recycled (PIR) and post-consumer recycled where the difference is where the input material is from (Orzan et al., 2021, p. 1).

2.3.3 Polycarbonates in Europe

Polycarbonates play important role in European plastics industry, contributing to economic growth and sustainability efforts. Europe effectively accounts for approximately one fourth of global polycarbonate productions, with major manufacturing facilities located in the Netherlands, Germany, Spain, and Belgium (Plastics Europe, 2023, p. 1). According to the Plastics Europe (2020, pp. 1-2), the European Economic Area (EEA) sees

an annual need of approximately 730 000 tonnes which accumulates a market turnover of 1,57 million tonnes. The value chain of polycarbonates is a key driver in employment, supporting around 535 000 jobs across the European Union and generating over 35 B€ in added value. The demand for polycarbonates comes from its extensive use across the different industries and its durable and versatile properties (Plastics Europe, 2023, p. 1; Abdulhadi et al., 2024, p. 2).

Recent studies have revealed and highlighted the growing applications for polycarbonates within energy efficient glazing solutions, especially in warm climates where it can be used to significantly reduce cooling energy consumption compared to the traditional alternatives (Mohammed et al., 2023, p. 954). According to Mordor Intelligence (2024) PC market report, key market leaders include companies such as CHIMEI, Covestro AG, Formosa Plastics Group, LG Chem, Lotte Chemical, Mitsubishi Chemical Corporation, SABIC, SIBUR Holding PJSC, Teijin Limited, and Trinseo. These companies are major contributors in developing alternative solutions for applications. The European plastics market is influenced by regulatory frameworks, that control and emphasize the importance of sustainability and circular economy (Erdei-Derschner, 2020, p. 63).

2.4 Regulatory and Stakeholder Environment

Regulations play a key role on steering industries towards more sustainable practices, particularly in the given context of plastics, where increasing scrutiny can lead into concrete environmental impact (European Commission, 2018, p. 5). According to Dudley & Brito, (2012, pp. 1-2), regulations, often referred to as administrative laws or rules, are standards or instructions that dictate the behaviour and actions of individuals, businesses, and organizations. These rules and guidelines serve as the key tools governments use to implement laws and agency objectives, which ensures compliance with certain policies. The given regulations provide the legal framework that maintains the market efficiency, environmental responsibility, and public welfare. Frameworks such as the European Commission's Circular Economy Action Plan are in place to emphasize the

need to reduce dependency on virgin materials, while encouraging recyclable content and promoting sustainable alternatives (European Commission, 2018, p. 5). Whereas regulations may pose financial and operational challenges in some scenarios, they also provide opportunities to align procurement and supply chain strategies with continental and global sustainability goals.

Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDDD) have emphasized and increased the accountability and transparency requirements for businesses (Liam & Watkins, 2024, pp. 3-4). The CSRD requires companies to disclose sustainability-related risks, environmental impacts as well as due diligence efforts in the companies' operations (Grant Thornton, 2024, p. 4). This directive replaces Non-Financial Reporting Directive (NFRD) and mandates more thorough sustainability-related disclosures in line with the European Sustainability Reporting Standards (ESRS) (Spinaci, 2023, p. 2). Similarly, Corporate Sustainability Due Diligence Directive (CSDDD) establishes mandatory actions such as due diligence obligations, which aims to have companies identify, prevent as well as to mitigate human rights violations and environmental harm that could be happening among the given supply chains (Liam & Watkins, 2024, pp. 3-4). These directives enhance the sustainability assessments thorough holding organizations accountable of their actions. Companies and organizations operating within the boundaries of European Union must navigate a complex policies aimed at fostering the main principles of circular economy while reducing the use of materials such as single-use plastics and striving for net-zero status.

2.4.1 Institutional and Policy Pressures on Sustainable Procurement

Institutional and policy pressures have crucial role in shaping the sustainable procurement strategies. According to Chowdhury (2021, pp. 40-41), Institutional Theory states that organizations are often adopting to regulatory-compliant behaviour to align with external public expectations even if the actions are not always economically motivated. The given theory identifies three main drivers, which are coercive, normative, and

mimetic pressures, which may compel organizations to integrate sustainability availability processes. Coercive pressures may arise from legal mandates and legislations such as European Green Deal and Corporate Sustainability Due Diligence Directive, which requires organizations to conduct a thorough assessment on the environmental and human rights impacts (European Parliament and Council, 2024, p. 1). CSRD adds to these pressures through demanding structured sustainability reporting, which mandates organizations to provide ESG (Environmental, Social and Governance) risks as well as the opportunities which enhances the transparency on procurement decisions (Spinaci, 2023, p. 3). These types of directives tend to push companies to adapt more sustainable practices to their operations.

Normative pressures often come from industry standards, and consumer advocacy groups, which push for sustainability as the standard practice (Pasamar et al., 2023, p. 8). Mimetic pressures on the other hand are often from competitive benchmarking, where companies imitate their peers to maintain the current market position or even seek for competitive edge (Pasamar et al., 2023, p. 8). These pressures are particularly visible in the sector of plastics, where procurement strategies may need to balance compliance with environmental regulations and cost. For example, the Circular Economy Action Plan mandates that companies have higher recycling rates and new innovations on material design by the year of 2030, pushes companies to adopt their strategies and try to find alternative solutions to comply with the regulations (European Commission, 2018, pp. 5-9). External public pressure also intensifies the given dynamics involved, as stakeholders are increasingly aware and demand transparency and accountability in corporate sustainability efforts (Wu & Memon, 2022, p. 2). In practice, the given effectiveness of these pressures depends on how the companies and organizations internalize these regulatory requirements.

Institutional Theory suggests that the extent to which organizations respond to the external pressures depends on their institutional environment as well as the strategic orientation. Organizations operating in highly regulated markets can be seen as more likely

to adopt given sustainable practices, whereas more loosely monitored markets may rely on voluntary or symbolic compliance to maintain legitimacy (Chowdhury, 2021, p. 38). Additionally, institutional isomorphism refers to how similar organizations grow alike, and thus can lead into wider adoption of sustainable manners (Pasamar et al., 2023, p. 4). This effect can be seen as particularly strong in the global supply chains, where multinational corporations require their suppliers to be compliant with sustainability-related regulations to maintain and align with their own regulatory and stakeholder expectations and (European Parliament and Council, 2024, p. 1).

As a result, companies, and organizations, which are not under any direct sustainability regulations may be forced to apply sustainable actions to their production methods to remain competitive option for customers. This highlights how well created regulations can drive broader positive change. According to Liam & Watkins (2024, pp. 4-5), the CSDDD highlights and amplifies this regulatory pressure by pushing and mandating companies to actively engage in risk-related due diligence. This means that companies must now evaluate their vendors and suppliers based on factors such as sustainability risks, which include environmental harm, human rights concerns as well as other ethical labour practices. As a result of directives such as CSDDD, organizations that may end up failing to align their procurement practices with the given due diligence are at risk on facing for example legal liabilities and reputational damage (Liam & Watkins, 2024, pp. 7-8).

2.4.2 Key Regulatory Frameworks and Directives

The European Union has introduced a wide range of different frameworks and directives that guides industries towards sustainability and circular economy principles (European Commission, 2018, p. 5). These policies are in place to shape procurement strategies by mandating variety of regulatory frameworks and directives to guide the given industries towards sustainability and circular economy principles. These policies push organizations procurement strategies by mandating reductions in the negative environmental impact

and promoting the use of sustainable material alternatives. Regulations relating to plastics have emerged to address issues such as waste management, recyclability, and the transition towards the use of bio-based alternatives (Lemos, 2020, p. 7). One of the most notable and important such initiatives is the Circular Economy Action Plan (CEAP), which aims to make all plastic packaging solutions either reusable or recyclable in cost-effective fashion (European Commission, 2025, pp. 5-12). Additionally, the European Green Deal strengthens these objectives by setting ambitious targets for sectors such as carbon neutrality and resource efficiency across the given industries (Lemos, 2020, p. 3).

According to the report by Grant Thornton (2024, pp. 2-4), the Corporate Sustainability Reporting Directive (CSRD) plays a critical role within the given regulatory landscape by requiring organizations and companies to disclose their sustainability-related performance data in standardized formats, which ensures the comparability across the industries and areas. Also, the given directive directly influences the procurement policies by making sustainability-related considerations a crucial factor in corporate decision-making. Organizations are under pressure to integrate ESG metrics within their existing strategies or even produce new ones considering its dimensions. Reporting these sustainability-related values has become a key factor which forces procurement teams to evaluate available suppliers also by their sustainability level rather than cost and efficiency alone (Grant Thornton, 2024, p. 6).

Another critical directive in the given scope is the Single-Use Plastics Directive (Directive 2019/904), which aims to mandate the reduction of single-use plastics options and items as well as by introducing market bans, where sustainable alternatives exist (Lemos, 2020, p. 5). This regulation forces the supply chain managers to explore different alternatives such as recycled and bio-based materials, which enhances the possibility to begin the transition. Mandatory recycled content requirements have also been introduced, where plastic bottles are required to contain at least 25% recycled materials by the year of 2025 and 30% by the year of 2030 (Plastics Europe, 2023, p. 69). According to European Parliament and Council (2024, p. 3), the Corporate Sustainability Due Diligence Directive (EU

2024/1760) imposes even stricter accountability measures on organizations, where the attention to mitigate social and environmental risks is demanded. The directive aims to align organizations sustainability goals and strategies by encouraging the use responsible sourcing and use of life cycle assessments.

Furthermore, the EU Policy Framework on Biodegradable and Compostable Plastics promotes and enhances the adoption process of bioplastics as a sustainable alternative. It supports the research and development of biodegradable solutions while simultaneously addressing concerns related to misleading green claims (European Union, 2023, p. 1). This policy aims to impact the procurement policies and strategies by pushing towards certified biodegradable products while highlighting the importance of end-of-life measures with waste management. To support the given transition, the Plastics Strategy outlines investment plans, including Horizon 2020, which has already allocated over €250 million for research conducted on recyclable materials and more efficient waste processing technologies (European Commission, 2018, pp. 15-16). Additionally, extended producer responsibility (EPR) schemes require and demand companies to contribute financially to waste collection and recycling systems, further influencing procurement strategies by factoring in the evident lifecycle costs (Plastics Europe, 2023, p. 63).

The combined impacts of implemented directives, such as CSRD and CSDDD, means that procurement is no longer just an operational function but also critical and needed part of corporate sustainability strategies. Companies operating in the EU area must also ensure that their suppliers effectively comply with the required frameworks in place. This is because failing to comply with these requirements causes risk factors such as regulatory problems and thus probable reputational damage. This leads organizations to reconsider procurement strategies and approach and implementing sustainability assessments and supplier audits as a part of standard practices.

2.4.3 Regulatory Context: National and Global Perspectives

Finland has distinct approach on what comes to plastic waste, which closely follows the European Union's directives, while emphasizing the circular economy model. Finland has set strict targets on recycling, where 55% recycling rate is the desired rate for the plastic packaging by the year 2030, which is in line with EU Packaging and Packaging Waste Directive (Directive 2018/852) (Ylä-Mononen & Alkio, 2021, p. 47). According to Ylä-Mononen & Alkio (2021, pp. 6-23) Finland's Plastic Roadmap highlights and outlines measures to increase plastics recovery, while promoting bio-based alternatives, and desires to establish full-scale recycling plants. As to be expected, Finland supports the European Plastics Pact, which requires that 30% recycled content be to be including in new plastic products and packaging by 2025. These are the types of national level efforts, which are complemented by EU-wide initiatives like the Single-Use Plastics Directive (SUPD), which sets the minimum requirements for the included recycled contents in PET beverage bottles (Ylä-Mononen & Alkio, 2021, pp. 21-23).

In contrast to the setting in Finland and in Europe, the regulatory approaches in North American and Asia vary significantly. In general, the plastics policies in the United States are more state driven which enhances variability. In some states like California, there exists stricter extended producer responsibility (ERP) schemes, the federal level mandates remain highly limited (OECD, 2022, p. 90). According to March et al. (2022, pp. 20-47), Canada has committed to banning given harmful single-use plastics as well as setting ambitious recycling targets, but there remain challenges across the provinces within the. Meanwhile, Asian nations have adopted and set place some kind of mix of bans, taxes, and recycling incentives, often driven by external international pressure coming from high income countries. China's National Sword policy, which was established to ban plastic waste imports, has influenced global recycling as it forced exporting countries to improve their own waste management systems (OECD, 2022, p. 24).

Geopolitical factors have a broad effect on organizations procurement strategies, particularly when it comes to securing sustainable plastics alternatives. Supply chain's

dependencies on virgin plastics remain as an evident problem and a challenge, with bio-produced and recycled alternatives remain relatively expensive with limited availability (Siltaloppi & Jähi, 2021, p. 5). According to Siltaloppi & Jähi (2021, p. 5), European, as well as Finnish firms are increasingly exploring alternative procurement and sourcing strategies to mitigate related risks associated with fluctuated fossil fuel prices as well as trade restrictions. Additionally, some regulatory uncertainties such as ever so evolving waste export restrictions as well as carbon taxation, impact in investment decisions regarding plastics recycling infrastructure. Finland's emphasis on the given domestic recycling capacity and the EU's desire of having standardized plastic regulations aim to enhance the supply chain resilience as well as to support the transition towards more circular plastics economy (Siltaloppi & Jähi, 2021, p. 7).

2.4.4 Stakeholders in Sustainability

The sustainability in business environment includes the balancing act of environmental, societal, and economic priorities while maintaining the long-term viability (Diniz & Blomberg, 2019, p. 2). Stakeholders include anyone who are capable to affect or be affected by the given organizations' objectives (Freeman, 1984, as cited in Valentinov, 2023, p. 27). Stakeholders in the traditional industrial organization environment could include groups of people such as employees, customers, suppliers, creditors, and shareholders. According to Valentinov (2023, pp. 69-72) as the challenges regarding various aspects of sustainability grow, the role of stakeholder theory within fostering collaborative efforts to address the given challenges has risen in importance. The stakeholder theory argues to include diverse groups beyond shareholders into the organizational decision-making processes to enhance and achieve sustainability (Valentinov, 2023, p. 69). This drives the shift of perspective from pure profit maximization towards creating value for all stakeholders including the already mentioned ones and the broader community (Shim, 2014, p. 65). By adopting such activities, and including ethical decision-making and long-term focus, businesses can enhance the responsibility and sustainability (Shim, 2014, p. 64).

Considerations around corporate sustainability often revolve around making trade-offs between environmental effects and economic performance. Whereas sustainability can improve competitiveness, add legitimacy, and even open new market opportunities, it certainly requires aligning stakeholder expectations and interests (Diniz & Blomberg, 2019, p. 2). Building trust towards stakeholders and highlighting the importance of transparency within the corporate communication channels are keyways to mitigate conflicts and secure cooperation (Gonzalez-Porrás et al., 2021, pp. 218-219). Consumers can be seen as a crucial force in driving sustainability, through attitudes, preferences, and willingness to pay for more sustainable alternatives as the organizations monitor consumer behaviour. Vehmas et al. (2024, p. 18) found that consumers value sustainability highly, but still often prioritize the lower price and convenience over environmental effect.

The willingness to pay the premium for more sustainable alternatives, varies depending on demographics and cultural contexts. According to Vehmas et al., (2024, p. 22), in general consumers appreciate sustainable and environmentally friendly practices, but may remain resistant to pay more, unless they see equal quality or other personal benefits. The given resistance underscores the importance on communicating the different intangible and tangible benefits on choosing the sustainable alternative. Customer engagement thus has begun to be an important part on advancing sustainability goals. This is displayed, as Diniz & Blomberg (2019, p. 8) highlighted the role of stakeholder surveys as a part of identifying customer preferences as well as in co-creating value propositions. Relational stakeholder theory indicates that building trust and communication paths enhances the quality and efficiency of teamwork in sustainability related matters (Gonzalez-Porrás et al., 2021, p. 214). Transparent and consistent reporting on sustainability metrics as well as active consumer education can be utilized to help bridge the information gap that often restricts of sustainable purchasing decisions (Vehmas et al., 2024, p. 14).

Despite these mentioned opportunities, several challenges remain in engaging customers in effective manner. A major barrier on sustainable consumer behaviour can be seen

to be the perception of higher costs associated with sustainable products. Many consumers still view price as the most important and critical factor in purchasing decisions, especially when it comes to commoditized goods (Tascioglu et al., 2021, p. 1). To counter this, businesses must communicate the long-term value of sustainability in effective way, including potential cost savings as added value through resource efficiency and reduced environmental impact (Sady, 2023, p. 210).

Trust also remains as notable barrier. Consumers sometimes lack either reliable or accurate, or both, information about sustainability of consumed products, which can cause certain lack of confidence in some green claims (Vehmas et al., 2024, s. 4-5). Feedback channels can increase the ability for organizations to offer wanted sustainable products and thus enhance the increase of customer involvement in sustainable transition (Diniz & Blomberg, 2019, pp. 8-9). Trust can be built with transparent communications and the use of third-party verifications, whereas affordability can be enhanced by minimizing the perceived cost barrier (Tascioglu, 2021, p. 1). Educational campaigns has a crucial role in helping customers understand the long-term benefits and effects as well as environmental and social benefits of their purchasing decisions, which enhances willingness to support sustainable offerings (Diniz & Blomberg, 2019, p. 3; Vehmas et al., 2024, p. 1). Getting customers involved in designing and interacting with the given sustainable business practices helps the both parties to reach their needs (Gonzalez-Porrás et al., 2021, 215).

2.4.5 The Role of Incumbent Companies in the Sustainable Development

Incumbent firms have a significant role in shaping the pace and direction of sustainable transitions, given their control and established market positions as well as possible political influence. While the older studies often suggested that incumbents have been passive factors or even obstructors maintaining the status quo of the transitions, more recent research acknowledges their given heterogeneity and dynamic role within the transitions (Saleh et al., 2025, pp. 1-2). These types of companies may simultaneously either defensive or proactive strategies depending on factors of the given situation, such as

current capabilities of the company, external pressures, and the market environment, making the behaviour more organized than assumed previously (Magnusson & Werner, 2020, pp. 905-906). Empirical evidence shows that many parties acknowledged as incumbents actively engage in sustainability orientated innovations, such as experimenting new sustainable technologies, entering sustainable markets or even forming partnerships with niche actors (Kungl, 2024, p. 1). Such strategies can be seen as an act to protect the companies long term competitiveness and adapting to the competitive pressure, whilst ensuring the compliance on future regulations.

The recent attempts to organize the incumbent strategies have led to useful classifications. Saleh et al. (2025, p. 3) identify four levels at which incumbents operate. These include organizational and management, technology development, industry, and market as well as institutional. At the organizational level, the given incumbents may embed sustainable actions in corporate governance and restructure some of the internal operations. Within the technological level, companies may invest in the development of low-carbon alternatives in various sectors. In the market level, strategies include the re-organization of product portfolios and on the institutional level, incumbents may try to influence the upcoming regulations or industry standards to enhance their market position.

Despite their evident potential to accelerate sustainable change, incumbents' can also even delay the transition processes. Mangunsson and Werner (2020, pp. 904-905), portray these behaviours with two pairings of actions: innovating versus defending and collaborating versus competing. These settings reflect clear tensions incumbents may face between established business models and pursuing the change. Contextual factors also effect on how the incumbents behave sectoral dynamics, including regulatory stringency, as well as the maturity of sustainable technologies all effect on how willing the companies are to adopt or will they proceed with defensive mindset (Saleh et al., 2025, pp. 1-2). To better understand on the systemic transitions, it is important to acknowledge incumbents as heterogeneous and dynamic actors. While passive approach can pose risks,

their status influence and resources often offer unique opportunities to scale sustainable practices, if their organizational strategies are aligned with the general goals of sustainable transition (Ramanauskaitė, 2021, p. 6).

3 Methodology

This chapter outlines the research methodology used in the thesis, which forms a structured approach to the research. The study is conducted as a single case study to examine the decision-making processes regarding the sustainable transition on polycarbonate materials. The data for the empirical section of the study is collected through semi-structured interviews arranged within the case company environment as well as by examination of raw material data provided by the case company. This chapter presents as well as explains the used research methodology, outlining the rationale for decisions made on research methods. Combining interviews and raw material data provides both subjective insight and objective context to the research questions.

3.1 Research Design and Data Collection

The research follows a qualitative case study design, which is found suitable for exploring contemporary decision-making processes in so-called real-world setting. A single-case holistic design is used in the given research, which Yin (2009, p. 18) defines to be particularly suitable when the goal is to understand a real-life phenomenon in depth, while boundaries of the given understanding of the phenomenon and the context are not clear. Therefore, the single case-study is justified for the research due the evident unique characteristics of the case company, which operates in the sector of electrification, which is where in-depth understanding can be seen vital. This approach enables the study to further investigate “how” and “why” questions related to the adoption and transition on sustainable materials in procurement environment, particularly, when the research in question has little to no control over the events being studied (Yin, 2009, p. 4). The focus of the research is a single case company which can be described to operate within the electrification sector, with the study having specific attention on polycarbonate materials used in the products. The case study approach helps in complex dynamics between the given sustainable goals and cost-efficiency pressures within an actual organization setting. It can be seen as particularly well-suited for this research as it permits the

integration of multiple available data sources, where the aim is using multiple perspectives to obtain a holistic understanding on of the studied phenomenon (Patnaik & Pandey, 2019, p. 177). Case studies are considered useful for developing context-dependent knowledge as well as understanding specific organizational dynamics, where comprehensive depth and contextual richness are emphasized over generalized findings (Patnaik & Pandey, 2019, p. 177).

The primary data sources used in the research are qualitative interviews with supportive internal quantitative data also obtained from the case company. The interviews, which are described in detail in the chapter 3.2, form the core of the empirical research and provide insight into how the sustainability-related “go” or “not-to-go” decisions are perceived and managed across the different functions within the organization. The interview data was manually coded to find patterns across the different stakeholders’ perceptions, with the coding process describe in more detail in the following chapter. The internal data points serve a triangulated role, which helps to contextualize and validate certain findings and insights brought up from the interviews (Doyle et al., 2009, p. 180). The data collection process was supported by the case company and constantly aligned to support the research need. The clear objective was to gain understanding on the operational factors influencing sustainable material choices in procurement. The use of both qualitative interviews and quantitative raw material data on the research reflects a mixed methods approach, which can be seen especially beneficial when neither method alone allows for full understanding of the research problem (Creswell, 2021, p. 2). This research follows a convergent mixed methods design, where the qualitative and the quantitative data are collected in parallel and integrated to the analysis to validate and complement the findings. This approach is particularly useful in complex decision-making settings, subjective viewpoints of relevant stakeholders must be interpreted alongside the raw material data (Creswell, 2021, p. 52). Combining the existing strengths of both forms of data allows the research to provide more expanded take of these complex decision-making dynamics (Creswell, 2021, pp. 28-29). Ethical considerations were also prioritized throughout the study through validation on aspects such as anonymity and consent to transcribe the interviews, voluntary participation and respecting the

boundaries when interviewing external personnel, all of which promotes openness in the interviews. To be able to conduct the thesis in collaboration with the case company, the original data which included interview transcripts and notes as well as the raw material data which contained raw material names, prices, and suppliers, cannot be displayed in the appendices of the thesis due company and trade secrets.

3.2 Qualitative Interviews

To obtain holistic understanding on the case company's procurement practices and sustainability-related decision-making, interviews were used as the main qualitative data collection method. Semi-structured interviews were chosen for the flexibility, which allows to guide the conversation towards the interviewee's areas of expertise, and to obtain answers for desired areas of interest. This approach aligns with the objective of the thesis, exploring complex and multi-faceted issues, which include sustainability transitions, where perceptions, experiences and contextual understanding can be seen as essential (Adams, 2015, p. 493; Abuhamda et al., 2021, p. 77). The interview themes were developed based on both a preliminary literature review conducted as well as discussions held with academic supervisors and case company representatives to ensure theoretical and practical relevance.

The interviews included total sixteen participants who participated in the process. Fourteen of them were conducted through Microsoft Teams, while two of the participants chose to provide the answers in text format due to scheduling restrictions. The live interviews allowed for dynamic and adjustable conversations, including according to follow-up questions and deeper probing into given relevant topics, which enhanced the richness and contextual relevance of the gathered interview data. Allowing written answers among the live interviews enable to get additional external views for the thesis, which would not have been possible due scheduling and availability challenges. All

participants were briefed on the research purpose and verbal consent was obtained prior the interviews to use 'Transcript' to save the conversation data.

The interview sample included both internal and external stakeholders. Twelve internal participants represented a diverse variety of functions, which have either direct or indirect significance on sustainability-related procurement decisions. These functions included procurement, quality, research and development, product management and customer care. In addition, four external stakeholders were interviewed, including a plastics distributor personnel, as well as suppliers and partners familiar with sustainability-related transitions and plastics. These external interviewees were held from a broader perspective, as some confidentiality constraints limited their ability to provide comprehensive insights into their respective companies' direct operations. Nonetheless, they provided a valuable insight and an important additional perspective on the matters covered in the thesis as well as additional areas of expertise. Key insights obtained related to market knowledge and the projection of future directions on sustainable plastics. This diversity of perspectives made it possible to understand both internal decision-making dynamics and external market-level expectations surrounding material shifts in sustainable context. The table 1 contains further information about the chosen interviewee's through the represented functions, interview dates, and interview lengths. Interviewees order number also indicates to which interviewee is referred in the results section chapters 4.1.1-4.1.6 of the thesis. Anonymity is ensured through numbering instead of names and direct roles, which is required to ensure the compliance with the case company requirements.

Table 1, Interview participants and information

Interviewee	Function	Interview Date	Interview Duration
1	Customer Care	3.4.2025	28min
2	Distributor - External	15.4.2025	58min
3	Procurement	31.3.2025	52min
4	Procurement	4.4.2025	31min
5	Procurement - External	4.4.2025	55min

6	Product Management	10.4.2025	45min
7	Product Management	9.4.2025	43min
8	Production Engineering	22.4.2025	41min
9	Quality	1.4.2025	47min
10	R&D	7.4.2025	43min
11	R&D	16.4.2025	25min
12	Sustainability	3.4.2025	48min
13	Sustainability	23.4.2025	25min
14	Sustainability	21.5.2025	45min
15	Sustainability - External	17.4.2025	Written
16	Supplier – External	16.5.2025	Written

The composition of the interviews was intentionally made broad. Whereas some participants were an expert of the main areas of the research, such as supply chain management experts or sustainability personnel, the interviews included participants whose responsible areas may be affected through decisions made on sustainable transitions. These include functions such as quality, research and development and customer care. One of the main objectives of the interviews were to gather an overview on how the different parties view the status quo and the near future of the sustainable transition and to obtain knowledge on what aspects of the transition may influence the work of others. Even if the participants were not direct experts on procurement, sustainability or polycarbonates, their views were considered important to be able to assess how sustainability-related topics are interoperated as well as communicated within the case company's functions and how the organizational sustainability-related actions are viewed across the company.

All participants were asked a set of the same semi-structured questions, intended to capture perceptions of the priorities revolved around sustainable transition, potential and existing risks, and challenges, on how sustainability-related data and material is

gathered and communicated across the organization as well as what are the company practices around sustainability. These initial questions served as an interview framework after which discussion flowed towards areas with the interviewee's specific role as well as expertise. This flexible format enabled for efficient interviews and obtaining comparable information while still delving into the matters where the interviewee has the most knowledge and thus added value. This adaptable format ensured consistency for cross-case comparison while still allowing for in-depth and contextual exploration of the key themes of the thesis (Adams, 2015, p. 493).

The semi structured interview questions were:

- How do you perceive the role and prioritization of sustainability of the different functions in your organization, especially when it comes to transitioning towards more sustainable materials and / or products? What factors do you feel influence this the most?
- What kinds of risks are there typically associated with shifting to more sustainable materials or product alternatives in your organization (e.g., material security, customers, financials)?
- How is sustainability-related information typically discussed, shared, and/or evaluated in your organization when considering material or product decisions – from your perspective?
- What kinds of opportunities do you see in your organization's transition towards more sustainable materials or product solutions?

The intention of the interviews was not only to gather information on the strategic decision-making process or sustainable development, but to also understand the organizational culture, level of collaboration on sustainable matters as well as on how well sustainability is embedded within the organizational actions across the different functions. By encouraging all the participants to consider cross-functional matters, the results shed a light on how non-experts interpret and engage on sustainability-related challenges and opportunities. This multi-angled approach including the participation of various

functions across the company aims for holistic understanding of the case company's situation on the sustainable transition. To effectively analyse the qualitative data obtained from the interview process, the research employs a thematic analysis. The thematic analysis process of the interview results involved familiarizing with the interview answers and generating initial codes to capture some recurring meanings, which were eventually grouped into larger themes to observe and analyse the situation to detect patterns (Braun & Clarke, 2012, p. 5). This method is widely used in qualitative research to locate patterns of meaning in the data and it was a good way to explore the multi layered dimensions on sustainable transitions (Dawadi, 2020, p. 62). It proved especially useful to identify recurring themes and comparing perspectives related to sustainability transitions, which enabled structured but flexible way to consider on how different stakeholders experience and influence procurement decisions. It is important to note that the interviewer have had prior experience from the case company and its operations, and it may have influenced both the framing and the interpretation of the interview questions. While this perspective has enabled for more access on the stakeholders as well as better knowledge of the company's operational environment, this aspect needs careful attention to maintain objectivity during the analysis process.

3.3 Quantitative Data Analysis

The data analysis part of the thesis completes a mixed-method approach, aiming to combine qualitative aspects of interviews with quantitative analysis of raw material data. To support and triangulate the findings obtained from interviews, raw material data provided by the case company was used. The given data consisted of structured lists provided by the case company, including proposed sustainable plastic alternatives and their corresponding virgin plastic counterparts. These lists included general information such as material names, pricing information, and categorization by recycling or bio-based type. The dataset is utilized to monitor as well as to compare the performance and cost implications of sustainable plastic alternatives, providing operational context for their

potential impacts for implementation. The purpose of incorporating the raw material data was to assess and confirm whether the interviewees assessments and perceptions, especially those related to costs and price development, aligned with the real-world patterns. This aligns with the principle of data triangulation, which can be seen to enhance the credibility of qualitative research by offering to validate findings using multiple data sources (Doyle et al., 2009, p. 178). The integration of qualitative and quantitative data can be seen to reflect a pragmatic mixed-methods approach, which allows for more comprehensive answers to a complex research question (Doyle et al., 2009, p. 178). It also helps to enhance the study's reliability by cross checking the own findings and perceptions with operational data.

The raw material data was used by grouping raw materials into different categories and thus detecting trends. Raw materials were for example divided into four main sustainable types: post-consumer recycled mechanical recycled (PCR Mech.), post-industrial mechanical recycled (PIR Mech.), post-consumer chemically recycled (PCR Chem.) and bio-based plastics (Bio-based). Another grouping included considering only the nine polycarbonate entries against their representative virgin materials. Comparing results across these groupings enabled the identification of relevant informative trends, even from relatively small amounts of data per material pairing.

To preserve confidentiality within the case company environment, all raw material prices were anonymized by applying a fixed scaling multiplier uniformly across all included categories. While the absolute values are altered, the relative differences between material types are preserved, enabling meaningful and informative visual comparison without revealing commercially sensitive data. The quantitative analysis included two primary approaches: first, a comparison of average unit prices across subcategories of sustainable plastics available in the scope, and secondly a theoretical scenario illustrating the aggregate cost difference between currently used materials and their proposed alternatives, excluding volume-weighted consumption. These methods aim to highlight and illustrate cost-level patterns rather than deliver a financial forecast, supporting triangulation with

the qualitative insights. This is mostly due the restrictions and realities set by the available data.

3.4 Case Company

The case company examined in the thesis operates in the sector of industrial electrification. The field requires strict performance and durability for materials used, which is important when considering purchased plastics. Procurement decisions around polycarbonates as a technical plastic are important due the required properties, but also through aspired quality, availability and pricing to be able to fulfil its needs. The case company can be considered as large player in the industry and is in a good strategic phase of sustainable transition. Its organizational decisions can have a concrete influence on how sustainability is enhanced in its supply chain and thus also by its nearby stakeholders. The case company is also required to keep up with current and upcoming regulatory changes as well as to try to forecast developments in raw material market. While the study focuses on a singular case company, the aim is to generalise the findings to a broader level, where companies with similar situations and interests may face same challenges and opportunities.

3.5 Reliability and Validity

Several aspects of reliability and validity were considered throughout the process of advancing the research to ensure the methodological approach within the research. In line with the case study principles, multiple data sources were selected and utilized during the research process, including interviews and raw material procurement data, which served to enhance the credibility of the findings through triangulation (Pandey & Patnaik, 2019, pp. 169-174). Triangulation enabled cross-verification between interview findings and raw material data, aiding the depth, consistency, as well as accuracy of the findings. Construct validity was supported through the use of semi-structured interviews based

on a consistent question framework, and tailored follow-up questions. This method helped collect both relevant and comparable data across the different included stakeholder groups (Adams, 2015, p. 494). Clear view of the research goals further enhanced the trustworthiness of the study.

4 Results

This chapter presents the empirical findings obtained from the research process, where qualitative interviews and quantitative data analysis results are presented. The aim is to illustrate how the case company navigates the given trade-offs between sustainability and cost efficiency in choosing raw materials such as polycarbonates. The findings display that improving the sustainability of supply chain requires compromises, while the aspirations are challenged by practical requirements such as performance specifications, price sensitivity, and material availability. Interviews across the functions supplemented by external expertise, expressed varied interpretations on how sustainability-related actions are employed in practice, often shaped by different interests, KPIs and exposure to external pressures such as regulations. The findings are shaped to highlight both shared considerations and specific tensions within the organization and between the functions on what the priorities should be. Important factors on these dynamics include technical constraints, risk perceptions, internal alignment challenges as well as emerging opportunities ahead. These observations among the data analysis will form the basis for the topics of this chapter, which will lay down the groundwork for the discussion and interpretations. The findings respond to the research questions on how sustainability-related decisions are formed in procurement as well as what affects do the choices have in organizational scale.

4.1 Insights from Qualitative Interviews

The qualitative findings in this study are based on sixteen interviews conducted with various internal stakeholders, including procurement, quality, customer care, product management, compliance, research, and development as well as external stakeholders such as suppliers and raw material distributors. This diverse sample size allowed for broad understanding on how sustainability-related considerations are perceived across and beyond the organization, and how the values are implemented and challenged when it comes to procurement of polycarbonate materials.

Many interviewees pointed out that the disconnect between organizational sustainability-related strategy and day-to-day actions and decision-making. While sustainability is most often referenced in strategic communicational documents and presentations, as well as in some cases in organizational OKRs (Objectives and Key Results), its concrete integration and implementation to operational processes remain uneven. Participants often mentioned and noted a lack of clarity on how the sustainability goals translate to actual choices and when it should be prioritized, especially when pricing, availability and technical properties remain the most significant measures for a purchased product. The interviews also highlighted a level of varying degrees of internal alignment. Functions such as procurement, quality and R&D often face conflicting KPIs, which can result in evident trade-offs and compromises, which require high level of co-operation. Importance of KPIs aligning with organizational goals was supported in literature by Hristov & Chirico (2019, p. 1) and Strunk et al. (2022, p. 15). Cost targets, technical properties and long certification processes were often mentioned as the most common challenges and barriers when considering what holds sustainable products back from wider adaptation. At the same time, organizational awareness and being able to adopt certain sustainable materials early and thus establish strong market position in the supply chain remain evident possibilities on the sustainable transition environment.

Themes such as the external market pressures, customer expectations, supplier engagement levels, and certification hurdles were among topics discussed in detail, revealing systematic challenges. Many interviewees expressed that the evident pressure and expectation to advance the sustainable transition onwards comes from internal organizational ambitions rather than from the customers. However, customer expectations were felt to be increasing as the market is getting more educated on the alternatives and factors influencing the sustainable transition. This trend was most noticeable in Europe. To provide a structured and organized view of the obtained interview data and the recurring themes, the results are divided into six sub sections (1) organizational alignment and sustainability implementation, (2) customer demands and market pressure, (3) supplier

engagement and documentation challenges, (4) technical and certification barriers, (5) material availability, risk, and pricing, and (6) timing and strategic opportunity. These categories aim to reflect the viewpoints of both the challenges and the evident momentum supporting the sustainable transition movement within the organization and beyond. The numbering within and after sentences in below chapters indicates if certain individual or individuals of interview participants heavily presented the given insight, where the number – participant list can be viewed in the chapter 3.2 of the methodology section.

4.1.1 Organizational Alignment and Sustainability Implementation

From the interviews on of the most significant reoccurring themes was the organizational misalignment when it comes to the integration of sustainability into procurement decisions. While sustainability is formally acknowledged at the strategic level and included in organizational OKRs, the concrete implementation still often faces some hurdles due to some conflicting objectives in different functions such as cost reduction in procurement and material properties in quality and R&D. The challenge of translating sustainability goals into realistic actionable procurement strategies was highlighted by many interviewees, particularly with a role in procurement or quality related functions. It is still important to consider that the said challenges can be seen as dramatic due to the high focus of the research, where they said challenges remain small in the organization where many sustainable actions can be seen to be the top of the given category.

For example, participants from procurement related functions noted, that the department is mostly driven by the cost reduction targets as well as supplier availability. These short-term operational goals may conflict with sustainable material shifts as they are historically still more expensive with restricted availability. Per the view of one interviewee, sustainability is a key priority, but it is hard to justify when the pressure remains to maintain competitive pricing (3). In contrast the quality department highlighted that the sustainable alternatives still often do not address the technical specifications

required, to justify the wider adoption at least when considering some categories of parts requiring for flame resistance or durability (9). These conflicting pressures may create tension, with each function opting to prioritize metrics important to their operations. This tension between advancing sustainable matters internally and maintaining operational priorities displays a broader phenomenon observed in incumbent firms navigating through sustainable transitions. As Magnusson and Werner (2020, pp. 904–906) note, such firms often balance between innovating and defending strategies, depending on context-specific pressures as well as internal capabilities. In this case, the competing logics between procurement's cost priorities and R&D's technical standards exemplify this evident strategic duality.

The issue of organizational alignment was also mentioned in a context where participants expressed a lack of clarity regarding what sustainability meant in a day-to-day context. While sustainability can be seen to be widely recognized as important, the absence of clear, guidelines on how and when to prioritize it has led into confusion in the past. An interviewee from R&D related function stated that sustainability is often talked about in strategy level, but it still is not clear on how it impacts the material selection or design choices (10). This lack of alignment between strategic goals and operational procedures underlines the difficulty of implementing the sustainable thought processes in a meaningful way. According to ISO 20400, organizations should proceed to analyse their sustainability drivers, such as competitive advantage, stakeholder expectations, risk management, or regulatory compliance, to define procurement objectives and improve and clarify internal communication around sustainability goals (ISO, 2017, pp. 7–8).

The challenges of defining sustainability goals in specific operational actions were highlighted by interviewees from compliance and product management related functions, who underlined the difficulty of connecting internal actions to broader environmental goals. This aligns with literature findings, where Nikitchenko et al. (2016, p. 33) emphasized the complex trade-offs organizations need to manage while the implementation of sustainable actions into the procurement strategies. This indicates that getting

sustainability in operational stage in procurement requires more than strategic commitment, it also requires cross-functional alignment and clarified ownership of the organizational sustainability goals in everyday activities. These findings align well with the ideology of rethinking decision-making frameworks being crucial to overcome sustainability integration barriers in organizational level. As noted by Pacheco & Clausen (2024, p. 956) in literature, balancing sustainable actions with cost realities often requires re-thinking of existing methods and habits and introduction of new decision-making frameworks. The internal considerations on the felt misalignments in matters such as KPIs and sustainability goals ownership further demonstrate practical issues that could arise if strategic ambitions are not employed effectively.

4.1.2 Customer Demands and Market Pressure

From the interviews, a clear message formed, stating that external customer pressure for sustainable materials remains low at least for now. Despite the evident global awareness and knowledge as well as regulatory shifts, most interviewees agreed that customer pressure is not a significant influencer on procurement decisions in the case company. Instead, the push for advancing the sustainable transition seems to be internally driven, aligned with organizational brand positioning and strategy. Multiple interviewees across most functions emphasized on this theory. Interviewee from customer focused function stated that customers remain still focused on price and performance rather than on how sustainable the product is (1). Nikitchenko et al. (2016, p. 15) similarly observed, that it brings organizations certain tension, that consumers in general might prefer cost over sustainability. Another interviewee mentioned the possibility that the product the case company is offering may not be the most significant sustainable factor on customers scope, which may also have an influence on this demand. One interviewee added that the sustainability-related conversations with customers heavily relate to packaging and logistics, rather than to raw materials used in the products (10). From the company's perspective, the current market reality does not yet justify a broad shift to sustainable raw materials especially if it comes with higher price points, unless the additional value

is not in other ways justified through restrictions such as legislations or some benefits from more efficient life cycle management.

However, some geographic differences were observed and identified. Several participants pointed out, that the European markets are beginning to reflect an evident growing awareness of sustainability, especially in sectors where external pressure or regulatory scrutiny are present and affecting the setting. One interviewee stated that in some regions in especially within EU, sustainability already might enable for slight competitive advantage, at least in bidding scenarios where environmental scoring may influence in the decision-making processes (3). This was generally seen a sign of what may follow: while current customer base may not be prioritizing or demanding a change, interviewees believe this will likely be a norm to demand certain level of sustainability in the future, especially eventually when sustainable material alternatives will not lose to traditional materials in price or availability. This may end up reality through coming innovations which could make sustainable alternatives easier to produce or distribute, or changes in regulations, which could restrict the use of non-sustainable materials. The still limited push from customers implies, that sustainability actions may now depend more on internal vision and regulatory foresight, which highlights the need of conducting long term strategies, which will not hinder in short term market disturbance.

4.1.3 Supplier Engagement and Documentation Challenges

Another recurring theme in the interviews was collaboration with some suppliers on documentation, compliance. Whereas suppliers are more and more involving themselves in sustainability-related actions and offering sustainable alternatives, the process of evaluating, comparing, and verifying the materials and products is often challenged by inconsistent communication, varying standards, and limited supplier knowledge. While raw material suppliers were often seen as proactive, some similar documentation issues were reported.

Despite the evident proactive stance, many interviewees from various functions reported some challenges in gathering sustainability-related documentation from suppliers. There remain significant differences on the sustainability documentation expertise, where some suppliers have professionals responsible of providing documentations such as RoHS, REACH or PFAS, whereas smaller suppliers may not be familiar with these at all. It has also been reported as a problem that some suppliers may not take such inquiries seriously before escalation through managerial level. The possible lack of knowledge on such documentations may in some cases lead into inconsistencies and even introduce legal risks at some point, if in the lack of further expertise, the forms are filled just to get them completed (11, 15). Some interviewees emphasized the difficulty of obtaining some of the sustainability-related information especially when the given supply chains are long with many foreign suppliers from another continents. Further difficulty on sustainable documentation and supplier interaction can be seen to be lack of standardization across suppliers and regions. Different compliance forms may require suppliers to use significant amounts of resources, which often may lead into conversations on who will deal with the cost of these documentations.

In addition to documentation and declaration related issues, another key aspect of supplier co-operation is the testing procedures. Multiple interviewees stated that even pre-certified materials often require internal testing, moulding trials, samples, and adjustments to achieve the desired standards (9, 10). These procedures often create another significant layer of coordination with suppliers, who may not always understand the strict requirements in the case company's industry. One interviewee from R&D stated that there is sufficient need to know how the new materials behave in the case company's tools and conditions.

Several interviewees across multiple functions suggested, that improving supplier co-operation and collaboration could be a major factor improving overall sustainability of procurement actions. This is echoed in literature, as according to Nikitchenko et al. (2016, p. 19), role of collaborative approaches and positive stakeholder engagement is crucial.

This could include building even closer partnerships, initiate joint testing programs, and work towards more harmonized sustainability standards across all suppliers and customers as well. As highlighted in ISO 20400, achieving desired sustainability related outcomes with suppliers often requires a shared long term plan and vision, which is then executed with collaboration and transparency as a driving force. This can be supported with various actions and incentives such as incorporating sustainability factors in contracts and KPI's, ensuring fair terms across agreements and mutually and constantly searching for areas for improvement (ISO, 2017, pp. 36–37).

External sustainability expert stated that more two-way communication would be needed to enhance the overall sustainability of the partnerships. High quality answers and communication is not possible to achieve just through forms; it is important to have conversations and build understanding on the holistic situation to formulate relevant expectations (15). Some participants stated that localization could still be the most significant direction for increasing the overall sustainability as most often the highest CO2 emissions are created through logistics. Some added that most often the communication and co-operation is more fluid with local suppliers, who share the same cultural aspects of doing business. It is still important to note that dual sourcing is often required due availability risks.

4.1.4 Technical and Certification Barriers

Interviews revealed the single most significant and non-negotiable obstacle of the wider adopting of sustainable material alternatives is the existence of strict technical properties requirements for given materials. Even when sustainable materials are made available and financially viable option, implementation is often restricted by performance concerns as well as validation and certification bottlenecks, especially in technically demanding products. Across the conducted interviews various participants from R&D and quality related functions stated that some of the purchased materials must meet the high technical thresholds, especially in the electrical, thermal, and mechanical

performance. There are components that simply must withstand heat or carry a current, or even be flame resistant, where compromises cannot be made on the required properties. There remain many sustainable materials, which fail to fulfil these requirements which restricts their implementation to be used in the technically critical parts of the product. These concerns are confirmed by some of the interviewees. One stated that some tested sustainable materials behave differently under heat or pressure (9). These inconsistencies can lead into increased rejection rates for the products or even product failures in the use. Given the case company's priority to provide durable and usable products, quality simply is not a place to allow compromises to allow wider sustainable adaptation.

Closely tied to the technological barriers is the evident challenge to have certificates for new materials. Several interviewees from various functions highlighted the importance and significance to obtain certificates from UL (Underwriters Laboratories) for materials and that it may take some time to obtain those. The given certificates are expensive, time consuming, as well as complex requiring extensive amounts of documentation, testing and even in some cases multiple rounds of iteration. One participant stated that the certificate process may take months and if it fails, the whole process resets (11). This reality creates a high entry threshold for any new material alternatives and even discourages the experimentation if there is significant interest. Additionally, many participants mentioned on how inflexible the certification process is. Thus, even small changes, such as switching to a recycled version of an already certified polymer, can reset and cause a full new certification process, especially if the component can be considered critical for the product. This reality can lead into a situation, where better versions of known materials must undergo same levels of scrutiny as entirely new ones, which can be viewed as highly inefficient. These are unfortunate procedures, but most of the times, there is no choice but to go with it stated one of the interviewees.

Certification processes also demand significant internal resources and collaboration. Testing and documentation are not only seen as costly but also requires the attention

and coordination of various levels and departments such as R&D, quality, procurement as well as external parties and testing labs. Due to teams usually focused on supporting the ongoing production procedures, they may lack the capacity to prioritize certification for new material alternatives. One interviewee stated that most of the parties agree that said actions are important, but close to no one has time, or budget to lead it unless there is a deadline attached to it (11). Discussion were also raised about desire for more agile and risk-calibrated certification pathways, most significantly for materials that can be declared to be used in non-critical parts. Several participants stated that more sustainable alternatives could be introduced to non-critical parts, but it still requires much attention to make it reality, and it is important to acknowledge the restrictions of certification process, where the most time is consumed. But it is worth noting that the pace of improvement of the sustainable material alternatives was viewed as positively by many of the interviewees. Many mentioned that the projected gap is closing, and the bio-based and recycled options are getting better year by year.

4.1.5 Material Availability, Risk, and Pricing

A commonly mentioned topic throughout the interviews was the considered interplay between availability, pricing, and risks involved when considering the transition to sustainable alternatives. Even though the awareness, interest, and knowledge grow within the case company's organization, these three factors continue to heavily influence the material choices, and what proposals are initially advanced. Most notable, the availability and experienced consistency of the given sustainable materials are both still seen as significant limiting factor, especially when demand spikes could arise, or specific grades and formats would be required.

Multiple interviewees, especially procurement and R&D based, emphasized that raw material suppliers are offering more sustainable options, which include alternatives such as bio-based and recycled polycarbonates. It is crucial to minimize issues such as reliability and batch quality differences, especially on when it comes to technically critical

components. One interviewee stated that if many companies pivot towards some sustainable variants, the existing supply chain may not be able to scale its operations fast enough which could lead into bottlenecks and delays (5). This adds another layer to consider not only from cost perspective but also from operational stability.

Another, and the most noted concern is cost. Sustainable materials are commonly more expensive, often by a significant margin. This was mentioned in the literature as Mooji & Muller (2021, p. 43) considered that the cost remains as the main barrier restricting the wider adoption. Several of the participants noted that in a price-sensitive market and industry, the difference is often hard to justify, unless it is accompanied by regulatory pressure or clear added value for the customers. This challenge was felt significantly evident in B2B context, where volumes are often remarkably high, which leads even small increases in material costs to stack up and make noticeable difference. Whereas normal consumers may be able to justify certain increase on purchased products through increased level of sustainability, or clarity on the origins of the raw materials, on a B2B level the reality remains that the price should not increase to sustain the market position.

Many interviewees noted a positive trend, which suggested that the price would not be as significant issue in the future, and even speculated with a tipping point, where sustainable materials may become the more affordable option. This may become reality through multiple factors, such as breakthroughs in innovation, increased levels of cooperation between relevant parties and possible regulatory demands. This is supported was also considered crucial, as Wnuczek & Podkoscielna (2021, p. 40) mentioned need for innovation great in the context of sustainable transition, as advancements in innovation can have significant impacts on being able to increase sustainability level of products. Many interviewees stated that while there is constantly more interest and demand for sustainable alternatives for various materials, it can be seen as probable, that the cost issue will continue its steady decrease towards similar price levels than its traditional counterparts.

Cost related risks were identified in indirect aspects such as investments required for a product to be made active as mentioned by multiple participants. Most of the time for a new material to enter the supply chain, various investments need to be made in the form of mould modifications, samples, tests, certificates and more. This highlights the importance of testing and research conducted to obtain as good view as possible on whether given materials would be suitable for the required purpose. In the case of changes in the proposed material, many of the investments would be required to be re-made to be able to advance the new version. Thus, it is vital to acknowledge, that there are significant costs to be considered outside the most obvious eventual production price.

4.1.6 Timing and Strategic Opportunity

Lastly theme to be mentioned, which was highlighted by the participants was the timing related to the adoption of sustainable materials. It came clear that the timing is not just a technical or financial question, but a strategic one. The transition appears inevitable for most organizations, so it is more a quest of when, rather than if. Based on the literature, transitions relating to sustainability require organized and sufficient organizational shifts across different dimensions, such as technology, business, and stakeholder interaction (Markard et al., 2012, as cited on Patala, 2022, p. 13). But the successful timing of it is one of the most complicated dilemmas relating to the very centre of the balancing act between the sustainability goals and cost-efficiency. The thought of sustainable transition being inevitable was shared with most internal and external stakeholders, and that the challenge lies in balancing the urgency with the readiness.

Whereas internal pressure is strong to move on with the sustainable transition, many interviewees highlighted the significant importance for well-informed timing. Acting too early on the movement might result in significantly higher costs, issues relating to performance as well as longer and costlier certification procedures. On the other hand,

delaying the transition might lead into missing the possible competitive advantage, missing to cement the strong position with the raw material suppliers as well as to be perceived as a lagged party in environmental responsibility by external stakeholders. Several interviewees either speculated or predicted that regulatory shifts could be expected to increasingly reward companies that are already set to align with sustainability frameworks (2, 3, 15). This expected shift is also supported by the mentioned academic literature, where regulatory pressure is highlighted as one of the main key drivers driving sustainability transitions forwards across industries (Köhler et al., 2019, p. 2).

Opportunities were especially seen in adopting sustainable materials first in low-risk components, which does not require the highest properties from the used raw materials. Interviewees from R&D and sustainability-related functions proposed that non-critical parts could serve as an ideal pathway and starting points for introducing new raw materials without compromising the products performance, safety, and integrity, and to avoid the triggering of full-scale certification processes (2, 6). Such phased adoption would allow the case company to build up the internal expertise, test supply chains as well as to prepare for broader shifts without facing the cost and resource requirements of full-scale transition all at once.

Strategic value was also linked to being able to establish the market position early. This was also emphasized by Vehmas et al. (2024, p. 1498) in the literature, by stating that companies that align internal procurement procedures with the projected development of sustainable transitions as well as approaching regulatory changes, most likely will obtain stronger market positioning. A recurring point made by several of the interviewees from various positions was that being able to be among the first to implement credible sustainability actions in B2B context, could lead into long-term brand and supply chain advantages. The interviewee from external plastics distributor highlighted the important role on the order in which the customers engage in discussions, which plays a crucial role. It can even be seen to obtain better availability and leverage the price negotiations, which makes the search for early market possibilities highly lucrative.

As stated by many of the interviews, how successful the transition is, is highly linked to how well strategically timed the actions are. This highlights the importance of factors such as tracking technology, regulations and staying in active collaboration with market professionals. The interviewee representing external raw material distributor stated that the co-operation and how early certain customer engages may affect into the pecking order according to which the opportunities are distributed.

4.2 Raw Material Data Analysis

The purpose of the data analysis is to complement and validate the interview findings with numerical and visual support. The available raw material data is new addition to the case company's data resources which is due to sustainable material alternatives becoming realistic option in many plastics categories in just recent years. One interviewee (16) also noted how recent these processes are due to the historical trend of virgin materials being the more attractive option up upon the very last few years. Whereas this makes making historical interpretations challenging, it also makes the data used the most relevant it can be which can be seen to enhance the validity of the research, as the data is from Q1 2025. For the sake of the case company's public market position, the datasets used in the thesis, were anonymized to allow comparison and illustration without displaying the actual values and prices of the raw materials. This was done by implementing non-visual multipliers to the charts in Sections 4.2.2 and 4.2.3, which adjusted the actual range of results while preserving the relative differences between material types in question. A fixed scaling factor was applied uniformly across all categories, ensuring that comparisons stay meaningful and visually true while exact values remain hidden. This approach enables the presentation of meaningful trends without disclosing sensitive pricing information obtained from the case company.

4.2.1 Comparison Between Different Subcategories of Sustainable Plastics

The used data contained different subcategories of sustainable plastics, including post-consumer recycled mechanical recycled (PCR Mech.), post-industrial mechanical recycled (PIR Mech.), post-consumer chemically recycled (PCR Chem.) and bio-based plastics (Bio-based). The different subcategories contained different plastic types, one of which was polycarbonates, but in this part of the data analysis, the whole raw material portfolio is considered. The different types of sustainable alternatives were compared to the price of currently used raw materials of the counterpart categories, where the average prices of current raw materials for give comparison category is illustrated as 100%.

Figure 6 displays that there are some differences between the subcategories, as some can be seen to be collectively cheaper than the actual used raw materials currently in use. While that does not mean that the given raw materials are immediately implemented, this means that those remain feasible options for the future – given that they pass all the required technical evaluations and certification processes. While there would be evident interest on trying to identify why the bio-based alternatives are significantly less cost-competitive compared to the recycled counterparts, it should be noted that generalizability is limited due such small sample size. This phenomenon will become more evident through multiple years of data being collected, but at the current time it is not viable. Notably price differences in this level are often caused from new processes of production. Bio-based may be more expensive due feed-stock costs, production scales and more complex supply chains compared to recycling existing material.

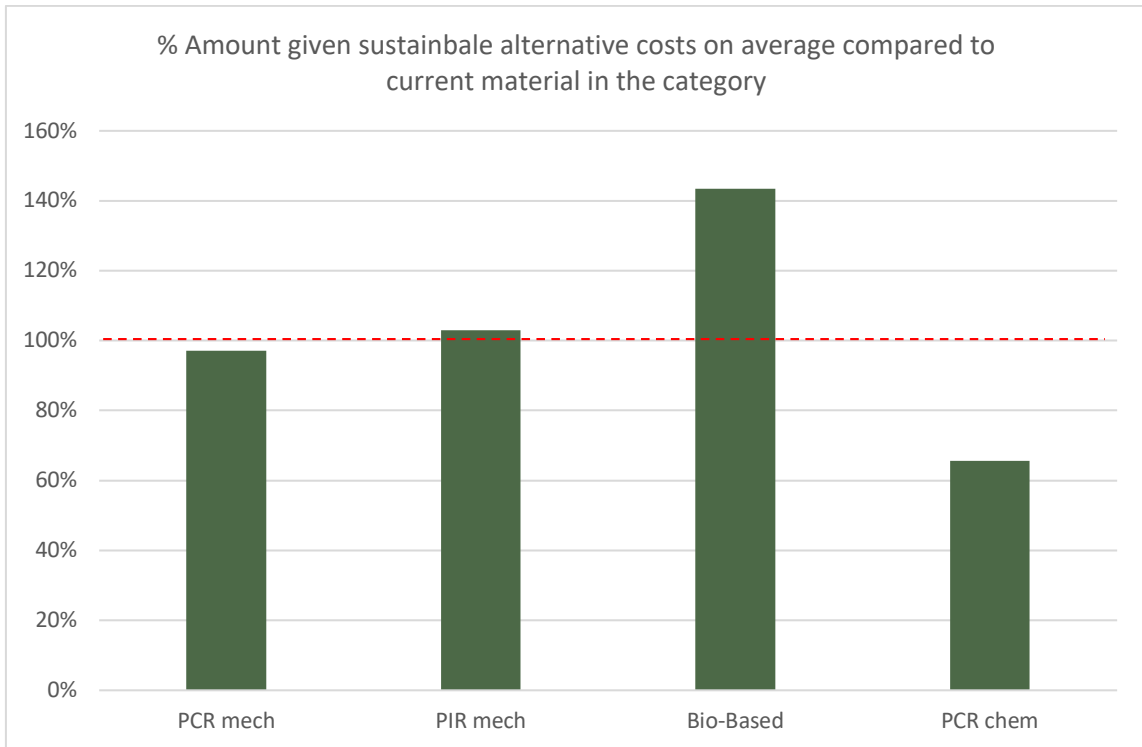


Figure 6, Different sustainable subcategories (analysed data from the case company)

4.2.2 Sustainable Polycarbonates vs. Current Plastic Choices

The second way to illustrate the obtained raw material data was to compare the sustainable alternative prices of polycarbonate options to the ones currently in use. The figure 7 contains nine polycarbonate-based plastics variations, which are potential options to advance to further phases of raw material selection. As previously mentioned, the ratio of the compared material illustrates the actual ratio of the prices between the two raw material options, but the scale does not represent any actual numerical values. This is done to allow the use of the given data without sacrificing the illustrative aspect of the chart.

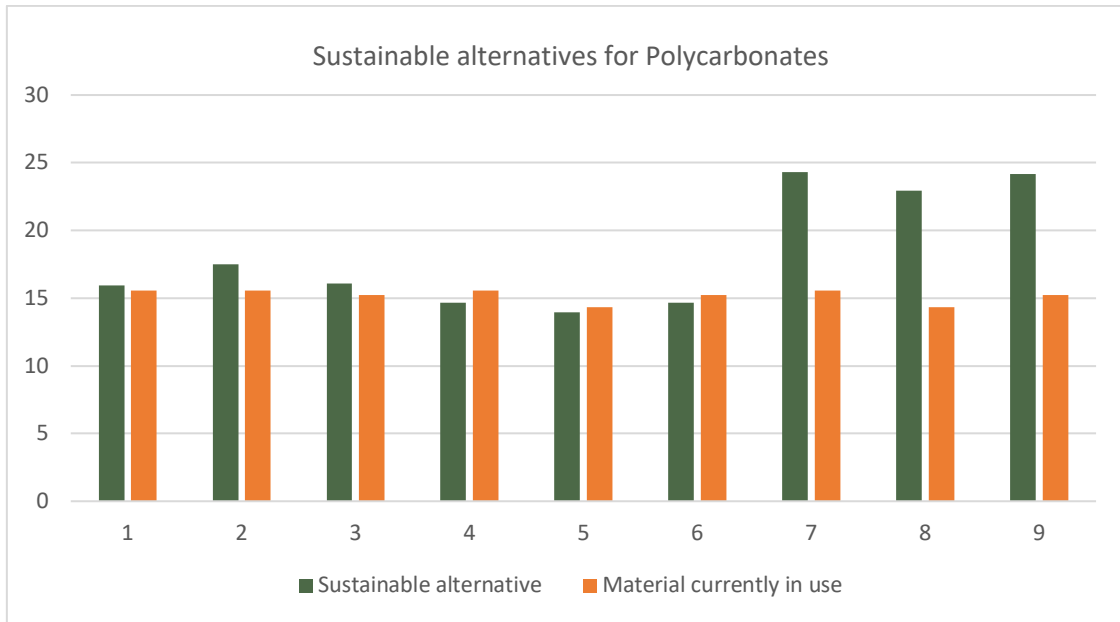


Figure 7, Polycarbonate category sustainable alternatives against currently used (analysed data from the case company)

As showed in the figure 7 and viewed in 4.2.1, there certainly are some sustainable alternatives within the scope of materials, that offer competitive pricing among the sustainability-related benefits. It is also visible, that this is yet not the case in all materials and significant price increases are still visible within some material slots. Whereas small sample size means that these findings are not generalizable, important takeaway here is that sustainable alternatives can already be cheaper than virgin plastics, which displays the promising trend.

4.2.3 Simplified Annual Difference of Sustainable vs. Traditional Plastics

This section of the data analysis contains the simplified overall analysis of the sustainable materials on average cost versus the currently used materials. The compared values are the average of each cheapest MOQ prices of both sustainable alternatives and currently used materials. The pillars illustrate the theoretical difference in ratio of the average single cost of all currently used materials versus the alternatives, without incorporating yearly consumption of given materials. So, the figure 8 is not an estimation of how much the cost would increase due the switch, but simply a theoretical illustration of where the

average price difference collectively is now between the virgin materials and sustainable alternatives. In this context, “theoretical” refers to a simplified average cost comparison that does not account for actual purchase volumes or anything else in that level. In contrast, a proper estimation of cost increase would require weighting each material by its annual usage quantity and incorporating logistics, validation costs, and potential price development. This suggest that the general cost-level relationship between sustainable and virgin options rather than simulate the financial impact of a real-life broader material switch.

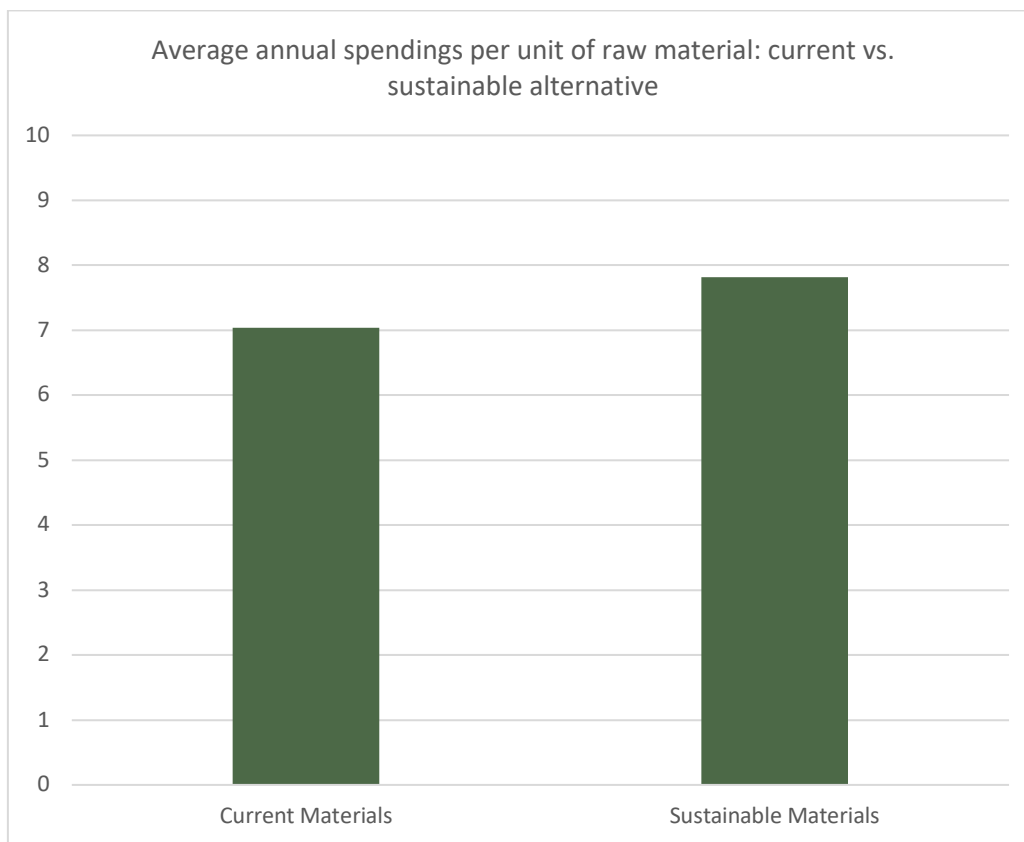


Figure 8, Theoretical annual average cost per raw material (analysed data from the case company)

As seen from the figure 8 the theoretical total toll of switching all current materials to their sustainable alternatives adds to a significantly larger amount in average price. Notably with the volumes and the magnitude of business for the case company means that the difference between the two accumulates into drastic differences in annual budget

used for raw materials, which can be seen to indicate that the total switch accounting with yearly volumes of each material is quite unrealistic scenario. On the other hand, it is important to note, that small amount of materials is significantly more expensive than the ones currently in use, which can lead into slightly skewed perceptions. Even if the 10 most expensive or cheapest materials were excluded, it could create overly optimistic or drastic picture of the actual situation. Since many of these materials in scope are still undergoing validation and certification, such filtering would not reflect the current stage of feasibility and would misrepresent the realistic potential of sustainable alternatives.

4.3 The Summary of Key Findings

To conclude the give results chapter, the following tables are presented to provide a synthesized overview of the key findings obtained from both the qualitative interview data and the quantitative raw material analysis. These tables are intended and formatted to help the reader quickly be able to grasp the most relevant patterns, tensions, as well as conclusions that emerged during the research process. Table 2 compiles the key insights from within the mixed-methods analysis and maps them to the research objectives, offering a short explanation of each finding. These findings form the foundation for the following discussion in Chapter 5.

Table 2, Summary of the key findings (data from the interviews and data analysis)

<i>Key Finding</i>	Source	Related Objective(s)	Explanation
<i>High up-front costs - (validation, testing) hinder quick adoption</i>	Interviews	1, 2	Interviewees note that switching requires new testing, certifications, and process changes.
<i>Market still driven by price, not sustainability</i>	Interviews	1, 2, 4	Customer care and procurement emphasize cost and performance as dominant purchase drivers.

<i>Lack of cross-functional alignment slows sustainability implementation</i>	Interviews	1, 3	Misalignment between departments slows down decision-making toward sustainability goals.
<i>Price difference alone cannot guide adoption; technical and compliance needs must also be met</i>	Mixed	1, 2, 3	Quantitative cost analysis + interview concerns highlight complexity in decision-making.
<i>Sustainable alternatives may be cheaper in some subcategories</i>	Data-analysis	1, 2	Figure 7 shows some bio-based materials are cheaper than current ones, depending on type.

Table 3 on the other hand offers a comparative view of the perspectives from different functions and roles interviewed in the case company and externally as viewed based on the conducted qualitative interviews. It highlights in generalized way how departmental focus, sustainability attitudes, perceived challenges, and customer influence vary across the different functions within the organization and beyond.

Table 3, Perception differences across internal and external functions (data from interviews).

Function	Primary Focus	Attitude Toward Sustainability	Main Challenge	Customer Influence
Procurement	Cost; availability	Pragmatic; cost-driven	Price sensitivity, availability	Low; internal push dominates
Sustainability	Lifecycle, footprint	Committed; strategic responsibility	KPI misalignment, weak operational link	Growing; anticipate future demand
R&D	Safety, technical fit	Supportive but cautious	Material inconsistency, high test cost	Low; readiness over pressure
Quality	Reliability, compliance	Conditional on material performance	Technical barriers, KPI conflicts	Minimal; durability prioritized
Customer Care	Communication, service	Supportive but unclear	Weak feedback link; internal clarity lacking	Limited; mainly packaging/logistics

<i>External Distributors</i>	Material offering, compliance	Proactive; part of business strategy	Vague client demands, legal risks	Rising; indirect end-user pressure
<i>External Sustainability</i>	Lifecycle, market trends	Advocate; system-level perspective	Supply instability, unclear standards	High; regulation and B2B shifts

This comparative aspect to analyse and visualize the obtained information by allowing the direct comparisons on what each internal and external function and party views as the most significant aspects of the sustainable transition. Together, these tables support the multidimensional interpretation and viewing of the findings by narrowing the gap of technical, organizational, and strategic perspectives.

5 Discussion

This chapter aims to interpret and reflect on the findings from the interview process. The findings are discussed in both academic and practical context. While chapter 4 carried out the empirical insights gained through the interview process and the conducted data analysis, this chapter seeks to address and explain the implications from these findings as well as to consider those in the context of research questions and theoretical framework. The discussion chapter is divided into the four topics, including the dynamics of organizational readiness, the influence of performance metrics, the strategic role of collaboration, as well as the broader risks and opportunities associated with transitioning towards more sustainable materials in procurement. Through this dividing, the chapter highlights the key enablers as well as challenges associated with aligning sustainability ambitions with procurement. The four subchapters are topics that emerged as the most notable and recurring during the research process and represented the interviews and data-analysis in the best way. These themes are viewed to align with the research objectives and questions, capturing the most notable findings related to internal readiness, performance metrics, collaboration, and risk–opportunity dynamics. This structure ensures the discussion in this chapter remains tightly linked to the study’s core aims. In addition to discussing key findings, this chapter links results to the theoretical frameworks presented in the literature review, which show how the findings contribute to both academic understanding and to practical procurement decision-making processes

5.1 Organizational Readiness and Cross-Functional Alignment

The case company demonstrates a strong strategic commitment towards general sustainability goals, the findings suggest that the practical implementation of organizational goals remains somewhat uneven across different functions. This seems to not be unusual in large, technically advanced organizations, where operational teams are aiming to flourish in their given area of expertise as well as to meet the demanding performance standards set by the expectations and ambitions. In some functions sustainability is not

part of the daily work, which might not be bad at the current moment, but which could need to evolve as the transition moves onwards. The lack of familiarity with sustainability principles can be seen as an opportunity for improvement rather than a drastic problem. As the recurrent theme among some of the interviewees was the lack of clarity on how the sustainability-related goals are visible in day-to-day activities, notably the current phase of the sustainable transition may not influence all the functions activities, but it is important to acknowledge that it will most likely be subject to a change in the future. It is also important to note that the disconnect does not indicate lack of motivation towards sustainability-related matters, even if there remain some negative perceptions on sustainability and considerations on if it really is important.

It can be viewed that the effectiveness of sustainability initiatives and communication appears to revolve around the level of how well functions understand their own role in the sustainable transition and the possible constraints and objectives of the other functions. Without this shared understanding there is a possibility of lacking resources where different parties focus merely on their own teams' priorities and thus create unnecessary challenges for other teams regardless of if they are working towards a common goal. This can be exemplified in a situation where an employee maximizes the factors benefiting their own functions merit without further considerations on how the choices may challenge the next one working on the project. Incorporating this holistic way of thinking as well as a basic understanding of how given situations may affect other functions could lead into more streamlined and fluid processes in sustainable transition. This way of consideration is especially important where co-working functions may have intersecting objectives, such as procurement aiming for cost efficiency and quality aiming for durability. While it is understandable and often necessary that each function opts to optimize outcomes from own perspective, this siloed approach may become problematic during sustainability transitions, where trade-offs are more complex as well as interdependent. To avoid such situations, increasing transparency and implementing diversity into communication could help tackle these potential conflicts at the earlier stage. By incorporating

some external considerations into internal decisions, functions can be better prepared to anticipate challenges and contribute to help organizations operate in better way.

It is important to note that building knowledge and alignment between functions often takes time especially when considering a relatively new corporate matter such as sustainability. There remain functions, which main function does not relate to sustainability-related actions, which makes it understandable that not all are familiar with the sustainability principles. Whereas this may not be an issue now, when sustainable materials and principles become more widespread either through innovation and thus competitive pricing, or through regulatory pressure, it would be important that every function and employee would be somewhat familiar with the concepts and implications of sustainable transition.

5.2 Incentivization and KPI Importance

One key finding was the difficulty of aligning performance metrics with sustainability ambitions. Whereas it is evident that sustainability is clearly a great priority in the case company and there are clear strategic commitments towards increased sustainability, many metrics that guide the day-to-day operations and actions of different teams, particularly in procurement and technical roles, remain anchored with traditional metrics such as cost reduction and operational risk reduction and excellence. Notably this is not case company specific problem but illustrates the more general difficulty of implementing sustainable materials before the options can be competitive in pricing and properties. While the trend is positive, the reality has not been fully reached yet.

Across interviewed functions the acknowledgement of the evident importance was clear as well as the willingness to support sustainable actions in function level activities, but it was often noted that the ability to act is shaped by the goals measured by metrics KPIs and OKR's. KPIs importance was also emphasized by Hristov & Chirico (2019, p. 1) and Strunk et al. (2022, p. 15) in the literature. For example, procurement professionals may

need to conflict their cost-reduction goals which are often viewed short term, to implement sustainable material alternatives to production due to a common higher price tag, regardless of if the obtained transition may prove to be profitable in longer time scope. Similarly, R&D and quality teams often may need to sacrifice some performance until the sustainable alternatives are comparable to the virgin materials in this aspect. Whereas traditional metrics such as cost reduction are proven and important for overall performance, it is worth consideration if some adjustments or considerations need to be made to align the performance metrics and goals to support sustainability initiatives. Importantly, the case company is doing well in most categories and to some extent sustainability initiatives are integrated into goal metrics. Nevertheless, to increase efficiency among which sustainability transition is executed within the company, adjustments and considerations relating to goals and performance metrics should be made. In the given context, tools such as Lifecycle Costing (LCC) and Lifecycle Assessment (LCA) as mentioned in the literature review, could further help in the process of aligning economic and environmental dimensions more effectively, by for example enabling procurement and technical teams to better understand long-term implications of material choices beyond the immediate price and performance aspects. These findings suggest possibility that tools like LCA and LCC could help bridge the gap between KPIs and long-term sustainability goals and thus operationalize principles such as TBL.

5.3 Collaboration with Suppliers and External Stakeholders

The findings clearly highlight the importance of collaboration as critical factor in sustainability transition, particularly in the case of sourcing and validating alternative materials. This was supported by (Nikitchenko et al., 2016, p. 19) in the literature, by highlighting the role of collaborative approaches in creating meaningful outcomes in sustainable transition. While collaboration is seen essential, to maximize the opportunities of the transition, collaboration should be extended and enforced to partners such as suppliers and other relevant external stakeholders. Encouraging, at least some of the known

suppliers for the case company and at least the ones interviewed, appears to be well aligned strategically with sustainability trends with many working with or towards the use of sustainable material alternatives or other sustainability actions, where raw material suppliers act as the most proactive party. It has become evident that raw material suppliers and distributors are increasingly innovative and trying to match the demand for sustainable alternatives with required properties and realistic price points as it may produce them a situational competitive advantage. These findings are well aligned with the stakeholder theory mentioned in literature review, which emphasizes that companies need to increasingly balance the expectations of the stakeholders beyond just shareholders (Valentinov, 2023, s. 27). In the given context, collaborative efforts and strategic responses on growing sustainability expectations formed by stakeholders who influence procurement decisions.

As confirmed by raw material distributors representative in the interviews, there remain unutilized upside from collaboration as the interests are often aligned. The collaboration could include more detailed conversations of the requirements, even shared research programs, which could lead into an established negotiation position for the future. Collaboration and being proactive was also highlighted as an important factor on obtaining a strong position with the supplier which can lead into benefits such as prioritization of some supplies and advance access to some new materials in tests. The importance of being early adopter of certain principles and interacting with upcoming materials as well as engaging before certain material choices are made, can lead into future benefits. This collaborative aspect extends from raw material suppliers to so called normal suppliers in the supply chain. Optimizing efforts towards more sustainable supply chain is easier when communication is cohesive and fluid across parties in different phases of the supply chain. Strategic frameworks such as the Kraljic Purchasing Portfolio Model mentioned in the literature review, can support this supplier collaboration by classifying items and suppliers based on the real profit impact and supply risk, helping procurement teams modify the reliability of the given supplier or product and thus tailor the importance it can have on the production (Caniëls & Gelderman, 2005, p. 142; Bianchini et al., 2019,

p. 1196). Most often some aspects where advancements in sustainability could be increased could be a matter of not knowing what the situation is in suppliers end or not considering something due to the lack of knowledge on the situation.

Several interviewees described to have had positive experiences with supplier communication as well as to have thought well of the joint testing initiatives, others highlighted challenges in obtaining clear, dependable, and consistent sustainability-related information particularly with documentation related initiatives. Such variation in supplier communication seems to not be uncommon in global supply chains, and it is not always easy thing to improve on. Some challenges come from suppliers limited knowledge on sustainability metrics due long global supply chains and international suppliers. This underlines the importance of systematic communication and exploiting the powerful status of incumbent company by demanding improvements in certain important aspects of business. Notably, closer coordination with organizations internal business units could further help supplier coordination and collaboration. It can be seen as evident, that there are many areas were sharing learnings, avoiding same issues and setbacks in for example material testing could improve the overall efficiency of the transition. It can also be viewed as an important negotiation strength if frame contracts conditions can be made better as volumes can be increased through organizational co-operation. These findings are supported by ISO 20400 standard, where it is emphasized that supplier relationships and the successful collaboration is key in advancing the overall sustainability of the supply chain. Standard states that it can be done by including sustainability related aspects in contracts and agreements, setting fair terms and incorporating good communication ways for passing sustainability related information (ISO, 2017, s. 36-37). The findings also go along with the stakeholder theory perspective, which suggests that long-term value creation within the sustainable transition processes not only consists of shareholder interests but also of fulfilling expectations of broader stakeholders such as regulators and suppliers as well as customers (Valentinov, 2023, p. 27).

5.4 Strategic Opportunities and Risks in Sustainable Transitions

The transition towards more sustainable materials used presents both constraints and opportunities. The findings obtained from this research highlight that whereas the case company is operating both in complex regulatory and cost-sensitive environment as well as in challenging phase of the transition, it is also well positioned to capitalize on the opportunities provided by shifts in regulation, customer demands as well as developments in supplier field. The interviews revealed a consistent alignment on how personnel perceived the probable development of sustainability in the industry. Most viewed that sustainability is becoming an evident long-term necessity regardless of if the current customer demand does not illustrate it as a trend. This strategic awareness can be seen as important factor of preparing for the evident steps when the timing is right. This aligns with broader sustainability transitions theory, which emphasizes that such shifts are not merely limited to product-level change but require systemic, multi-actor realignments across the required areas. As Köhler et al. (2019, p. 2) argue, transitions often unfold over long timeframes and involve diverse actors including firms, regulators, and civil society. They are shaped by complex co-evolution between factors such as cultural norms, institutional arrangements, infrastructure, and technology. The findings from this study, including the evident need for regulatory shifts and internal cultural readiness, reflect how procurement transitions follow these patterns. Successfully navigating these shifts demands not just technical validation of materials but also organized strategic approach across organizational units as well as external stakeholders (Köhler et al., 2019, p. 2).

However, one of the critical challenges emerged from the interviewee conversations was the uncertain middle ground between adopting materials too early or waiting to act for too long. Both pose strategic risks as being early often exposes for hurdles during testing processes due unknown producibility and high costs of testing as well as low availability and dual sourcing opportunities. This dilemma was supported by Vehmas et al. (2024, p. 1488), who argued that being an early adopter might provide an advantage and being late might increase risks through market position. This is especially the case with sustainable materials, known for less impressive properties and thus possibility to not

withstand all the required benchmarks in different requirements. Plastics are also viewed as variable raw material, where batch to batch there might be significant differences, which was also highlighted by several interviewees. This may lead into quality issues, especially if the material is used to produce so called critical products, where heat or current is in proximity of the product. The magnitude of batch differences naturally comes less and less, at least in some cases, when the producing party has increased experience with the material. This highlights the challenges of new sustainable material alternatives, which are new or still in development phase. So being fully alert on when the raw material becomes a realistic option may lead into great cost savings due the more stable supply of more known material.

Being late can cause restricted negotiation edge and lower place in the pecking order when the produced material is allocated to customers. Negotiations are often driven by leverage, often mandated by supply and demand. Raw material supplier stated in the interviews, being active on the developing a great relationship with the raw material distributor can lead into an opportunity in both early chances to test new materials through strong positioning. This shows the need to constantly be aware on how the plastics industry is developing and what are the most significant new inventions. One considered matter was the fact that the pressure to advance sustainable transition is mostly internal. It was considered with many interviewees, that could it be not only due customers preferring lower pricing and thus not demanding more sustainable products, and also due customers being happy with the case company's pace and example as a sustainable organization. This begs the consideration that maybe lack of external pressure is not a sign that sustainable transition is not required and rather sign that the current actions are already appreciated.

Another notable insight is the fact that the market and cost environment is constantly changing. Many of the interviewees observed that the existing gap between the sustainable alternative materials and the ones actively in use is steadily decreasing, and more affordable categories already have been found as confirmed by the data analysis. This is

down to many factors and where the situation may need to be observed in longer time scope as some cheaper materials may not make it into production through testing of the properties, the trend is still visible. For a company, which is operating in a competitive industrial environment, the ability to anticipate and thus thoroughly prepare for such shifts and trends is crucial to obtain strong market positions during the transition.

Dynamic Capabilities View (DCV) is aligned with this, as it analyses how organizations must develop and reconfigure their internal competencies to respond effectively to ever so evolving external environments (Teece, 2022, p. 119; Cezarino et al., 2018, p. 95). In this context, sensing and aiming to forecast regulatory these shifts, taking opportunities in sustainable materials, and aiming to re-tool procurement and R&D practice exemplify the types of dynamic capabilities needed to align long-term competitiveness within the ongoing sustainability transitions (Cezarino et al., 2018, p. 96).

It should be wise to build sustainable foundations even if the transition is not yet in full scale. Preparing the personnel to be familiar with the sustainable concepts as well as the realities can be seen as really important step towards the time when sustainable transition underway in full force. This is due that in some cases attitudes towards sustainability can remain a bit old fashioned. These points of view also align with known EU-level policy developments, where plastics are under increasing regulatory development. The European Strategy for Plastics in a Circular Economy (European Commission, 2018, pp. 5-12) and more broad entities such as the Green Deal and Circular Economy Action Plan place direct pressure on organizations that are operating in plastics-intensive sectors to advance their operations towards more sustainable practices. Although these initiatives were mentioned in broader level in most interviews, the case company operates in the policy environment where restrictions on certain materials could have great effect on the operation. This is also an important aspect to consider and further emphasizes the evident need to rather operate proactively than reactively, which was highlighted also by most interviewees.

6 Conclusion

This chapter concludes the conducted research by summarizing the most important key findings, connecting them to the original purpose of the research as well as by reflecting on the broader relevance of the study and its themes. In addition to addressing the research questions, the last chapter outlines the practical recommendations for the case company, discuss and conduct the contribution to theory and practice, and return on how the limitations played a part in the research process. Lastly, future research opportunities and suggestions are made to enable directions on where to advance to research on the matter of sustainable transition.

6.1 Summary of Key Findings

The thesis set out to examine and explore how sustainability goals could be balanced with cost-efficiency goals and realities, using polycarbonate materials as a case example in the global industrial setting of the research. Throughout the combination of phases such as literature review, qualitative interviews, quantitative data-analyses, several key findings, and recurring themes have emerged that exemplify the complexities and opportunities associated with sustainable transition in procurement perspective.

The study confirmed that the existing organizational readiness and suitable alignment are critical enablers for successful sustainability integration. Whereas the case company has demonstrated a strong strategic commitment to sustainability, the operationalization of the given goals is still evolving with the influencing environment. Interviews revealed that sustainability-related awareness, knowledge, and practices vary across different teams and functions in the case company. Many professionals are supportive towards sustainable actions but lack clear structure and understanding of how it connects to their current role and day to day decisions. Many interviewees work in a team, where the key KPIs often conflict with the sustainable at least for now as many of the material alternatives are relatively new and thus more expensive and less durable if the setting

was to be exaggerated. This interplay can be also seen challenging when considering the teams such as procurement, quality, and R&D working in parallel and sometimes without great understanding on how their decisions impact each other. Whereas in general this is a normal challenge and even strength to some extent, when it comes to sustainable transition it may act as a hindering factor. This highlights the importance of cross functional communication on sustainable transition. Key takeaway is that if every function and team would have even slightly more awareness on how their decisions and prioritization affect the work of other teams the whole process may and up to be significantly more fluid. A practical way to tackle future issues between different parties in industrial setting is open dialogue and collaboration.

The findings also underscore the importance of incentive structures as well as performance metrics to direct the operations towards organizational goals. Traditionally procurement KPIs revolve around monetary metrics which was found to be the case in the case company, which is normal due to it being the main purpose of procurement teams. But when it comes to sustainable transition, it could be the case that the more expensive initial price tag would prove to be better long-term option also in financial terms through possible shifts in market dynamics, regulation, and customer perception. This means that in some cases making the right long-term choice could be against the fundamental short-term goals. It is important to align organizational goals in the KPIs if it is expected that the employees make actions towards the transition. To some extent, actions are in place and sustainability is integrated into the goals of at least some functions. This reflects organizational commitment towards sustainability, which highlights the company's ability to integrate sustainability in realistic way. Nevertheless, if sustainability is a key important factor for the organization, making sustainable and financially viable choices should be made easy, even if it meant some setbacks in short term performance metrics.

Thirdly, the role of collaboration in internal and supplier level is seen as a crucial factor on how well the sustainable transition can be put underway and carried out. Most if not all relevant suppliers either from raw material or product side are actively working on

sustainable alternatives and actions as it seemingly is among the greater common interest of most parties. Collaboration to aid innovation and produce alternative opportunities as well as allowing resources to get things right the first time to avoid avoidable indirect costs such as mould modifications and reworks can significantly improve the magnitude of how well the market opportunity of the sustainable transition is capitalized. Centralized agreements with raw material distributors as well as collaborative testing programs can also highlight the importance of maximizing the positive collaboration between internal business units.

Lastly, it is to be noted and identified, that there is growing recognition within the organization as well as among the close business partners that sustainability will become increasingly central to procurement and supply chain strategy in the coming years. This is mostly due the expectations on the price development of sustainable alternatives making them more and more realistic for broader adoption. While there are significant actions ongoing on testing and researching the developing situation, constant monitoring, and ability to change remains key to make most of the transition. Readiness, in terms of skill, cross-functional awareness and supplier relationship, will be a critical factor and key to navigating the evident transition in effective manner.

Overall, it can be detected that the case company is well aligned to lead the sustainable transition, with realization that constant awareness is required to keep up with the latest developments.

6.2 Connecting Findings to Purpose

The aim of the research was to investigate on how sustainable goals can be effectively balanced with cost-efficiency in procurement-based decisions, particularly in the chosen case study category of polycarbonates. To achieve this, the study focused on both strategic and operational perspectives via the following research questions:

- How do sustainability goals and regulatory frameworks influence procurement decisions for polycarbonate materials?
- What are the practical challenges and opportunities in transitioning to sustainable polycarbonate materials in the case company's procurement strategy?

These questions were complemented by set objectives aimed at understanding the existing and developing market dynamics, organizational structures, as well as the stakeholder behaviours that shape sustainable procurement decisions.

For the first research question, findings of the conducted research suggest that sustainability goals are already influencing procurement thinking, but their practical integration remains somewhat uneven across the different functions in the organization. Strategic goals are well set in the organizational level and there is a strong emphasis and awareness of evolving EU directives and customer expectation. However, the influence of said organizational goals is somewhat filtered as expected as cost efficiency and quality and availability remain key foundation of a strong business in the industry. The thesis illustrates that sustainability is a driving force shaping the goals of different functions, but its implementation depends on how realistic and how close the proposed alternatives are in different metrics. Also, the implementation depends on the correct alignment between organizational and team level performance indicators such as KPIs.

From a practical standpoint and for the second research question, the retrieved findings illustrate the existing challenges, including sustainability-related supplier documentation, decision-making between functions, and limited internal coordination between different business units. These issues illustrate concrete challenges that influence the effectiveness and pace of sustainable transition. This is largely because a sufficient transition requires accurate information of current processes, which is obtained by systematic documentation, whereas collaboration is the key enabler for enhancing the efficiency of any transition. Apart from the challenges, the research detected evident opportunities such

as suppliers' willingness to co-operate and self-initiative approach to sustainability overall is a strong enabler. This among the evident positive market development towards more affordable sustainable plastic, which makes it more lucrative and realistic option. Strong actions toward sustainability such as testing programs and extensive R&D initiatives are not opportunities itself but evidently provide a strong platform to make most of the existing opportunities.

In relation to the thesis objectives, the research successfully explored the trade-offs between cost-efficiency and sustainability, contextualized the evident readiness the organization poses, and identified practical tools and ways of working towards more holistic decision-making. By combining theoretical frameworks with the obtained empirical insights from the case company, this thesis contributes both to academic understanding and managerial relevance of the situation. It demonstrates the position of sustainable procurement as simply not driven by cost but also a question of organizational alignment, existing and future initiatives and incentives and strategic timing. The research confirmed that whereas the large incumbent organizations commonly act as a driving force in sustainable transition, controlled and phased approach to the transition among with realistic views on the market is required for successfully make the transition financially sustainable and realistic. Only by achieving to conduct the transition in stable way, the organization can continue to drive it onwards.

6.3 Practical Recommendations for the Case Company

The research examined how sustainability considerations can be better applied to procurements practices, particularly in the context of the case study category of polycarbonates. Based on the company's current practices, findings obtained from the interviews and the broader industry trends, the following recommendations and areas of focus are offered to support the company's strategic transition. The suggestions are not intended to illustrate radical shifts, but rather to complement the existing efforts, particularly in procurement, cross-functional communication and collaboration and

organizational readiness. Notably, enhancements to areas of the thesis are widely acknowledged to relate to high level organizational goals, which makes making more concrete suggestions more abstract, which is important to note when considering the recommendations.

6.3.1 Increase Collaboration in Sustainable Procurement

Many procurement professionals across the given organization are already engaged in discussions with sustainability-related actions with the suppliers. Even though there evidently are well put initiatives, this remains an area, where more efficient collaboration could end up enabling for additional value for various parties. This was also mentioned by many external interviewees as a potential area of improvement as increased understanding of what the needs are in both ends of the agreement as well as the acknowledgement of what the capabilities are could prove to enable more integrated collaboration with more instinctive ways of working. Mostly the goals are aligned, at least with the raw material supplier, so helping each other could be great factor in maximizing the opportunities during the transition.

Among supplier collaboration, the co-working should be prioritized with internal organizational business units. With great quantities comes great financial opportunities. Aligning strategies and bonding strong partnerships with suppliers by negotiating with two or more business units could drastically change the available leverage and thus provide a more lucrative and robust way of doing business. This co-operation could be sped up by encouraging cross-unit engagement by holding raw material events internally, where available supplier knowledge and strategies could be taught to others.

6.3.2 Embed Cross-Functional Awareness into Sustainability Readiness Efforts

As sustainability becomes more integral part of the procurement strategies, the interdependencies between internal functions such as procurement, quality and R&D will become increasingly important. Notably, this does not mean it is a weakness of any means for the case company, but that simply small differences in how well cross-functional cooperation works can be a difference maker in maximizing opportunities during sustainable transition. Currently, it can be viewed that all the decisions are made in good faith, but still with limited visibility into how they might impact functions down the stream. The goal for efficiency would be that different teams would know and acknowledge how the options affect the work for others, and what options would possibly be most suitable for greater good, regardless of if it would not be the most optimal one from the own functions point of view.

The setting of awareness illustrates through a lens on how the organizational readiness affects the ability to act in efficient fashion on sustainable opportunities. In sustainable context, knowledge is key, and it is important that even personnel to whom the sustainable actions are not yet day-to-day level, would also pay interest and try to learn the fundamentals. If majority of the functions would be well educated on sustainability and its fundamentals both the readiness to start working with sustainable materials and initiatives, as well as detecting sustainable opportunities would increase. This comes down to the quality and quantity of sustainable education. The research itself acts as an educational piece of work, aimed to enhance the levels of understanding on sustainable transition, as well as to shed a light on what aspects of the transition are the most impactful ones for different functions. The research also acts as a tool to better understand sustainability-related procurement scenarios on for example what the interest of different stakeholders might be. Among with detailed action level awareness, broader organizational level communication plays a key role. How well the organization can sell the importance of sustainable transition and its concrete effects as well as showing the importance of individual actions is crucial to help shift the perception towards the positive end of the spectrum. It is important to acknowledge that in sustainable communication,

quality often beats quantity as overflowing information may have a negative effect. So overall, education and communication are awareness and awareness further on is readiness, which illustrates how capable organization is to capitalize on sustainable transition.

6.3.3 Introduce a “Green Credit” Mechanism to Support Sustainable Procurement Decisions

One of the reoccurring challenges identified in the study is the complexity of goals and KPIs. This is best illustrated in a situation, where a procurement choice could be well-thought sustainably as well as strategically viable and thus financially strong in long term, but effect negatively on short term cost reduction. This is something worth considering, as it would be important to align organizational goals to how easy the goals are to follow. It should be made easy to make financially viable and sustainably well-thought strategic decisions rather on than forcefully think about short term costs. Again, it is worth noting that, there are actions around it but to encourage procurement professionals to make decisions that line up with the organizational goals, something like “Green CR” or “Green Credit” could be implemented at least in trial level. This would allow procurement professionals to offset some higher costs in cost reduction follow-up for the sake of strategic positioning and increasing sustainability. This could be a percentage of overall yearly CR goal and would make sustainable decisions easier to make and not against existing performance metrics. This would serve its purpose in situations where the sustainable alternative can be seen to be maybe close in price but to be projected to have positive impact in longer time, or other similar scenarios. So, the idea is to enhance sustainable decision-making when it is concretely realistic a strategically good option, not to overall increase in sustainable switches just for the sake of sustainability.

6.4 Contribution to Theory and Practice

The conducted thesis has contributed both on academic research and practical applications in the field of sustainable procurement, particularly in the context of global industrial organizations navigating through sustainable transition. In addition to aligning with established theories, the thesis offers a theoretical additional contribution by highlighting that balancing act between sustainable goals and cost-efficiency is not managed only through procurement actions. Results highlight, that the successful sustainable transition demands management of the holistic view and thorough collaboration approach, which includes functions such as R&D, quality, sustainability, and customer care. Insights also highlight, that organisations should not passively wait for the situation around sustainable transition to develop, and instead take active position and work with suppliers to make the conditions more favourable for the transition. This may lead into stronger market position through being proactive and preparing carefully for future realities. This preparation includes building strong supplier relationships, educating both internal and external parties of sustainable factors, and being on good terms with taking calculated risks. These findings provide a new perspective on the ongoing sustainable research, by examination of how dynamic capabilities in different functions relate to making sustainable transition more realistic and viable.

Towards the contribution on theory and research, the thesis adds to the growing body of sustainable literature by conducting case-based perspective view on how sustainability mandates, goals, and realities shape the adoption of sustainable materials, especially in technically demanding context. It analyses how the transition towards more sustainable materials can be conducted in price-sensitive environment, where trade-offs are often evident at least with the status. Also, key point of the setting is addressing the tensions between strategic sustainability goals and operational performance metrics. This entity can be seen to be to some extent unexplored area in the academic writing, which makes the thesis add a fresh perspective on the sustainability research.

Furthermore, the theoretical contribution aligns with theoretical principles such as the Triple Bottom Line (TBL), which evaluates corporate sustainability practices through economic, environmental, and social dimensions (Elkington, 2004, pp. 1–3; Slaper & Hall, 2011, p. 4). The findings of this thesis illustrate how organizations in industrial sectors can aim to balance cost-efficiency with broader sustainability goals, even in technically and economically challenging environments. As highlighted by Brisan (2024, pp. 6–9; 23–29), firms adopting TBL principles, have been seen to achieve environmental and supply chain improvements while still maintaining profitability. This underscores the relevance of integrating multi-dimensional evaluation frameworks such as TBL into procurement transitions, especially when considering organizations that face rising expectations to go beyond traditional financial metrics. This can be seen to be the case when considering the organizations such as the case company, which can be classed as incumbent party in its own market.

By considering theories related to organizational alignment, cross-functional integration, and incentive systems, the thesis proceeds to highlight on how internal structures and cultures can act as enablers as well as barriers to sustainable transition. The new concept of “green credits” was suggested to support value-aligned procurement decisions to manage traditional KPI frameworks while encouraging to do sustainable minded procurement decisions. Furthermore, the research suggests that sustainable transitions are not solely about technological regulatory challenges and changes, but deeply organizational processes, especially when the organizations hold incumbent role in the given market.

From a managerial perspective, the thesis offers valuable information gathered from around the organization. The information offers new perspectives on procurement decisions, as well as understanding on how different choices affect the actions of other functions. The thesis also provides actionable recommendations, whilst considering the reasonable probability of employing such actions in global organization. The reality is that some of the decisions regarding sustainable transition are made in such organizational

level, where proposing large changes may be unrealistic. Thus, the thesis focuses on actionable suggestions that can be scaled, modified and to some extent put to practice in local level. Key recommendation or better put as output of the thesis is the shared information it holds. Key aspect of sustainable transition is preparing through knowledge and educating the organization to understand dynamics of sustainable transition. Being able to capitalize the opportunities early on the transition requires knowledge of the dynamical situation around sustainable transition. Thus, key is to educate local unit through the information obtained in the different parts of the thesis. Secondary, the recommendations included enhancements to cross-business unit co-operations and increasing supplier collaborations as those remains areas, where increased efficiency may unlock great potential.

6.5 Limitations, Future Research Suggestion and Last Thoughts

While the conducted study offers relevant information and insights into the evident intersection of sustainability and cost-efficient procurement in industrial context, certain limitations must be considered to holistically validate the output of the research. These limitations can be seen to stem from the thesis' methodological choices, the case specific nature of the research, the constantly developing landscape of sustainability in policy as well as in practice.

Firstly, single-case study design naturally limits to some extent the overall generalizability of the obtained findings. The research focuses on single company operating in the electrification and industrial manufacturing business. To some extent identified challenges such as cost versus sustainability trade-offs, regulatory uncertainty, and internal coordination of the relating values and priorities are likely to be similar in all organizations in the same market context. Still, notably specific organizational goals and culture may affect the applicability of the recommendations elsewhere. Future studies may benefit from more thorough comparable research across different companies or even sectors to obtain higher consistency and thus higher transferability of the obtained findings.

Secondly, the thesis relied on the conducted qualitative interviews as its primary data source, which provides rich, context-specific information, but also can introduce some potential biases. The sample was limited to a certain group of internal and external stakeholders, who were selected to represent the most important functions and parties of the sustainable transition. Regardless of the focus on interviewee choices, the voice of singular interviewee remains strong so personal positioning on certain considerations may have influenced some of the findings. Also, it could also be argued that more interviews could have been held, which can be seen as limitation regardless of the realities of the thesis schedule and available resources. In the context of this thesis, the focus was to investigate the internal dynamics of conducted procurement choices, so to focus on more detailed level to the procurement aspects, future research could benefit from including more procurement professionals and less personnel from other functions.

Thirdly, the used data for data analysis acts as a limitation, when considering its small sample size. As mentioned in results section, the data related to sustainable alternatives compared directly to materials in use has not been conducted for long due the nature of the sustainable alternatives not being a realistic option up until recent years. So, the data used to create illustrations on where the status quo of price differences are, limits the findings to only illustrate the trends rather than identifying specific values. Whereas this can be seen as limitation, the use of most relevant and recent datasets is also seen as the strongpoint of the thesis regardless of the size. Future research could benefit from re-visiting the price comparisons in few years' times, to conduct comparable trendline data-analysis to illustrate the development of the prices both in the sustainable alternatives and the materials actively in use.

In conclusion, future research could benefit from re-visiting the matters studied in the thesis soon, when some of the dynamics could end up being quite different. As projected in the interviews, the prices of sustainable alternatives are approaching being increasingly competitive against virgin materials, which means that the changes are evident in

the coming years. As the situation is under constant development, findings of this thesis or to any research can be proven to be outdated if the market dynamics change in drastic enough way. This highlights the importance of riding the wave of development in the sustainable plastics industry to both keep up with the competition but to also prepare for changes in raw material portfolio to more sustainable selections as that seems to be ahead sooner or later. Building on these insights, future research could benefit on exploring how procurement collaborates with relating functions such as R&D, quality, sustainability, and customer care to enhance the sustainable transition. This cross-functional collaborative act emerged as a key opportunity from the research, but there currently exists limited research on it in the given context. Additionally, future research could benefit from studying how decision-making frameworks, such as dynamic capabilities or lifecycle-based evaluation tools are integrated into decision processes when there is uncertainty on regulatory changes and market development. Also, deeper investigation could be conducted on how organisations can proactively shape the sustainable raw material market, rather than wait for it to evolve, through strategic supplier collaboration, which is critically highlighted opportunity in this study.

As mentioned previously in the thesis, the sustainable transition is a question of when rather than if, so now it is time prepare and be proactive, see the transition develop, and act when the time is right. Transition seems evident and as the time passes, many challenges mentioned in this thesis could already be solved and addressed, which decreases the topicality of this research, but also means many of the predicted outcomes would have become reality.

References

- Abdulhadi, S., Alsalihi, H., Ibrahim, S. I., & Hamood, A. F. (2024). Mechanical properties study of polycarbonate and other thermoplastic polymers. *Journal of Physics: Conference Series*, 1973(1), 012001. <https://doi.org/10.1088/1742-6596/1973/1/012001>
- Adams, R., Grichnik, D., Pundziene, A., & Volkmann, C. (Eds.). (2023). *Artificiality and sustainability in entrepreneurship: Exploring the unforeseen, and paving the way to a sustainable future*. Springer. <https://doi.org/10.1007/978-3-031-11371-0>
- Alvarez, S., & Rubio, A. (2015). Carbon footprint in Green Public Procurement: A case study in the services sector. *Journal of Cleaner Production*, 93, 159–166. <https://doi.org/10.1016/j.jclepro.2015.01.012>
- Bethorn, P., Nairn, A., & Money, A. (2003). Through the Paradigm Funnel: A Conceptual Tool for Literature Analysis. *Marketing Education Review*. <https://doi.org/10.1080/10528008.2003.11488830>
- Bianchini, A., Benci, A., Pellegrini, M., & Rossi, J. (2019). Supply chain redesign for lead-time reduction through Kraljic purchasing portfolio and AHP integration. *Benchmarking: An International Journal*, 26(4), 1194–1209. <https://doi.org/10.1108/BIJ-07-2018-0222>
- Braun, V., & Clarke, V. (2012). *APA handbook of research methods in psychology: Vol. 2. Research designs: Quantitative, qualitative, neuropsychological, and biological*. Washington, DC: American Psychological Association.
- Birsan, A. (2024). *Challenges and practical approaches to implementing triple bottom line strategies* [Bachelor's thesis, Metropolia University of Applied Sciences]. Theseus. Retrieved [25.2.2025], from https://www.theseus.fi/bitstream/handle/10024/856761/Birsan_Alexandru.pdf

- Brito, J., & Dudley, S. E. (2012). *Regulation: A primer*. Mercatus Center at George Mason University. Retrieved [8.2.2025], from <https://regulatorystudies.columbian.gwu.edu/sites/g/files/zaxdzs4751/files/downloads/GW%20Reg%20Studies%20-%20Regulation%20A%20Primer%20-%20SDudley%20%26%20JBrito.pdf>
- Caldwell, J. (2022a). Overview of Thermoplastic polymers and several properties. *Research & Reviews: Journal of Material Sciences*, e-ISSN: 2321-6212, 3–4. <https://doi.org/10.4172/2321-6212.10.S4.002>
- Caniëls, M. C. J., & Gelderman, C. J. (2005). Purchasing strategies in the Kraljic matrix—A power and dependence perspective. *Journal of Purchasing and Supply Management*, 11(2), 141–155. <https://doi.org/10.1016/j.pursup.2005.10.004>
- Carbon Trust. (2006). *Carbon footprints in the supply chain: The next step for business*. Retrieved [18.2.2025], from: <https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/carbon-footprints-in-the-supply-chain-the-next-step-for-business>
- Castell-Rüdenhausen, M. zu, Almasi, A., & Vanderreydt, I. (2022). *Non-packaging plastics in Europe*. European Environment Agency – European Topic Centre on Circular Economy and Resource Use. Retrieved [19.1.2025], from: <https://cris.vtt.fi/en/publications/non-packaging-plastics-in-europe>
- Cezarino, L. O., Alves, M. F. R., Caldana, A. C. F., & Liboni, L. B. (2024). Dynamic capabilities for sustainability: Revealing the systemic key factors. *Systemic Practice and Action Research*, 31, 1–14. <https://doi.org/10.1007/s11213-018-9453-z>
- Chartered Institution of Highways and Transportation. (2023). *Building carbon reduction into procurement processes*. Retrieved [18.2.2025], from:

<https://www.ciht.org.uk/knowledge-resource-centre/resources/building-carbon-reduction-into-procurement-processes/>

Chowdhury, D. (2015). *Institutional theory: Knowledge and competitiveness in elite institutions in Bangladesh—Implications for governance*. Retrieved [25.2.2025], from:

https://www.researchgate.net/publication/342917902_Knowledge_and_Competitiveness_in_Elite_Institutions_in_Bangladesh_Implications_for_Governance

Copello, L., Haut, G., & Mongodin, F. (2022). *Single Use Plastics Directive Implementation Assessment Report*. Rethink Plastic – EU. Retrieved [10.2.2025], from: <https://rethinkplasticalliance.eu/wp-content/uploads/2022/09/SUP-Implementation-Assessment-Report.pdf>

<https://rethinkplasticalliance.eu/wp-content/uploads/2022/09/SUP-Implementation-Assessment-Report.pdf>

Correia, F., Howard, M., Hawkins, B., Pye, A., & Lamming, R. (2013). Low carbon procurement: An emerging agenda. *Journal of Purchasing and Supply Management*, 19(1), 58–64.

<https://doi.org/10.1016/j.pursup.2012.11.004>

Creswell, J. W. (2021). *A Concise Introduction to Mixed Methods Research*. SAGE Publications.

Cui, S., Borgemenke, J., Liu, Z., & Li, Y. (2019). Recent advances of “soft” bio-polycarbonate plastics from carbon dioxide and renewable bio-feedstocks via straightforward and innovative routes. *Journal of CO2 Utilization*, 34, 40–52.

<https://doi.org/10.1016/j.jcou.2019.05.027>

Dawadi, S. (2020). Thematic Analysis Approach: A Step by Step Guide for ELT Research Practitioners. *Journal of NELTA*, 25(1–2), Article 1–2. <https://doi.org/10.3126/nelta.v25i1-2.49731>

<https://doi.org/10.3126/nelta.v25i1-2.49731>

De la Colina Martínez, A. L., Martínez Barrera, G., Barrera Díaz, C. E., Ávila Córdoba, L. I., Ureña Núñez, F., & Delgado Hernández, D. J. (2019). Recycled polycarbonate from electronic

waste and its use in concrete: Effect of irradiation. *Construction and Building Materials*, 201, 778–785. <https://doi.org/10.1016/j.conbuildmat.2018.12.147>

Diniz, B., & Blomberg, A. (2022). *Stakeholder engagement for business sustainability: The case of a stakeholder sustainability survey*. University of Tampere. Retrieved [7.2.2025], from: https://cris.tuni.fi/ws/portalfiles/portal/82657448/stakeholder_engagement_2022.pdf

Elkington, J. (2004). Enter the triple bottom line. In A. Henriques & J. Richardson (Eds.), *The triple bottom line: Does it all add up?* (pp. 1–16). Routledge.

European Commission. (2018). *A European strategy for plastics in a circular economy*. Retrieved [22.12.2024], from: <https://www.europarc.org/wp-content/uploads/2018/01/Eu-plastics-strategy-brochure.pdf>

European Investment Bank. (2023). *Cutting plastics pollution—Financial measures for a more circular value chain*. European Commission. Retrieved [10.2.2025], from: https://www.eib.org/attachments/lucalli/20220248_cutting_plastics_pollution_en.pdf

European Parliament. (2024). *Packaging and packaging waste (Resolution P9_TA(2024)0318)*. Retrieved [10.2.2025], from: https://www.europarl.europa.eu/doceo/document/TA-9-2024-0318_EN.pdf

European Union. (2024). *Directive (EU) 2024/1760 of the European Parliament and of the Council*. EUR-Lex. Retrieved [8.2.2025], from: <https://eur-lex.europa.eu/eli/dir/2024/1760/oj/eng>

European Union. (2023). *European Commission (2023/C 228/19). Official Journal of the European Union*. Retrieved [10.2.2025], from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.C_.2023.228.01.0132.01.ENG&toc=OJ%3AC%3A2023%3A228%3ATOC

- Foerstl, K., Reuter, C., Hartmann, E., & Blome, C. (2010). Managing supplier sustainability risks in a dynamically changing environment—Sustainable supplier management in the chemical industry. *Journal of Purchasing and Supply Management*, 16(2), 118–130. <https://doi.org/10.1016/j.pursup.2010.03.011>
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24–40. <https://doi.org/10.1016/j.eist.2011.02.002>
- GHG Protocol. (2024). *The Greenhouse Gas Protocol—A Corporate Accounting and Reporting Standard*. Retrieved [25.2.2025], from: <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>
- Gonzalez-Porras, L., Heikkinen, A., Kujala, J., & Tapaninaho, R. (2021). *Chapter 14: Stakeholder engagement in sustainability transitions*. Retrieved [7.2.2025], from: <https://www.elgaronline.com/edcollchap/edcoll/9781789906028/9781789906028.00021.xml>
- Gothár, E., & Schanz, H. (2024). Dynamics in the evolution of circular sourcing strategies: Evidence from German frontrunners sourcing for recycled plastics. *Journal of Cleaner Production*, 435, 140561. <https://doi.org/10.1016/j.jclepro.2024.140561>
- Grant Thornton. (2024). *Corporate Sustainability Reporting Directive (CSRD) and Due Diligence Directive (CSDDD)*. Grant Thornton España. Retrieved [24.2.2025], from: <https://www.grantthornton.es/contentassets/1be9db60b28747fa8af51573c2c9b508/corporate-sustainability-reporting-directive-csrd.pdf>

- International Organization for Standardization. (2017). *ISO 20400:2017(E) – Guidance on sustainable procurement*. ISO. Retrieved [24.6.2025], from https://gpp.golocal-ukraine.com/wp-content/uploads/ISO_20400_2017E-Character_PDF_document.pdf
- Katalin E.-D. (2020). The Importance of Circular Economy (CE) and its Effect on the Plastic Packaging Supply Market. *Európai Tükör*, 23(4), Article 4. <https://doi.org/10.32559/et.2020.4.5>
- Kuźniarska, A., Mania, K., & Jedynek, M. (Eds.). (2024). *Organizing sustainable development*. Routledge. <https://doi.org/10.4324/9781003379409>
- Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., Alkemade, F., Avelino, F., Bergek, A., Boons, F., Fünfschilling, L., Hess, D., Holtz, G., Hyysalo, S., Jenkins, K., Kivimaa, P., Martiskainen, M., McMeekin, A., Mühlemeier, M. S., ... Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. *Environmental Innovation and Societal Transitions*, 31, 1–32. <https://doi.org/10.1016/j.eist.2019.01.004>
- Labaree, R. V. (n.d.). *Limitations of the study*. University of Southern California Libraries. Retrieved [11.2.2025], from: <https://libguides.usc.edu/writingguide/limitations>
- Latham & Watkins LLP. (2024). *The EU's Corporate Sustainability Due Diligence Directive: Obligations for companies*. Retrieved [24.2.2025], from: <https://www.lw.com/admin/upload/SiteAttachments/The-EUs-Corporate-Sustainability-Due-Diligence-Directive-Obligations-for-Companies.pdf>
- Lemos, P. (2020). *Existing legislation and policies on plastics*. Retrieved [22.12.2024], from https://www.wto.org/library/events/event_resources/tbt_0703202310/90_403.pdf

- Magnusson, T., & Werner, V. (2023). Conceptualisations of incumbent firms in sustainability transitions: Insights from organisation theory and a systematic literature review. *Business Strategy and the Environment*, 32(2), 903–919. <https://doi.org/10.1002/bse.3081>
- March, A., Salam, S., Evans, T., Hilton, J., & Fletcher, S. (2022). *A global review of plastics policies to support improved decision-making and public accountability*. Global Plastics Policy Centre. Retrieved [10.2.2025], from: <https://plasticpolicy.port.ac.uk/wp-content/uploads/2022/10/GPPC-Report.pdf>
- Mohammed, M. A., Menkabo, M. M., & Budaiwi, I. M. (2023). Assessment of polycarbonate material as a sustainable substitute for glazing in hot climates. *International Journal of Sustainable Energy*, 42(1), 954–974. <https://doi.org/10.1080/14786451.2023.2246092>
- Mooji, D., & Muller, M. A. (2021, March 15). *Decarbonisation options for the Dutch polycarbonate industry* [Policy report]. PBL Netherlands Environmental Assessment Agency. Retrieved [25.2.2025], from: <https://www.pbl.nl/en/publications/decarbonisation-options-for-the-dutch-polycarbonate-industry>
- Moretti, E., Zinzi, M., Merli, F., & Buratti, C. (2018). Optical, thermal, and energy performance of advanced polycarbonate systems with granular aerogel. *Energy and Buildings*, 166, 407–417. <https://doi.org/10.1016/j.enbuild.2018.01.057>
- Nguyen, D. T., & Le, P. L. (2022). Twenty-year application of logistics and supply chain management in the construction industry. *Construction Management and Economics*, 40(10), 796–834. <https://doi.org/10.1080/01446193.2022.2110273>
- Nikitchenko, Y., Berzina, S., & Buzan, G. (2016). *Handbook on sustainable public procurement*. State Ecology Academy of Postgraduate Education and Management at the Ministry of

Ecology and Natural Resources of Ukraine. Retrieved [22.12.2024], from:
https://www.oneplanetnetwork.org/sites/default/files/handbook_spp.pdf

OECD. (2022). Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options. *OECD Publishing*. <https://doi.org/10.1787/de747aef-en>

Orfanidou, V. S., Rachaniotis, N. P., Tsoulfas, G. T., & Chondrokoukis, G. P. (2023). Life cycle costing implementation in green public procurement: A case study from the Greek public sector. *Sustainability*, 15(3), Article 32817. <https://doi.org/10.3390/su15032817>

Orzan, E., Janewithayapun, R., Gutkin, R., Lo Re, G., & Kallio, K. (2021). Thermo-mechanical variability of post-industrial and post-consumer recycle PC-ABS. *Polymer Testing*, 99, Article 107216. <https://doi.org/10.1016/j.polymertesting.2021.107216>

Pacheco, D. A. de J., & Clausen, D. M. (2024). Sustainable purchasing supply management assessment in construction supply chains: A design science research approach. *Supply Chain Management: An International Journal*, 29(6), 943–962. <https://doi.org/10.1108/SCM-10-2023-0493>

Parmar, B. L., Freeman, R. E., Harrison, J. S., Wicks, A. C., Purnell, L., & de Colle, S. (2010). Stakeholder Theory: The State of the Art. *Academy of Management Annals*, 4(1), 403–445. <https://doi.org/10.5465/19416520.2010.495581>

Pasamar, S., Bornay-Barrachina, M., & Sánchez, R. M. (2024). Institutional pressures for sustainability: A triple bottom line approach. *European Journal of Management and Business Economics*, 26(1). <https://doi.org/10.1108/EJMBE-07-2022-0241>

Patala, S. (2022, April 26). *Sustainability transition approaches: Energy Business and Innovation – Session 3* [Lecture slides]. Aalto University School of Business. Accessed [8.2.2025].

- Picuno, C., Allassali, A., Chong, Z. K., & Kuchta, K. (2021). Flows of post-consumer plastic packaging in Germany: An MFA-aided case study. *Resources, Conservation and Recycling*, 169, 105515. <https://doi.org/10.1016/j.resconrec.2021.105515>
- Plastics Europe. (2020). *Polycarbonate in the EU*. Retrieved [19.1.2025], from: <https://www.aboutpolycarbonate.com/wp-content/uploads/2024/04/Polycarbonate-in-the-EU.pdf>
- Plastics Europe. (2023). *The plastics transition*. Retrieved [22.12.2024], from: https://plasticseurope.org/wp-content/uploads/2023/11/1814354_Roadmap-copy-change_112023.pdf
- Ramanauskaitė, J. (2021). The Role of Incumbent Actors in Sustainability Transitions: A Case of LITHUANIA. *Sustainability*, 13(22), Article 22. <https://doi.org/10.3390/su132212877>
- Ryan, P. G. (2015). A Brief History of Marine Litter Research. In M. Bergmann, L. Gutow, & M. Klages (Eds.), *Marine Anthropogenic Litter* (pp. 1–25). Springer International Publishing. https://doi.org/10.1007/978-3-319-16510-3_1
- Saari, U. (2021). Sustainability experiments in transitions: Emergence, characteristics and contexts. In W. Leal Filho, A. M. Azul, L. Brandli, A. Lange Salvia, & T. Wall (Eds.), *Industry, innovation and infrastructure* (pp. 1–11). Springer. https://doi.org/10.1007/978-3-319-71059-4_94-1
- Saleh, R., Vidican Auktor, G., & Brem, A. (2025). Incumbency and sustainability transitions: A systematic review and typology of strategies. *Energy Research & Social Science*, 122, 104000. <https://doi.org/10.1016/j.erss.2025.104000>

- Schaltegger, S., & Csutora, M. (2012). Carbon accounting for sustainability and management. Status quo and challenges. *Journal of Cleaner Production*, 36, 1–16. <https://doi.org/10.1016/j.jclepro.2012.06.024>
- Shaked, S., Crettaz, P., Saade-Sbeih, M., Jolliet, O., & Jolliet, A. (2015). *Environmental Life Cycle Assessment*. <https://doi.org/10.1201/b19138>
- Shim, E. (2014). Sustainability, Stakeholder Perspective and Corporate Success: A Paradigm Shift. *WCBT Faculty Publications*. Retrieved [7.2.2025], from: https://digitalcommons.sacredheart.edu/wcob_fac/401
- Sitaloppi, J., & Jähi, M. (2021). Toward a sustainable plastics value chain: Core conundrums and emerging solution mechanisms for a systemic transition. *Journal of Cleaner Production*, 315, 128113. <https://doi.org/10.1016/j.jclepro.2021.128113>
- Singh, S., Singh, G., Singh, S., & Misra, S. C. (2024). Understanding green procurement dynamics: An assessment framework for public sector organizations. *Journal of Environmental Management*, 351, 119756. <https://doi.org/10.1016/j.jenvman.2023.119756>
- Spinaci, S. (2023). *Corporate sustainability due diligence* (No. PE 729.424). European Parliament. Retrieved [15.2.2025], from: [https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI\(2022\)729424](https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)729424)
- Strunk, K., Ihl, A., Hasenauer, L., & Fiedler, M. (2022). Organizational Sustainability Transformation through KPIs: A Model for Sustainability Change. In *Academy of Management Proceedings* (Vol. 2022, No. 1, p. 13764). Briarcliff Manor, NY 10510: Academy of Management. Retrieved [1.6.2025] from: https://www.researchgate.net/publication/361364391_Organizational_sustainability_transformation_through_KPIs_A_model_for_sustainability_change

- Tascioglu, M., Eastman, J., Bock, D., Manrodt, K., & Shepherd, C. D. (2019). The impact of retailers' sustainability and price on consumers' responses in different cultural contexts. *The International Review of Retail, Distribution and Consumer Research*, 29(4), 430–455. <https://doi.org/10.1080/09593969.2019.1611619>
- Teece, D. J. (2022). The evolution of the dynamic capabilities framework. In R. Adams, D. Grichnik, A. Pundziene, & C. Volkmann (Eds.), *Artificiality and sustainability in entrepreneurship* (pp. 113–129). Springer. https://doi.org/10.1007/978-3-031-11371-0_6
- UNECE. (2019). *Sustainable procurement: Recommendation No. 43*. United Nations Economic Commission for Europe. Retrieved [22.12.2025], from: <https://www.genevaenvironmentnetwork.org/wp-content/uploads/2020/06/UNECE-at-GEN-Sustainable-Procurement.pdf>
- United Nations Development Programme (UNDP). (2024). *Combatting plastic pollution for sustainable development: A snapshot of UNDP's work in 12 countries*. Retrieved [12.2.2025], from <https://www.undp.org/chemicals-waste/publications/combating-plastic-pollution-sustainable-development-snapshot-undps-work-12-countries>
- University of California, Los Angeles. (2024). *What is sustainability?* UCLA Sustainability. Retrieved [5.1.2025], from: <https://www.sustain.ucla.edu/what-is-sustainability/>
- Valentinov, V. (2023). Sustainability and stakeholder theory: A processual perspective. *Kybernetes*, 52(13), 61–77. <https://doi.org/10.1108/K-05-2023-0819>
- Vehmas, K., Bocken, N., & Tuovila, H. (2024a). Understanding Consumer Attitudes Towards Sustainable Business Models—A Qualitative Study with Finnish Consumers. *Circular Economy and Sustainability*, 4(2), 1487–1512. <https://doi.org/10.1007/s43615-023-00338-2>

- Verheyden, R. (2003). *A search after the core concepts of purchasing*. Retrieved [8.2.2025], from: [https://procurement-academy.com/wp/KnowledgePortal/Articles/Strategy/What is Purchasing.pdf](https://procurement-academy.com/wp/KnowledgePortal/Articles/Strategy/What%20is%20Purchasing.pdf)
- Walker, H., & Phillips, W. (2009). Sustainable procurement: Emerging issues. *International Journal of Procurement Management*, 2(1), 41–61. <https://doi.org/10.1504/IJPM.2009.021729>
- Wang, H., Xu, F., Zhang, Z., Feng, M., Jiang, M., & Zhang, S. (2023). Bio-based polycarbonates: Progress and prospects. *RSC Sustainability*, 1(9), 2162–2179. <https://doi.org/10.1039/D3SU00248A>
- Wnuczek, K., & Podkościelna, B. (2021). *Polycarbonates—Synthesis, properties and environmental impact*. In U. Czyżewska, M. Bartoszewicz, & R. Sawczuk (Eds.), *Modern problems and solutions in environmental protection – 2021* (pp. 39–49). University of Białystok. Retrieved [22.12.2025], from: <https://repozytorium.uwb.edu.pl/jspui/handle/11320/17669>
- Yin, R. K. (2009). *Case Study Research: Design and Methods*. SAGE.
- Ylä-Mononen, L., & Alkio, J. (2021). *Plastics roadmap for Finland: Reduce, reuse, recycle and replace*. Ministry of the Environment Finland. Retrieved [10.2.2025], from: <https://ym.fi/documents/1410903/42733297/Reduce+and+refuse,+recycle+and+replace.+A+plastics+roadmap+for+Finland+2.0.pdf>
- Zak, A. (2015). Triple bottom line concept in theory and practice. *Research Papers of Wrocław University of Economics*, 387, 251–264. <https://doi.org/10.15611/pn.2015.387.21>

Appendices

Appendix 1. Interview Guide

This appendix illustrates the interview plan based to which the semi-structure interviews were conducted. This document displays a descriptive worded version of the instructions, which were provided in advance in written format and verbally before conducting the interview.

Instructions and Description of the Interview

The interview is conducted in Microsoft Teams and recorded through the software's Transcript function. The interviews will take 30-45 minutes, and consist of four semi-structured questions listed below, to guide the interview conversation and enable comparison of the interview answers. Interviewees are also informed that their answers will be addressed in the thesis in a way that their name and exact role in the organization will not be mentioned but rather referred to interviewees as personnel from given function (for example as interview from quality related function).

The interviewees are asked to consider all questions both from the viewpoint of their own role and own functions relation to the sustainable transition, but to also speculate on how they view the procurement actions transition towards more sustainable raw materials. This is to enable consideration of the overall knowledge and perception the stakeholders internally and externally feel on different aspects of the sustainable transition. Interviewees are also encouraged to consider sustainability in this case as environmental sustainability and the core dilemma as virgin vs. sustainable plastics, as sustainability can also be seen as for example social and financial.

The interview questions are:

- How do you perceive the role and prioritization of sustainability across the different functions in your organization, especially when it comes to transitioning

towards more sustainable materials and/or products? What factors do you feel influence this the most?

- What kinds of risks are there typically associated with shifting to more sustainable materials or product alternatives in your organization (e.g., material security, customers, financials)?
- How is sustainability-related information typically discussed, shared, and/or evaluated in your organization when considering material or product decisions – from your perspective?
- What kinds of opportunities do you see in your organization’s transition towards more sustainable materials or product solutions?

The interview questions are modified slightly for external stakeholders to enable comparable consideration without additional restrictions caused by not being able to disclose company secrets. This is done by adjusting the scope of the questions from organizational perspective to more general viewing of the situation in the given market. An example list for the modified questions for external interviewees can be found below:

- How do you see the role of prioritization of different aspects when it comes to transitioning towards sustainable material alternatives? What factors do you feel influence this the most?
- What kinds of risks there is that are typically associated with the shift to more sustainable materials (e.g., material security, customers, financials)?
- How is sustainability-related information usually gathered and evaluated – from your perspective?
- What kinds of opportunities do you see in the transition towards more sustainable materials?