



**THE ROLE OF THIRD-PARTY LOGISTICS PROVIDERS (3PLs) ON
ADVANCING ENVIRONMENTAL SUSTAINABILITY IN SUPPLY CHAINS**

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ABSTRACT

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The role of third-party logistics providers (3PLs) on advancing environmental sustainability in supply chains

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Topic of this master's thesis is third-party logistics providers (3PLs) and environmental sustainability. The aim of the thesis is to provide understanding of the role which three-party logistics providers have on advancing the environmental sustainability in supply chains. Another aim is to discover barriers and incentive for 3PLs on adopting the environmental sustainability initiatives.

The thesis has been conducted as qualitative research and identifies as a singular case study. The thesis uses both primary data from a semi-structured interview and secondary data from latest sustainability report of the case company. Data was analyzed by utilizing coding, theme identification and content analysis to answer the research questions.

3PLs have various opportunities and initiatives to influence environmental sustainability of supply chains. The most prominent environmental sustainability initiatives are data collection and analysis initiative, but other initiatives are operational optimization, consolidation, collaboration with supply chain partners, customer engagement, investments in technology, packaging, electrification of vehicles, usage of low carbon fuels as well as management of waste and dangerous goods shipments. The main incentives for 3PLs are legislation, governmental pressure and support as well as requirement of customers. The main barriers for 3PLs are lack of sufficient infrastructure and current technology.

TIIVISTELMÄ

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Kauppatieteet

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Kolmannen osapuolen logistiikan tarjoajien (3PL) rooli ympäristövastuullisuuden edistämässä hankintaketjuissa

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Avainsanat: Vastuullinen toimitusketjun hallinta, kolmannen osapuolen logistiikan tarjoaja, ympäristövastuullisuus, vihreä logistiikka, vastuullinen hankintaketju

Tämän tutkimuksen aiheena on kolmannen osapuolen logistiikan tarjoajat ja ympäristövastuullisuus. Tutkimuksen tavoitteena on ymmärtää kolmannen osapuolen logistiikan tarjoajien rooli ympäristövastuullisuuden edistämässä hankintaketjuissa. Toisena tutkimuksen tavoitteena on löytää esteitä ja motivaattoreita kolmannen osapuolen logistiikan tarjoajille vastuullisuuskäytänteiden käyttöönotossa.

Tutkimus on toteutettu kvalitatiivisena tutkimuksena ja on yksittäinen tutkimustapaus. Tutkimus käyttää dataa haastattelusta sekä case-yrityksen viimeisimmästä vastuullisuusraportista. Data on analysoitu hyödyntäen koodausta, teemojen tunnistamista ja sisällönanalyysia löytääkseen vastaukset tutkimuskysymyksiin.

Kolmannen osapuolen logistiikan tarjoajilla on monia mahdollisuuksia ja käytänteitä vaikuttaa hankintaketjujen ympäristövastuullisuuteen. Merkittävin käytänte on datan keruu ja analysointi, mutta muita käytänteitä ovat toiminnan optimointi, konsolidointi, yhteistyö hankintaketjun kumppaneiden kanssa, asiakkaiden sitouttaminen, investointi teknologiaan, paketointi, ajoneuvojen sähköistäminen, vähähiilisten polttoaineiden käyttö sekä vaarallisten aineiden hallinta. Merkittävimmät motivaattorit ovat lainsäädäntö, valtiollinen painostus ja tuki sekä asiakkaiden vaatimukset. Merkittävimmät haasteet ovat riittävän infrastruktuurin puute ja nykyinen teknologia.

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1. Introduction

It is well known that logistics generate a significant number of negative externalities because of its natural characteristics and will continue so if nothing changes in the industry. Emissions and other contributes to climate change by a transport sector has increased steadily over three decades as transportation is the largest energy end-use sector and depends on oil more than any other end-use sector according to ITF (2021). Current decarbonization initiatives and commitments in transportation are not enough to meet set climate targets, and companies must commit to reduction of 600 tonnes of emissions in transport sector by 2030 (ITF 2021). Therefore, it can be said that logistics has an important role in achieving sustainability in supply chains but also in a wider scale of business and society. This has created pressure for both companies and policymakers to innovate more sustainable ways of working in logistics operations to attain sustainable transportation and sustainable supply chains worldwide.

Logistics are common operations to outsource to a third-party and numbers of outsourcing have increased in the last years. Up to 60 percent of shippers outsource freight forwarding and 52 percent outsource international transportation (Langley 2023, 12). Warehousing is one of the logistics operations that has decreased in terms of outsourcing and even then, 43 percent of shippers have outsourced their warehousing operations. Some shippers may not have the network or expertise to organize logistics internally or a supply chain may be too constrained, which has resulted in outsourcing. (Langley 2023, 12) Nonetheless, there are various logistics organizations which take care of the logistics operations on behalf of the shipper such as third-party logistics providers (3PL) or fourth-party logistics providers (4PL). In this research, the focus is on third-party logistics providers.

When logistics are outsourced to a third-party, the shipper is not anymore directly in control of sustainability in their supply chains. Third-party logistics provider arranges transportation and controls the supply chain, and therefore is also responsible for delivering a sustainable supply chain for their customer. But how then third-party logistics provider can affect the sustainability of supply chains and provide sustainable supply chain, which is highly demanded?

Implementing sustainable supply chain is a difficult process for any company due to ever-growing complexity of the supplier network and globalization of supply chains. Pressure from customers, society and other stakeholders demand quick solutions for sustainable supply chains, but the transformation is not as quick and easy as one could hope. If the manufacturing company face challenges within their own supply chains when trying to adopt

initiatives for sustainable supply chains, then what kind of challenges third-party logistics provider encounter? What even motivates third-party logistics providers to aim for sustainable supply chains as an outsider for their customers?

1.1. Literature review

Some research has been conducted about third-party logistics providers and their sustainability initiatives as well as barriers and incentives for adopting the initiatives. Lieb and Lieb (2010, 531-532) states that many third-party logistics providers have committed to sustainable practices in logistics by implementing organizational changes, developing a website, expanding collaborative partnerships, offering sustainability training and modifying operational practices. Cargo consolidation, reduction of vehicle speed, release of eco-friendly containership, use of more fuel-efficient modes, participating in governmental programs and experimenting with alternative fuels were recognized as solely transport-related sustainability initiatives (Lieb & Lieb 2010, 527-531; Baz & Laguir 2017, 1463). Froio and Bezerra (2021) recognized energy efficiency, customer recognition and emission reductions as sustainability initiatives carried out by third-party logistics providers in developing countries.

Previous research conducted in developing countries has stated that both internal and external factors negatively affect adoption of sustainability initiatives among third-party logistics providers. Environmental uncertainty, complexity of sustainability, lack of collaboration and lack of clear environmental strategy are barriers preventing the adoption. A lack of top management support and insufficient knowledge within a company may also be seen as barriers. (Baz & Laguir 2017; Lin & Ho 2011) Froio and Bezerra (2021) highlighted high costs, compliance with legislation, difficulties of involving customers and management of extensive territory in emerging countries. In Scandinavia, customer priorities, managerial complexity, network imbalance and technological as well as legislative uncertainties have been recognized as barriers of adopting sustainable initiatives (Abbasi & Nilsson 2016, 281).

Previous research has concluded that competitive pressure, enhancement of company image, customer pressure, support from employees and top management, attraction of green customers and “right thing to do” are motivators for adopting sustainability initiatives by third-party logistics providers (Lieb & Lieb 2010, 526; Baz & Laguir 2017, 1465). Lin and Ho (2011) states that customer pressure does not have significant influence on adoption of sustainability initiatives in logistics industry unlike in manufacturing sectors. Lin and Ho (2011, 80) concludes regulatory pressure, governmental and organizational support, quality

of human resources as well as advantage and compatibility of sustainable practices are factors affecting adoption of sustainable initiatives in China.

There is still a lack of research regarding forwarding in logistics and supply chain management especially from a perspective of sustainability. Even, research focusing solely on environmental sustainability in logistics from a perspective of third-party logistics providers rather than a whole supply chain is rare according to Marchet, Melacini and Perotti (2014). Klumpp (2017) states that empirical evidence of improving sustainability in logistics and supply chain management is missing and declares a need for further in-depth research regarding all aspects of sustainability for third-party service providers.

According to Marchet et. al (2014) many areas of supply chain management have already been reviewed and studied, but there is a need for more research about the issue of environmental sustainability from a perspective of 3PLs. Marchet et. al (2014, 802) highlight that adoption of sustainability initiatives among third-party logistics providers have had only little attention. Centobelli, Cerchione and Esposito (2017, 468) agrees while proposing a need for more research about factors influencing the adoption of the initiatives and clear definitions of barriers and drivers in a context of the sustainability initiatives.

1.2. Research questions and objectives

Research questions of this research are presented below. Main question seeks to understand environmental sustainability initiatives adopted by third-party logistics providers to achieve sustainable supply chains through green logistics. There are two sub-research questions supporting the main research question by investigating what incentives are influencing the adoption of sustainability initiatives for the third-party logistics providers as well as what are barriers of the adoption.

“How third-party logistics providers can affect sustainability of supply chains?”

“What are the incentives influencing the adoption of sustainability initiatives?”

“What are the barriers of sustainability initiatives for 3PLs?”

The main aim of the research is to provide wholesome understanding of the role which three-party logistics providers have on advancing the environmental sustainability in supply chains. Other aims are to focus on challenges in adopting sustainability initiatives for three-party logistics providers and discover incentives influencing the adoption of sustainability

initiatives for 3PLs to maintain and develop their sustainability actions in logistics to offer more sustainable supply chains for customers.

This research is useful for any professional working in the logistics industry. The research provides an overview of how third-party logistics providers can affect environmental sustainability of supply chains. Multiple managerial contributions are provided since third-party logistics providers may find advice on what incentives are influencing adoption of sustainability initiatives as well as what barriers prevent the adoption. Therefore, adoption of sustainability initiatives may be easier to implement. Besides logistics professionals, the research is useful for any who is interested in improving sustainability of supply chains. In theoretical perspective, the thesis contributes insight to green logistics and sustainable supply chain management under a literature of supply management.

1.3. Research framework

This research focuses on how third-party logistics providers can advance environmental sustainability of supply chains through their actions in the field of green logistics. Incentives and barriers of sustainability initiatives affect adoption of green logistics practices for third-party logistics providers. Eventually, when practices of green logistics are possible to execute and maintain, sustainable supply chains may be accomplished. Sustainable supply chain management can be seen as a top concept for the whole research as logistics is one of the core activities of SSCM (Panigrahi, Bahinipati & Jain 2019, 1002) and greening supply chains is a part of sustainable supply management according to Ageron, Gunasekaran and Spalanzani (2012).

Figure 1. Research framework.

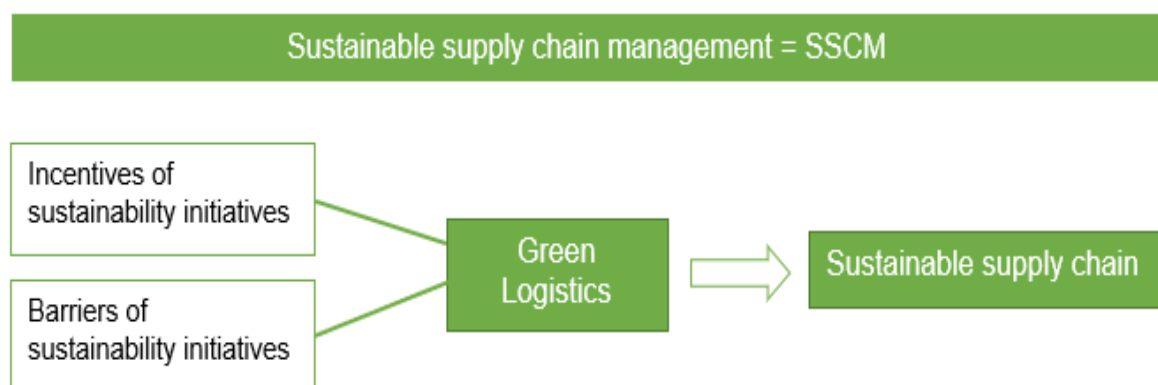


Figure 1 above showcases the research framework of the research. Ideology of sustainability is affecting all concepts utilized in this research, but the main concepts are

green logistics, sustainable supply chain management, sustainable supply chains and environmental sustainability initiatives.

1.4. Research methodology & data collection and analysis methods

The research is conducted as qualitative research due to nature of the research questions and the aim regarding the studied phenomenon. Qualitative research allows us to explore the phenomenon in its natural state and describe individual experiences while also explaining issues of the phenomenon (Bluhm, Harman, Lee and Mitchell 2011, 1869).

The research methodology applied is a case study since according to Kähkönen (2011, 31) case study provides possibility to conduct in-depth analysis of a phenomenon. The research approach for the case study is descriptive as it aims to present a description of the phenomenon within its context. The research consists of one case company and therefore is also identified as a singular case study.

Data utilized in the research are both primary and secondary data. Primary data was collected by a semi-structured interview with two representatives of the case company. The representatives were chosen because of their experience and work responsibilities within the case company. Secondary data was collected from a sustainability report of the case company, which was published in 2022. The data was analyzed by coding, theme identification and content analysis.

Figure 2. Process for research methodology and data collection & analysis process.

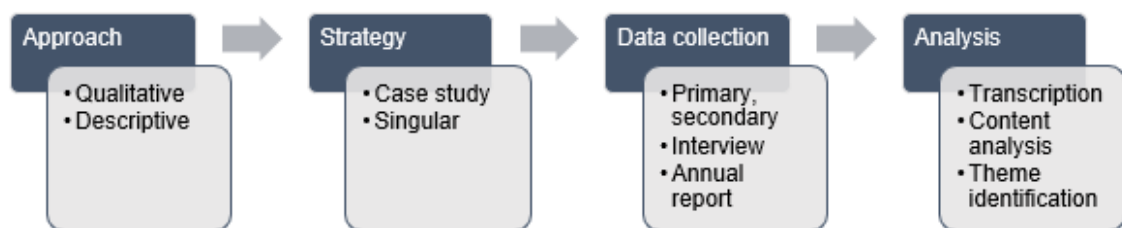


Figure 2 above concludes the research methodology and data collection and analysis process for the research. A more detailed description of conducting the research can be found in chapter six later.

1.5. Limitations

This research contains some limitations, which are important to address for transparency. The research focuses solely on the environmental aspect of sustainability and therefore excludes socio-economic aspects.

The research is also limited to medium-sized third-party logistics providers due to characteristics of case company. This research does not consider other logistics model types besides third-party logistics providers.

In a theoretical point of view, the research is limited to theories of supply chain management, supply management and logistics alongside sustainability aspects of the mentioned theories. The research is limited to green logistics regarding sustainability in logistics.

1.6. Validity and reliability

Validity and reliability have been assessed for planning and conducting the research. Interview conducted for the research is reliable since the questions were conducted to avoid leading and based on a literature review. Interviewees are experts of their field with comprehensive experience which supports the reliability of the research.

As this research is qualitative research, analysis is affected by how researcher interprets data. Bluhm et. al (2011, 1871) state that social position, experiences, training and expectations of a researcher in qualitative research affects how the data is interpreted and analyzed. This may affect the validity of the research, even though there is a general acceptance of researcher bias according to Bluhm et. al (2011, 1871).

Kähkönen (2011, 35) also stated the risk of misinterpreting participant of research as a limitation for single case studies. Other factors which may affect the validity of the research as a single case study are generalizability and a risk of overstating easily accessed data (Kähkönen 2011, 35). Due to having solely a single case company for data collection, the results of this research cannot be generalized to the whole logistics industry and to its many different modes of transport without hesitation.

1.7. Definitions

In this chapter, key terms and concepts of the research are defined briefly. More defined, in-depth descriptions of the concepts are followed in the theory section of the research starting from chapter two.

Third-party logistics providers (3PLs) traditionally offer outsourced logistics management activities such as transportation, warehousing and order processing, but the role has developed to a strategic coordinator of customer's supply chain activities (Zacharia et. al 2011, 40).

Green logistics consists of logistics operations that aim to reduce the negative environmental externalities such as noise, greenhouse gases and accidents, while supporting economic, environmental and social objectives (Dekker et. al 2012). Fields for green logistics practices are green transport, green warehousing, green packaging, sustainable waste management and green management of administration and logistics data (Vienažindienė, Tamulienė & Zaleckienė 2021, 6).

Sustainability initiatives work as tools for companies to achieve sustainability. Sustainability initiatives can be differentiated into two dimensions which are internal versus external focus and innovation versus efficiency. (Robbins & Page 2012, 177)

Sustainable supply chain management consists of “*specific managerial actions that are taken to make the supply chain more sustainable with an end goal of creating a truly sustainable chain*” (Pagell & Wu 2009, 38).

Sustainable supply chain is the one that “*performs well on both traditional measures of profit and loss as well as on an expanded conceptualization of performance that includes social and natural dimensions*”. The expanded conceptualization of performance refers to all aspects of sustainability – environmental, social and economic. (Pagell & Wu 2009, 38)

Environmental sustainability is “*the ability of the environment to continue to function properly indefinitely*”. The goal is to minimize environmental damage and reverse the cycle of environmental degradation. (Vidová, Babčanová, Witkowski & Saniuk 2012, 1007)

1.8. Outline of the research

The research is structured as follows. In the beginning, the importance of the topic was introduced alongside research questions, objectives and suggestions of those who may find the research useful. In the introduction chapter, literature review of previous studies regarding third-party logistics providers as well as incentives and barriers affecting implementation of sustainability initiatives were assessed. A need for more research about sustainability in logistics from perspective of third-party logistics providers was also recognized in the literature review.

After literature review, research framework was showcased alongside a short introduction of research methodology as well as data collection and analysis methods. Finally in the introduction chapter, limitations, validity and reliability were assessed followed by definitions of main terms and concepts of the research.

Theory sector starts with chapter two, which provides a description of logistics industry as well as third-party logistics providers and environmental sustainability of logistics industry. The theory sector continues onto introduction of green logistics. In a chapter of green logistics, sustainability initiatives especially in a logistics industry are determined. Barriers and incentives of adopting environmental sustainability initiatives are also determined. Last in the theory sector, sustainable supply chain management and sustainable supply chains are introduced in more detail.

After the theory sector, chapter five describes how the research was conducted and discusses and justifies applied research methodology as well as data collection and analytics methods. Case company and interviewees are introduced shortly.

Empirical sector of the research begins with results of the research. The results are presented in chapter six to answer the research questions. Then discussion chapter discuss the results relating to previous studies and provide an analysis of the research topic. At the very end of the research, conclusions and possible future studies are stated followed by references and appendices.

2. Logistics industry

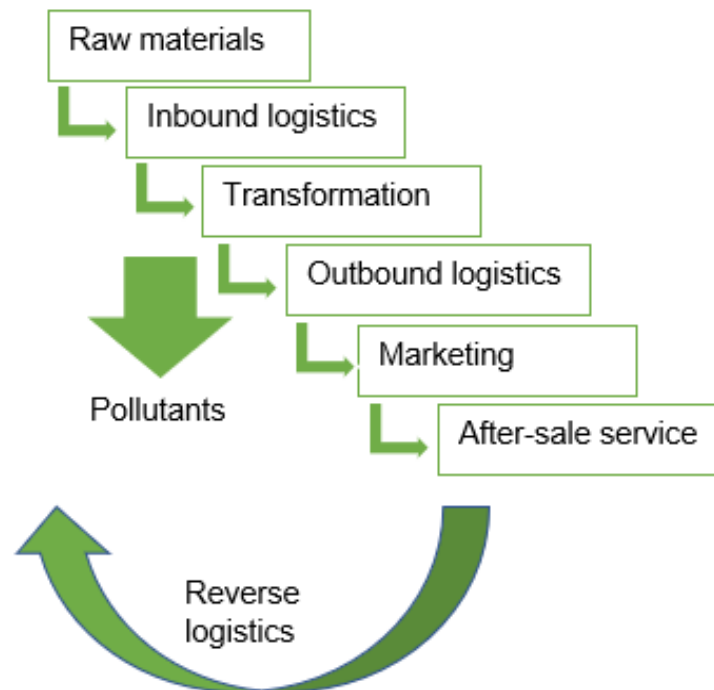
Logistics can be seen as the backbone of businesses. Logistics can be defined as *“planning, implementing and controlling efficient, effective flow and storage of goods and services from the beginning point of external origin to the company and from the company to the point of consumption for the purpose of confirming to customer requirements”* according to Lummus, Krumwiede and Vokurka (2001, 431). The most common logistics practices are transportation, customs clearance, handling, insurance, packaging, warehousing, order processing and IT support related to those practices (Zacharia et. al 2011, 40; Sezer & Abasiz, 11-12). Nowadays the aim of logistics is not solely a smooth transfer of goods, but also maintaining the balance of sustainable logistics system (Vidová et. al 2012, 1007).

Logistics is driven by consumption and production. Therefore, logistics has an important role of providing competitive power and strategies for companies. Processes and functions of logistics must be integrated at a management level in order for logistics to create competitive strategies. (Vidová et. al 2012, 1007) Besides a high importance for companies, logistics has a vital role contributing to national economies by creating employment, national income and foreign investment influx. The transportation industry relates to almost 10 million people while employing around 5 percent of total employment and generating around 4.6 percent in gross domestic products. Development of logistics industry facilitates economic growth for a nation by providing competitive advantages. (Sezer & Abasiz 2017, 11; Khan, Zhang & Hêriş, 2018, 479) Logistics provide also other socio-economic impacts such as new infrastructure and a decrease of poverty, hunger and crimes (Abbasi & Nilsson 2016, 273).

Regardless of its relevance, logistics is identified as non-core activities for many companies. Due to being mostly a non-core activity, providing opportunities for cost savings and requiring significant assets, logistics is a primary candidate for outsourcing. Knowledge and resources of 3PLs as well as their influence in the logistics market are other major reasons for the outsourcing. A shipper may outsource solely one task to 3PLs, the whole strategic management of a logistics operation or anything between those two options. (Zacharia et. al 2011, 40; Wolf & Seuring 2010, 84) According to Langley (2023, 12) domestic and international transportation, freight forwarding, customs brokerage and warehousing are the top logistics services outsourced by shippers. Almost 70 percent of shippers outsource domestic transportation and a little over 50 percent outsource international transportation. (Langley 2023, 12)

Logistics systems consist of varies of different modes. Vidová et. al (2012) presented a model of logistics system in figure 3 below. The logistics system begins with raw materials acquisition followed by inbound logistics, transformation of materials and then outbound logistics towards customers and end-users. Marketing and after-sales service occur after the traditional logistics functions with an objective of enabling reverse logistics in collaboration with customers. Reverse logistics aims to reduce total waste in the system, substitute for more environmentally friendly materials, reuse materials multiple times and recycle an item to a new one after chemical or physical process. The traditional inbound and outbound logistics and transformation of materials create most of the negative environmental impacts of the whole logistics system. (Vidová et. al 2012, 1008-1009)

Figure 3. Logistics system. (Vidová et. al 2012)



Logistics has evolved over time to a term called 'Logistics 4.0' to include more digital innovations in addition to the traditional logistics activities. Winkelhaus and Grosse (2020,21) define logistics 4.0 as *"the logistical system that enables the sustainable satisfaction of individualized customer demands without an increase in costs and supports this development in industry and trade using digital technologies"*. Mass customization and trends like sustainability have generated higher demands on logistics systems, which have led to the development of logistics 4.0. The developed logistics system aims to understand *"implications of the changing production paradigm to mass customization"*, use new digital technologies such as IoT and CPS as well as understand importance of people's

significance in their roles while environmental changes occur. (Winkelhaus & Grosse 2020, 20)

Logistics 4.0 has three dimensions – logistics, technological and external. Focus on logistics dimension is on tasks, domains and human factors. Tasks include all common logistics activities but highlight management activities such as information management. The tasks are separated into four domains which are supply logistics, production logistics, distribution logistics and reverse logistics. Human factors are considered in logistics dimension because logistics is heavily linked to knowledge and capabilities of humans as well as to their physical limits, motivation and psycho-social interactions. (Winkelhaus & Grosse 2020, 21-22)

Technological dimension simply consists of main technological drivers of industry 4.0 and digital transformation technologies, which can transform traditional logistics systems into standards of logistics 4.0. External dimension includes ideal changes to be made for logistics 4.0 to occur. These ideal changes are influenced by individualization, sustainability, industry 4.0 and globalization. All dimensions are connected and in an interaction with each other which allows an integration of all elements in logistics 4.0. (Winkelhaus & Grosse 2020, 21)

2.1. Third-party logistics providers

If logistics is a backbone of businesses, third-party logistics providers (3PLs) can be identified as “*architects of transport*”. Third-party logistics providers organize transportation of goods nationally and across borders while utilizing specialized knowledge of the logistics industry. (Schramm 2012, 24-25) In addition to transportation, 3PLs provide services such as:

- warehousing,
- handling,
- customs clearance,
- packaging,
- consultation of transport,
- consolidation service
- supervision of shipments.

Services of 3PLs were established because of shippers' need for lead time reductions, flexibility and outsourcing as well as growing globalization and increasing market coverage (Wolf & Seuring 2010, 86).

Collaboration of a shipper and third-party logistics provider begins with a consultation regarding freight rates, routing recommendations, advise on regulations, affreightment of freight and terms of sale. Affreightment function is the most important main service of 3PLs as it includes booking cargo space and despatching the shipments. Then other additional, needed services follow, which differ depending on the shipment and needs as well as skills of the shipper. If the shipment goes across the border, customs clearance is a common service provided by 3PLs. Acting as an agent for a consignor or a consignee, 3PLs can speed up the movement of cargo with their expertise of customs clearance, which some shippers may not have in-house. 3PLs can also handle the documentary paperwork for a shipment such as export/import licenses, inspections certificates or delivery permits. If needed, 3PL can arrange cargo insurance for the shipper. However, there is insurance coverage in a forwarding contract between the shipper and 3PL up to a certain amount. (Schramm 2012, 24-27)

Third-party logistics providers can be specialized depending on various of factors such as mode of transport, type and scope of forwarding, location, direction of cargo movements as well as cargo type or industry of a shipper. Depending on type and scope of forwarding operations, 3PLs can handle single shipments called "full-container-load" (FCL) or "full-truck load" (FTL), but if the cargo is consolidated in a groupage service, the shipments are called "less-than-container-load" (LCL) or "less-than-truck load" (LTL). Depending on the direction of cargo movements, 3PLs are either export or import agents. 3PLs can also choose to specialize in special cargo types like hazardous materials, food or textiles. (Schramm 2012, 30-32)

Traditionally 3PLs provided solely logistics capabilities for a shipper, but the role of 3PLs has evolved to being an "*orchestrator of supply chains*" to facilitate strategic supply chain management practices. Reasons for the evolving role are higher volumes and demand for more wider services by shippers as well as growing connectivity and communication requirements of supply chains. Shippers first demanded inventory management, packaging, technology management and cross docking in addition to traditional logistics activities, but an even more strategic role was wanted and then created later on. (Zacharia et. al 2011, 40-51) The main tasks of third-party logistics providers alongside the traditional logistics activities are according to Zacharia et. al (2011):

- standardizing data,
- providing technologies and processes along the supply chain,
- effective planning,
- providing visibility of exceptions,
- improve performance by initiating change and help collaboration between every actor in supply chains while controlling the supply chain to everyone's benefit.

Nowadays, third-party logistics providers are in a leadership role coordinating, communicating and collaborating with other organizations within the supply chain. 3PLs handle all the supply chain management activities on behalf of a shipper company with an objective of effective, integrated logistics which enhances customer satisfaction and provides a competitive advantage. Use of 3PLs allows shippers to focus on their core activities as they do not need to communicate with multiple carriers and other stakeholders of the logistics operations simultaneously. 3PLs advocate for both - the shipper and the carriers – and therefore can be stated as “*neutral arbitrator*”. (Zacharia et. al 2011, 40-49)

A neutral role between a shipper and a carrier generates many advantages. 3PLs may provide cost savings to shippers due to a consolidation of cargo with competitors. Since shippers are more willing to share their sensitive cargo information to 3PLs than to competitors, 3PLs are capable of consolidating the cargo of the shipper with competitors' cargo. At the same time, 3PLs encourage different parties in supply chains to collaborate by introducing opportunities and providing tools and processes. As a neutral player, 3PLs reduce risks and eliminate barriers related to the collaboration. 3PLs also initiate change for shippers and carriers as knowledge and advice of outsiders promotes the change more objectively without internal politics. This requires credibility and objectivity from the 3PLs which derive from wide experience and knowledge of the industry. (Zacharia et. al 2011, 48-50) Langley (2023, 15) reported that 3PLs have continued to improve services for shippers and have provided new, innovative ways to increase logistics effectiveness and decrease supply chain costs.

3PLs have begun to incorporate more environmentally friendly services to improve their customer satisfaction, which has changed their operations and strategies to be up to standards of green perspective. Importance of environment has developed to be relevant in strategies of 3PLs and their strategic development. If the environmental concern is not important for the business strategy, then environmental concern is at least an incentive for more efficient processes for 3PLs. (Zailani, Amran & Jumadi 2011) It is reported that 19 percent of 3PLs do not have a program for their environmental, social and governance

(ESG) efforts and 41 percent of 3PLs is reported as average in their ESG practices. Even if 3PLs make an effort in ESG practices, 20 percent of them lag behind the efforts of suppliers and other partners. (Langley 2023, 55) Wolf and Seuring (2010, 85) state that 3PLs do not have much flexibility in regards of implementing of environmental sustainability since shippers make critical choices of shipments.

Nowadays, the focus on supply chains is more on technology and moving data and information rather than physical goods. This phenomenon has created critical issues for both shippers and 3PLs since technology is increasing and the right use of technology will optimize operations, improve visibility and develop decision-making. It is reported that 75 percent of shippers emphasize technology solutions and development in evaluation and selection process of 3PL partnerships. 87 percent of 3PLs have seen the greater emphasis on technology in evaluation process from shippers' side. However, there is still room for development in technology for 3PLs since only 54 percent of shippers are satisfied with IT capabilities of their 3PLs. In addition to IT skills, shippers require more capabilities from 3PLs in use of analytics and data mining tools, cloud-based technologies and control tower visibility. (Langley 2023, 7-15)

2.2. Environmental sustainability of logistics industry

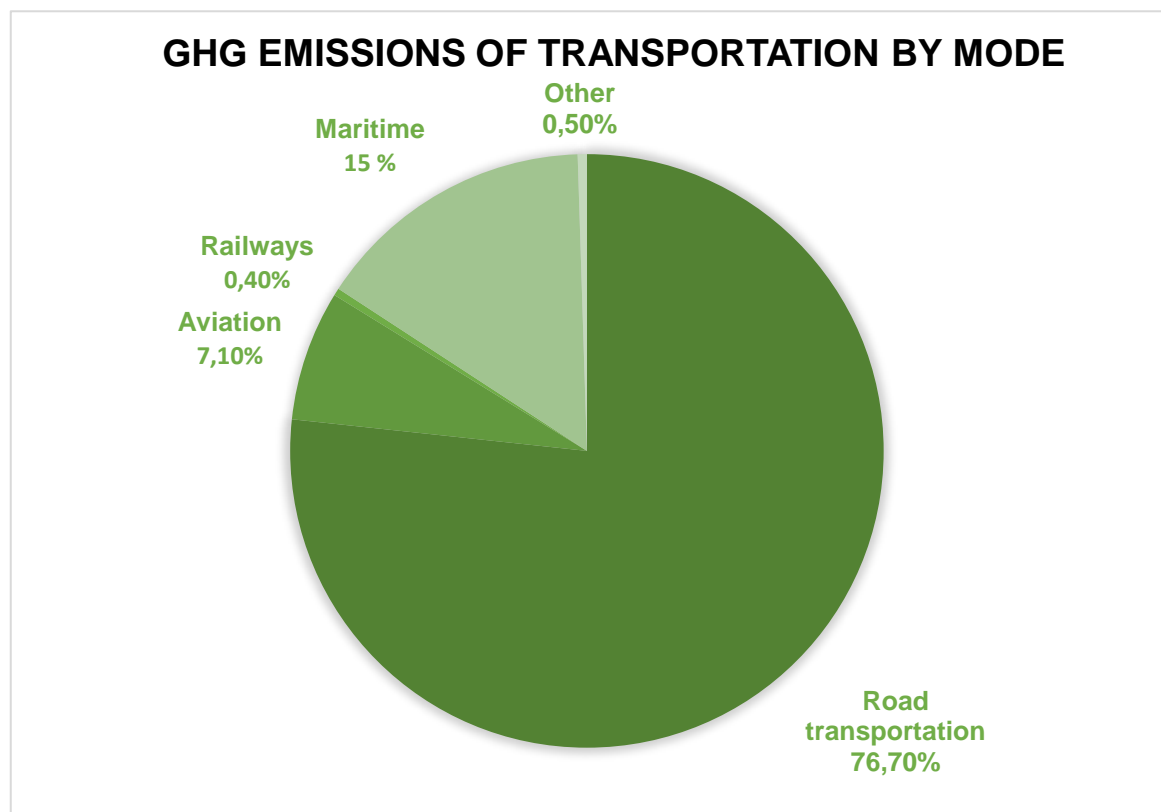
Logistics and environmental degradation are highly connected to each other due to logistics position and characteristics in a supply chain. Companies must consider external, environmental costs of logistics activities such as noise, climate change, pollution, air quality and vibrations. Logistics performance significantly affects national emission levels, but at the same time logistics has an important role in carbon reduction efforts because of the expertise. (Liu, Yuan, Hafeez & Yuan 2018, 290; Vidová et. al 2012, 1009–1013) Nonetheless having an important role in a supply chain and being a major contributor to the environmental degradation, Banister et. al (2011, 253) state that transportation is not at a center of the climate change debate.

Emissions, energy usage and other contributes to environmental degradation have been on the increase for over three decades already in the logistics industry. Transportation is the largest energy end-use sector since over 28 percent of energy consumption is reported coming from the sector. Transportation also depends on oil more than any other end-use sector. The most energy is consumed in road transportation with 238.2 million tonnes of oil equivalent while other transport modes consume less than 5 million tonnes of oil equivalent each. (ITF 2021; European Commission 2022, 119) According to Banister et. al (2011, 248), an increasing demand for transportation and a high usage of oil by the transportation sector

creates concerns over oil scarcity, price volatility and energy security especially in western countries.

Regarding greenhouse gas emission levels in 2020, transportation sector emitted as much as energy industries and marginally more than manufacturing and construction industries as well as industrial processes and product use sectors. The transportation sector emitted 777.2 million tonnes CO₂ equivalent of GHG emissions in EU. Road transportation emits the most GHG emissions compared to aviation, maritime transportation and railways. Over 76 percent of emissions from the transport sector are produced in road transportation. Maritime transportation creates significantly more emissions than aviation and railways by producing over 15 percent of the transportation sector emissions as seen in figure 4 below. (European Commission 2022, 127-134) Banister et. al (2011, 249) state that the emission levels of transportation will continue to increase and account for at least 50 percent of all CO₂ emissions by 2050, if there is no significant change. Decreasing emission levels is not an easy task since there are difficulties in defining who creates the emissions and where. (Banister et. al 2011, 262)

Figure 4. GHG emissions of transportation by mode (shares %). Adapted from European Commission (2022, 135).



There are other negative environmental impacts of transportation such as oil spills, which are possible due to accidents. It is reported by the European Commission (2022, 156) that 10 000 tonnes of oil were spilt at sea in 2020 in Europe. The most major oil spill in Europe occurred in 1978 near France when 223 000 tonnes of oil was spilt (European Commission 2021, 156). Transportation creates other negative impacts which are not as high magnitude as oil spills. Due to a high demand for mobility and logistics, traffic congestion and endangerment of traffic safety occur in big cities causing accidents and injuries. Logistics has a negative effect also on residents' health and safety. (Banister et. al 2011, 248; Abbasi & Nilsson 2016, 274).

Reduction of environmental issues supports and demonstrates corporate social responsibility, which then improves the company image to stakeholders (Vidová et. al 2012, 1013). A great image in corporate sustainability is important in the logistics service industry since environmental sustainability has become a significant selection criterion for both shippers and carriers. The great image in sustainability may also attract future employees who share similar values. Besides being a selection criterion, environmental sustainability is critical determining success factor in cost reduction and increased sales. (Centobelli et. al 2017, 455)

Environmental sustainability provides other advantages in logistics besides an improved corporate image. Efforts in environmental sustainability provide economic benefits such as reduction of material costs and energy consumption as well as decrease in waste disposal and environmental accidents and related costs. Reduction in overall company costs may also be achieved. Other benefits alongside economic ones are increased motivation of stakeholders in environmental issues and greater life quality for all people. (Marchet et. al 2014, 800) As environmental sustainability is achieved in collaboration with stakeholders such as suppliers, shippers and distributors, the whole business performance will improve alongside the environmental efforts (Dey et. al 2011, 1239).

Dey et. al (2011) reported a great example of how faults in environmental sustainability cause negative impact on company image as well as create a lot of unnecessary costs. In 2010, a bulk carrier struck into the Great Barrier Reef while transporting coal. Due to the accident, two tons of heavy fuel oil spilled into the water and the ship cut a two-mile gash, which takes decades to heal, into the coral reef. The accident happened because the captains of the ship wanted to sail through an illegal short-cut to decrease transportation time. The captains were arrested and fined. The bulk carrier was also given fines up to 23 million dollars. (Dey, LaGuardia & Srinivasan 2011, 1241)

Negative environmental impacts from the logistics system are seen in value adding functions of a company. When goods are produced from resources, pollutants are produced as byproducts during each step of integrated supply chain. (Vidová et. al 2012, 1008) Zailani et. al (2011, 111) disagree and state that most of the negative environmental impacts of logistics is created in transportation due to fuels used by vehicles. Therefore, the most sustainability initiatives should be implemented in the transportation function of logistics (Zailani et. al 2011, 111).

Centobelli et. al (2017, 455) remind that environmental issues only increase in logistics because of a constant demand for goods. However, a development of environmental sustainability in logistics mostly focuses on mitigating the externalities rather than decreasing the mobility of the goods. Policymakers and others hesitate to decrease the amount of logistics due to its important role economically as well as societally. (Banister et. al 2011, 252)

Logistics has many direct and indirect impacts on the environment, but the impacts can be decreased with right actions. Management and awareness of the environmental impacts can already reduce the negative impact. (Vidová et. al 2012, 1008) According to Vidová et. al (2012, 1008) direct impacts on the environment caused by logistics can be decreased by:

- right type of transport
- shorter shipping routes
- usage of more environmentally friendly vehicles
- usage of returnable containers
- usage of recyclable or biodegradable packs

Indirect environmental impacts of logistics can be decreased by:

- evaluation of ecological approaches by contractor
- usage of wasteless technology
- usage of low toxic materials
- usage of high recycling goods and segments

Besides the actions mentioned above, Vidová et. al (2012, 1008) and Zailani et. al (2011, 104) state that green innovations would have major impact on decreasing the environmental issues of logistics industry especially regarding pollution and greenhouse gas emissions. This creates a need for integrating green innovations in logistics. According to Zailani et. al

(2011, 104) 76,9 percent of logistics service providers consider technology as an important tool for reducing the environmental issues of logistics industry. Transport management system, freight forwarding system, warehouse management system and e-shipping documents are seen as the most environmentally beneficial technologies for logistics companies (Zailani et. al 2011). Companies must monitor how their business processes impact on the environment and make an effort to reuse resources (Vidová et. al 2012, 1013).

3. Green logistics

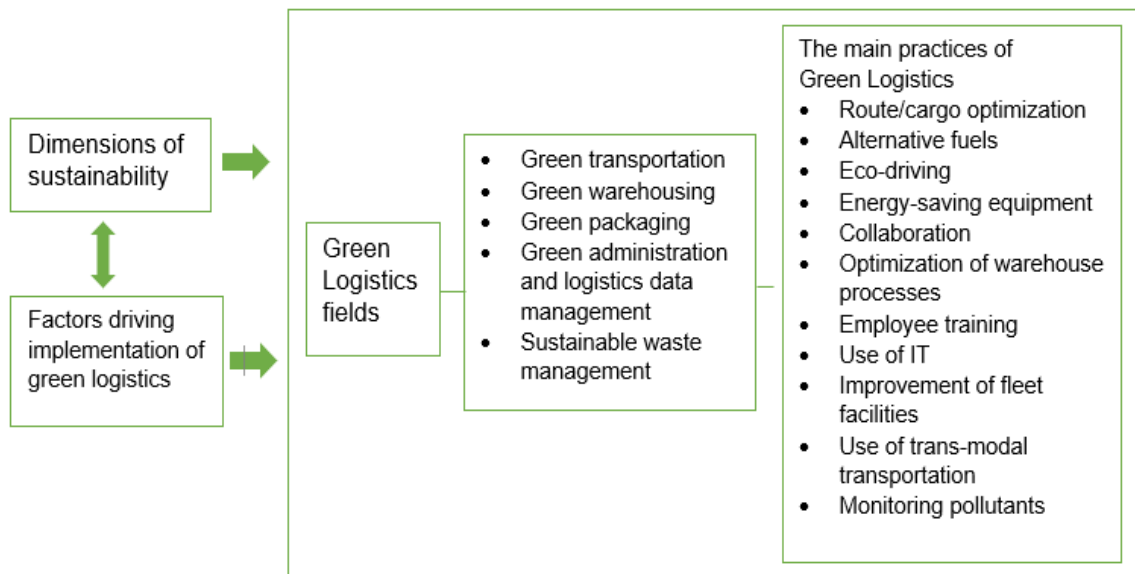
Traditionally, the focus has been on maximizing profitability when arranging logistics, but the focus has shifted more to aspects of sustainability over the past 15 years. Field of logistics has received pressure from customers and governments regarding sustainability because of wide range of externalities from logistics such as noise, vibrations, accidents, congestions, greenhouse gases and other contributions to climate change as well as to societal issues. (McKinnon et. al 2015; Vienažindienė et. al 2021) This pressure and demand for sustainable logistics services have evolved traditional logistics into a concept of green logistics (Vienažindienė et. al 2021, 1).

As a term, green logistics is a convergence of various of study branches that has been explored since 1960s. Green logistics has been discussed under terms of reverse logistics, city logistics, green/sustainable supply chain management, reduction of freight transport externalities and logistics in corporate environmental strategies. (McKinnon et. al 2015, 7; Rodrigue, Slack & Comtois 2001, 2) In this research, green logistics is discussed under a context of sustainable supply chain management. Liu et. al (2018) state that green logistics is an important part of sustainable supply chain management due to its position in a supply chain and an ability to connect closely with every supply chain member.

Green logistics combines the mentioned themes above as McKinnon et. al (2015,4) defines green logistics as *“study of the environmental effects of all the activities involved in transport, storage and handling of physical products as they move through supply chains in both forward and reverse directions”*. This definition highlights effects of logistics in environment, but Dekker et. al (2012, 671) provide a more practical and wholesome definition as they define green logistics as *“practices that aim to reduce the environmental externalities, mainly related to greenhouse gas emissions, noise and accidents, of logistics operations and therefore develop a sustainable balance between economic, environmental and social objectives”*. The research will apply this definition of green logistics by Dekker et. al (2012) since the definition focuses on environmental externalities while aiming to develop all aspects of sustainability in logistics operations.

Vienažindienė et. al (2021) has developed a framework for applying green logistics practices to accomplish sustainable development (figure 5). The framework concludes green logistics' connection to sustainable development and determines which logistics practices seek to develop sustainability.

Figure 5. Framework of green logistics practices. (Vienažindienė et. al 2021)



Green logistics practices can be implemented in all of traditional logistics areas. Areas of green logistics can be differentiated into green transportation, green warehousing, green packaging, sustainable waste management as well as green administration and logistics data management. A few main practices of green logistics are route and cargo optimization, use of alternative fuels, eco-driving, energy-saving equipment, monitoring of pollutants from vehicles, optimization of warehouse processes, collaboration with partners and customers, employee training, use of IT, transport and warehouse management systems, improvement of fleet facilities and use of transmodal transportation. (Vienažindienė et. al 2021,4-6) Kumar (2015, 11) highlight that use of ITC enables sustainable development in all the areas of logistics.

Increased globalization and complex supplier networks have increased interest to manage sustainability performance of the supplier networks, but the management is still quite inadequate (Vienažindienė et. al 2021, 1). Klumpp (2016 ,1) even declare that “*the objective of green logistics has thus far failed*”. Overall, adoption of green logistics practices is “*a transformative risk*” for companies since the change must consider all activities of the business. Adoption of green logistics practices also requires high additional investments upfront, which only produce benefits for companies in the long run, as well as technological improvements and long-term regulations. Therefore, companies may hesitate to adopt green logistics practices. (Vienažindienė et. al 2021, 1; Klumpp 2016,16)

The aim in green logistics is to reduce environmental as well as other negative impacts created from logistics operations (Vidová et al. 2012, 1008). Vienažindienė et. al (2021, 2)

highlight that green logistics practices are “*the only solution to control air pollution, climate change and global warming problems*”.

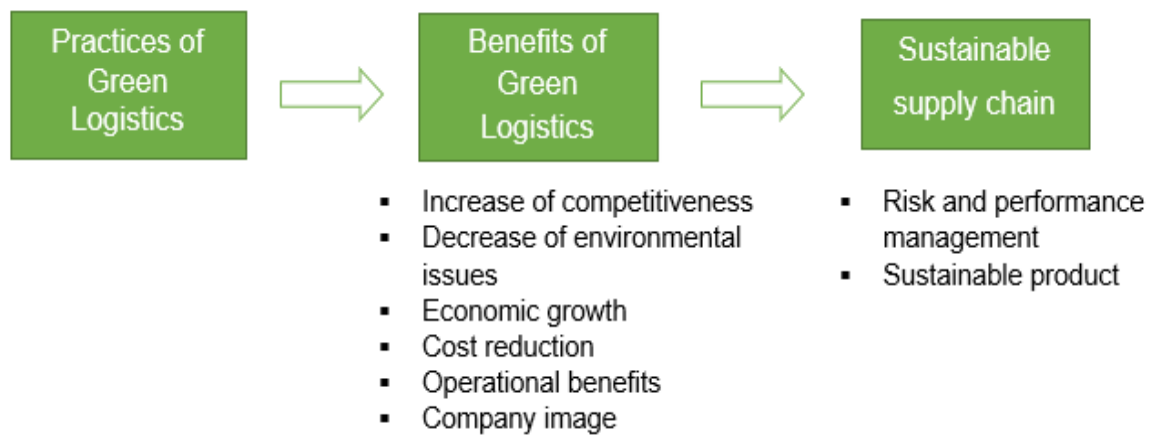
There are numerous benefits from utilizing green logistics besides apparent reduction of sustainability issues. Implementation of green logistics practices enable companies to optimize limited resources available, decrease operation costs in the long-term as well as achieve competitive advantage in the dynamic, global environment of logistics. It has been recognized that green logistics increases customer satisfaction and confidence, improves operational efficiency as well as company image. Green logistics diversifies the business activities and enables additional growth directions. (Vienažindienė et. al 2021, 2-7)

Green logistics practices offer diversification from competitors and established competitive advantage as well as opportunity to develop new products, expand to new markets and gain market size. There are also operational benefits such as optimization of logistics flow and manufacturing as well as reduction in using toxic chemicals. (McKinnon et. al 2015, 19) Green logistics practices are positively correlated to economic and environmental growth (Aldakhil et. al 2018; Kumar 2015, 9). Khan et. al (2018, 488) concluded benefits of green logistics by stating that “*green logistics improves efficiency of energy, FDI inflows and usage of renewable energy in business activities, while greenhouse gas and carbon emissions are decreased significantly*”. It can be concluded that green logistics can provide conventional business benefits alongside the sustainability benefits (McKinnon et. al 2015, 18).

However, viability and effectiveness of the green logistics practices determines success of economic and environmental objectives in green logistics. Simultaneously, renewable energy sources improve performance of green logistics, attract foreign investors as well as improve economic development. Therefore, governments should encourage usage of renewable energy sources in logistics to improve FDI inflows and GDP per capita. (Khan et. al 2018, 448)

Ultimately, practices of green logistics should provide a sustainable supply chain. Zaman and Shamsuddin (2017, 52) provided a framework seen in figure 6 below for how relationship between green logistics and socio-economic-environmental factors contribute to sustainable supply chain process by creating substantial benefits. It can be concluded that green logistics has potential to influence economic and societal issues alongside apparent environmental issues (Vienažindienė et. al 2021, 3).

Figure 6. Green logistics and sustainable supply chain (Zaman & Shamsuddin 2018,52).

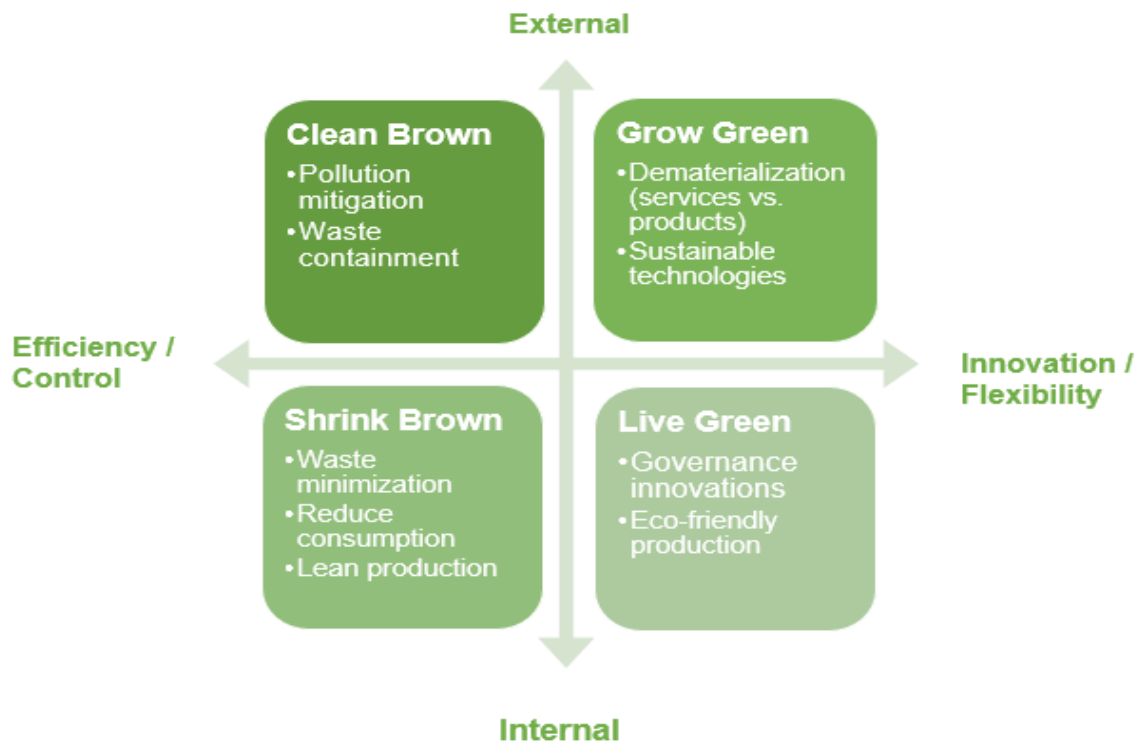


Logistics and sustainability have been seen as opposite of each other for a long time. Kumar (2015, 9) reported several paradoxes of green logistics in areas of cost, availability, network, reliability, storage and e-commerce. For example, in a dimension of cost, companies pursue cost reductions by improving packaging and minimizing waste, but environmental costs occur to be bigger than the costs of developing sustainability. In a dimension of availability, integrated supply chains provide an efficient distribution system with better availability of products, which results to increased higher sales and production. However, the bigger distribution system and bigger production require more space and energy as well as produce increased emission levels. (Kumar et. al 2015,9) Practices of green logistics seem ideal from a perspective of sustainability but require critical judgement of the long-term effects and if the practices will truly create sustainability for the business and supply chain.

3.1. Sustainability initiatives

Sustainability initiatives are practices which aim to attain sustainability in organizations' operations. Organizations apply many sustainability initiatives from different perspectives. Sustainability initiatives can be separated into two dimensions which are internal versus external focus and innovation versus efficiency (figure 7). Innovation versus efficiency can also be named flexibility versus control. (Robbins & Page 2012, 177)

Figure 7. Sustainability initiative dimensions (Robbins & Page 2012, 177).



Internal versus external dimension determines where organizations focus their sustainability initiatives. Organizations can apply the initiatives internally on products and services or externally to environmental effects of their operations in which the goods are made. Internal focus will have an impact on day-to-day operations of the organization and not necessarily on any features of a product. Innovation versus efficiency dimension on another hand determines how much organization develops their product and processes and reconfigures systems. (Robbins & Page 2012, 177)

Clean Brown – category of sustainability initiatives is between efficiency and external. When those initiatives are applied, services and products will continue to be the same but in cleaner and more efficient way. The aim is to solve issues effectively and avoid creating them in the first place. Many pollutions intensive industries apply supply initiatives of this category. (Robbins & Page 2012, 177-178)

Shrink Brown – category lies between efficiency and internal. These initiatives focus on reducing consumption and waste generation in business operations, for example through lean production. Some of the initiatives can also be extended to include supply chain activities. Initiatives from Clean Brown and Shrink Brown -categories should be combined to achieve ultimate efficiency rather than pursuing them independently. (Robbins & Page 2012, 177-178)

Live Green – category of sustainability initiatives is between internal and innovation. These initiatives aim to figure out completely new approaches to problems via innovations. The aim is to reconfigure internal processes to achieve efficiency at a system level rather than develop existing processes further. Even though organizations can achieve competitive advantage and governmental support, there is hesitation towards Live Green – initiatives since they require short term investments while returns are acquired in a long-term. (Robbins & Page 2012, 178-179)

Grow Green – category lies between external and innovation. The aim of sustainability initiatives in this category is to find “*systematically novel and sustainable ways to meet human needs and desires*”. An example of this is car-sharing service. (Robbins & Page 2012, 178-179)

In the logistics industry, companies must start early and simply with their sustainability initiatives. Visualization of supply chains is essential to identifying opportunities and risks of implementing sustainability initiatives. Benchmarking the sustainability efforts against other organizations in the logistics industry should be done at the beginning of adoption of sustainability initiatives. The benchmarking allows measurability and analysis of development later in the adoption. Top management must be committed to the cause since the adoption of sustainability initiatives requires a lot of resources and affects the whole company. (Dey et. al 2011, 1237)

In the long term, companies must stay ahead of governmental regulations to create more of their own operations and processes rather than reacting solely to the regulations. This requires a proactive role from top management in implementing sustainability and anticipation of new measures ahead of time. The proactive role will provide competitive advantage by eventually saving time, resources and costs. (Dey et. al 2011, 1252) Even though 3PLs should be proactive regarding adoption of environmental sustainability initiatives, most of the 3PLs have reactive approach with an objective of cost savings and compliance with regulations (Baz & Laguir 2017, 1464). Besides being proactive regarding regulations, companies must set measurable carbon goals to encourage concrete reductions and measure the carbon footprint of their goods. The visualization of the supply chains will help in this task. (Dey et. al 2011, 1252)

3.2. Environmental sustainability initiatives of logistics

There are numerous environmental sustainability initiatives which can be implemented in logistics. Evangelista, Colicchia and Alessandro (2017, 358) have separated the environmental sustainability initiatives of logistics into two categories – point initiative and

supply chain initiative. Companies may adopt initiatives from only one category or from both categories to find a balanced set of initiatives. Most of the companies adopt initiatives from both categories, but point initiatives are more utilized than supply chain initiatives. It seems that even companies without an environmental strategy in logistics and with a lower priority for environmental sustainability still implement point initiatives or a cluster of initiatives from both initiative categories. Companies with a higher priority of environmental sustainability implement a wider range of initiatives from both categories. However, there are no clear patterns of why companies implement certain initiatives. (Evangelista et. al 2017, 360-361)

Point initiative	Supply Chain Initiative
Vehicle use	Environmental training and information
Transport modes and intermodality	Supply chain re-organization
Energy efficiency	Supply chain collaboration on shared green targets
Recycling materials and packaging	Collaborative planning
Warehousing and green building	Environmental control

Table 1. Categories of environmental sustainability initiatives by Evangelista et. al (2017).

As seen in table 1 above, point and supply chain initiatives consist of areas, which include the environmental sustainability initiatives regards to logistics. Point initiatives include areas of vehicle use, transport modes and intermodality, energy efficiency, recycling as well as warehousing and green building. Supply chain initiatives take a wider range of perspective in its actions compared to point initiative. Supply chain initiatives consist of areas such as environmental training, supply chain reorganization, supply chain collaboration on shared green targets, collaborative planning and environmental control. (Evangelista et. al 2017, 358)

In the area of vehicle use, there are initiatives such as change of vehicle specifications, reduction of empty running and improvement of vehicle loading phase. Initiatives of using lower energy transport modes and greater use of intermodality are included in an area of transport modes and intermodality. An area of energy efficiency focuses on utilizing

renewable energy including alternative fuels. Recycling initiatives focus simply on increasing the amount of recycled waste as well as on reducing packaging. Lastly in the point initiative category, the area of warehousing includes focus on green building design, efficient land use, use of alternative energy sources in warehouses and energy-efficient material handling equipment. (Evangelista et. al 2017, 358)

Supply chain initiatives take a wider range of perspective in their actions. Environmental training and information include actions of customer and supplier training, information about carbon footprint and employee training which includes eco-driving and tyre pressure monitoring. Planning transportation and optimal routing as well as changes in the logistics system are included in supply chain re-organization. The area of supply chain collaboration focuses on collaboration on shared green targets with customers and other 3PLs. Lastly, areas of collaborative planning and environmental control focus on setting lower GHG targets, emission off-set programs and environmental management system (ISO 14001). (Evangelista et. al 2017, 358)

There are other studies as well (Froio & Bezerra 2021; Baz & Laguir 2017; Sureeyatanapas et. al 2018; Vienažindienė et. al 2021) identifying environmental sustainability initiatives of logistics adopted by third-party logistics providers. The most common environmental sustainability initiatives of logistics from the literature review are summarized in table 2 below. The initiatives were separated into nine categories by utilizing categorization of point and supply chain initiatives by Evangelista et. al (2017).

Environmental sustainability initiatives of logistics	
Vehicle use	Change of vehicle specification, reduction of empty running, improving vehicle loading time, use of newer vehicles, clean maintenance, eco-driving
Transport mode & intermodality	Lower energy transport modes, greater use of intermodality, shipment consolidation
Energy efficiency	Renewable energy, use of alternative energy
Recycling materials	Increase of recycled or re-used materials, reducing packaging consumption and waste, use of environmentally friendly materials, monitoring recycling of transport waste
Warehousing	Green building design, efficient land use, energy-efficient material handling equipment, optimization of storage space, use of innovative loading systems
Training and internal information	Customer and supplier training, information on carbon footprint, on-going employee training, manager environmental awareness, transparency policy, monitoring of emissions, formal statement
Supply chain re-organization	Planning transportation, optimal routing, changes in logistics system in favor of the environment
Supply chain collaboration	Collaboration on shared green targets with customers and other 3PLs, assist with certifications, collaboration with suppliers, selection of partners and assessment of their environmental measures
Collaborative planning & environmental control	Environmental Management System (ISO 14001), emission off-set programs, setting lower GHG targets, collaboration in recycling programs, audit of effectiveness of environmental measures

Table 2. Environmental sustainability initiatives of logistics.

Froio and Bezerra (2021) researched environmental sustainability initiatives adopted by logistics service providers from a perspective of a developing country. Initiatives were found in categories of distribution, warehousing and green building, reverse logistics, packaging,

internal management, collaboration with customers and external collaboration. (Froio & Bezerra 2021, 4-6)

In distribution category, initiatives of clean maintenance, use of more recent vehicles, speed reductions, shipment consolidation and closer distribution centers were recognized as the most used while use of alternative fuels and vehicles, intermodality and emission control were recognized as the least utilized initiatives by 3PLs (Froio & Bezerra 2021, 4). In the category of warehousing and green building, Froio and Bezerra (2021, 4) recognized similar initiatives as Evangelista et. al (2017) since re-design of logistics system in a favor of the environment, green design of a building and low-energy consumption of handling equipment were highlighted similarly. Use of alternative energy sources in warehouses was also recognized, but not seen as a common initiative. Collaboration in recycling programs was also recognized by Froio and Bezerra (2021, 4) in addition to recycling and waste management in the category of reverse logistics.

Packaging category included reduction of packaging consumption and waste, reusing and recycling packaging as well as use of environmentally friendly materials in packaging. In internal management, initiatives of manager environmental awareness, personnel training, transparency policy, monitoring as well as formal statement were recognized. Utilization of ISO 14001 was recognized as well with hesitation since only a few 3PLs utilize it in practice. (Froio & Bezerra 2021, 5) Froio and Bezerra (2021, 5) recognized collaboration on green logistics with customers, but highlighted initiative of helping customers with certifications because 40 percent of 3PLs implement the highlighted initiative. 3PLs implement the least initiatives from the category of external collaboration. Some 3PLs participate in green programs, but not to the whole potential. Collaboration with suppliers and other companies was recognized as well but highlighted that implementation of the initiative is very low. (Froio & Bezerra 2021, 5)

Baz and Laguir (2017) also conducted research regarding third-party logistics providers and environmental sustainability initiatives implemented by them. The initiatives were categorized into similar categories as other studies. The categories were transport and vehicle use, warehousing and handling, environmental training and control as well as supply chain collaboration on green initiatives. All the recognized initiatives in the categories are similar compared to other introduced studies. (Baz & Laguir 2017, 1463)

Most of the environmental sustainability initiatives implemented by 3PLs are related to transport and vehicle use (Baz & Laguir 2017, 1463; Sureeyatanapas et. al 2018, 13).

Sureeyatanapas et. al (2018, 13) highlighted eco-driving as one of the most utilized initiatives. It is concluded that 3PLs adopt transportation and vehicle use initiatives mostly because of possible cost reductions and improvement in efficiency rather than environmental benefits. Government incentives were also recognized as more impactful motivators than the environmental benefits in the category of vehicle use. The environmental benefits are seen as additional benefits of the initiatives rather than drivers by some 3PLs. The reason for this may be due to the services provided by 3PLs. 3PLs who provide solely transportation, warehousing and other traditional logistics services are not seen as keen on environmental sustainability compared to 3PLs who offer a wider range of services throughout the supply chain. (Baz & Laguir 2017, 1463-1464) Sureeyatanapas et. al (2018, 13) remind that two goals are possible to achieve simultaneously in adopting sustainability initiatives so 3PLs do not need to choose between cost reductions and environmental sustainability.

Vienažindienė et. al (2021, 10) conducted research as well regarding green logistics initiatives and recognized some different initiatives than Baz and Laguir (2017) as well as Froio and Bezerra (2021). The focus on initiatives was mainly on monitoring and assessing. Monitoring of emissions from vehicles and monitoring of recycling of transport waste were recognized as quite common initiatives adopted by 3PLs. In green management, initiatives of selecting partners and assessing the effectiveness of their environmental measures as well as auditing environmental measures were identified. Regarding warehousing, optimization of storage space and use of innovative loading systems were recognized. (Vienažindienė et. al 2021, 10)

3.3. Barriers of environmental sustainability initiatives

There are many recognized barriers for adopting environmental sustainability initiatives in logistics. Barriers can be separated into internal or external barriers as seen in table 3 below, which summarizes the most common barriers of environmental sustainability initiatives identified in the academic literature.

Barriers of environmental sustainability initiatives		
External	Lack of regulatory framework	Limited infrastructure
	Low priority for customers	Lack of partners' environmental awareness
	Lack of customers' environmental awareness	Uncertainty of payback on green investment
	Fragmentation of logistics industry	Network imbalance
	Technological uncertainty	Difficulty of involving customers
	Environmental uncertainty	
Internal	High investment costs	Lack of funding
	Lack of knowledge	Lack of IT skills
	Measurement of GHG emissions	Difficulty of managing distant teams
	Compliance with legislation	Decrease in the quality of service
	Complexity of green practices	

Table 3. Barriers of environmental sustainability initiatives.

Baz and Laguir (2017, 1466) concluded that most of the barriers are related to financial aspects in implementing the environmental initiatives in logistics because competition in the market is mainly based on a price. Financial aspects such as uncertainty of payback on green investments and a lack of funding alongside high investment costs are recognized as

significant financial barriers (Baz & Laguir 2017, 1466). Various other research has also identified too high investment costs as one of the main barriers for adopting sustainable actions in logistics (Transporeon 2022). A report by Transporeon (2022) concluded that especially utilization of lower carbon energy and fuels require too high investment costs for many companies. Concerns for too high investment costs as well as for limited infrastructure have increased by 15 percent since 2021 (Transporeon 2022, 10). However, Ho, Lin and Tsai (2014, 179) did not recognize adoption costs as a significant barrier as high costs motivates 3PLs to take the adoption of sustainability initiatives more seriously and cost-effectively.

Lack of environmental awareness in sustainable initiatives by customers as well as their low priority in a development of sustainable initiatives by 3PLs are perceived as barriers (Abbasi & Nilsson 2016, 279; Evangelista et. al 2017, 361; Baz & Laguir 2017, 1466). Abbasi and Nilsson (2016, 279) state that *“customer behavior is the opposite of environmental cautiousness”* because customers see logistics as one of the non-value-added activities which should be done as quickly as possible and with lowest possible cost. These requirements of customers do not leave much room for 3PLs to develop their environmental sustainability since it is already difficult to balance cost, time and environmental sustainability in the first place. Demands and priorities of customers also differ between different markets. (Abbasi & Nilsson 2016, 279)

Customers are seen as barriers also since in the most cases they are not willing to pay their share of the costs for implementing sustainable actions. In general, customers are difficult to involve in environmental projects. (Froio & Bezerra 2021, 7; Tacken, Sanchez Rodrigues and Mason 2014, 69) Baz and Laguir (2017, 1466) also highlight the lack of environmental awareness and commitments by partners as a significant barrier.

Implementing environmental sustainability initiatives in logistics may be a challenge due to characteristics of the logistics industry itself. Fragmentation of logistics industry makes finding a sustainable solution difficult as the solution must be cooperated with multiple other stakeholders of 3PLs such as carriers and subcontractors. The logistics industry also works in collaboration with various of different types of industries which require a flexible logistics system. There might also occur imbalance of goods and resource flows in a network due to restrictions and geographical position in the logistics system, which can be a barrier for implementing environmental sustainability initiatives. The imbalance in goods and resource flows decreases the level of resource utilization which leads to more emissions and other negative environmental impacts. The issue multiplies in an international market. (Abbasi &

Nilsson 2016, 280) Ho and Lin (2011, 80) highlight that complexity of green practices themselves as well as environmental uncertainty have a negative impact on the adoption.

Adoption of environmental sustainability in logistics requires technological advancements, but there still lies many technological uncertainties especially in a global market regarding fossil-free fuels and infrastructural changes for production of such fuels. Investments to new changes in transportation infrastructure are also a major technological uncertainty. (Abbasi & Nilsson 2016, 280).

A lack of well-defined regulatory framework and uncertainty in legislation challenge 3PLs externally in the adoption of sustainable initiatives. If there is no long-term direction and regulations set in place by regulators, the logistics industry hesitates to take risks voluntarily regarding sustainability. Only international political decisions and regulations will truly develop environmental sustainability further in the logistics industry. (Abbasi & Nilsson 2016, 280; Baz & Laguir 2017,1466)

Even though a lack of regulatory framework is seen as a barrier, compliance with legislation when required can also be a barrier for some 3PLs according to Froio and Bezerra (2021, 6). It is concluded by Abbasi and Nilsson (2016, 280) that uncertainties, whether in technology or regulations, in adopting sustainable actions make 3PLs reactive rather than acting proactive in taking initiatives.

There are various possible internal barriers within 3PLs. Baz and Laguir (2017, 1466) perceived a lack of qualified employees and lack of IT skills in employees as barriers for adopting sustainability initiatives. Abbasi and Nilsson (2017, 279) highlighted managerial challenges such as measurement of GHG emissions and assessment of environmental impacts of logistics activities as barriers because there is no standardized methods or platforms for it. Froio and Bezerra (2021, 7) state that large 3PLs have difficulties managing and monitoring distant teams which participate in same environmental projects. Tacken et. al (2014, 68) found out that 3PLs fear possible decrease in a quality of service, which then decelerates the environmental improvements. This issue is highlighted especially when competitors perform greenwashing which increases marketing costs and prevents development of environmental improvements for other companies (Tacken et. al 2014, 68).

3.4. Incentives of environmental sustainability initiatives

Companies have many reasons behind implementing sustainability activities in their operations even within the same country due to different objectives, business cultures, services and operations (Vienažindienė et. al 2021, 11). Factors affecting companies' interest to adopt the sustainability initiatives may be compulsive coming from an external party such as a government or some factors may arouse interest in companies voluntarily. Evangelista et. al (2017, 361) state that internal factors are seen more important rather than external factors by 3PLs, but the external ones develop the adopted initiatives further. However, Vienažindienė et. al (2021, 16) disagree by stating that external factors have influenced companies the most to implement green logistics practices.

Various research has studied which factors are influencing positively the adoption of sustainability initiatives by third-party logistics providers (Transporeon 2022; Evangelista et. al 2017; Sureeyatanapas et. al 2018; Vienažindienė et. al 2021; Ho. et. al 2014; Tacke et. al 2014; Oberhofer & Dieplinger 2014). Table 4 below summarizes the most common internal and external incentives of sustainability initiatives recognized in the logistics industry.

Incentives of environmental sustainability initiatives		
External	Governmental support	Improvement of customer relationships
	Requirements of customers and society	Implemented by competitors or partners
	Regulations (international, national, local)	Economic incentives (EU, national, regional)
	Improvement of supply chain effectiveness	Longer freight contracts
	Shippers' willingness to pay more lower carbon transport	Requirements of logistics partners
	Internal	Cost reduction
Increase of profitability		Reduction of company risk
Company image		Company size
Financial status		Service areas
Organizational support		Needs to improve competitiveness
Needs to fulfill own environmental mission		Needs to improve environmental performance
Quality of human resources		

Table 4. Factors of environmental sustainability initiatives.

Governmental support has a significant influence on efforts of 3PLs in adopting sustainability initiatives since companies' desire to receive subsidies and other benefits from governments (Vienažindienė et. al 2021, 16). Governments should provide 3PLs with financial, technical and educational resources which help green practices within the company (Ho et. al 2014, 180). It is reported that governmental subsidies for carbon reduction tools and tax incentives for low-emission vehicles encourage the most (Transporeon 2022,4). According to Evangelista et. al (2017, 359) economic incentives have more importance as drivers for 3PLs compared to international, national or local regulations. Vienažindienė et. al (2021, 12) agree that legal and regulatory requirements have a weak impact in encouraging 3PLs to adopt sustainability initiatives further. Legislation is seen as a minimum requirement but drives proactive companies to develop their operations as they do not want to be driven by policy (Tacken et. al 2014,66)

Pressure from stakeholders such as competitors, partners, society and customers can also affect 3PLs' interest on adopting sustainability initiatives (Oberhofer & Dieplinger 2014, 249). Evangelista et. al (2017, 359) state that initiatives implemented by competitors are the second major external driver after governmental support to further adopt sustainability initiatives. Benchmarking environmental practices to competitors motivates 3PLs as well (Tacken et. al 2014, 66). However, advice from competitors regarding topics such as fuel reductions does not have much importance according to Transporeon (2022, 4). Vienažindienė et. al (2021, 12) disagree by stating that demands of a society are the most influential external factor since societies have become more open and increasingly demanding of companies due to climate change and globalized markets. Requirements of partners are recognized as drivers was well (Vienažindienė et. al 2021, 13).

3PLs who want to focus on maintaining their relationships with customers as well as improve the customer relationship further, should listen to requests of customers and participate in sustainability programs created by the customers. When customers of 3PLs are environmentally aware, they have potential to be in a key role of driving 3PLs to adopt more sustainability initiatives. (Evangelista et. al 2017, 359-361) Abbasi and Nilsson (2016, 279) highlighted that customers' interest in developing and using environmental-friendly solutions is essential for 3PLs to develop and deliver sustainable activities. In customer relationships, shippers' willingness to pay more for lower carbon transport and longer freight contracts encourage 3PLs the most regarding sustainability (Transporeon 2022, 4).

There are numerous economic factors which drive 3PLs to implement sustainability initiatives. Cost reduction is recognized as the most important internal driver. When costs

reduce, the profitability of the company naturally increases and further motivates 3PLs. Reduction of company risk has also been recognized as significant driver as sustainability initiatives can act as a lever for 3PLs to handle unexpected changes in regulations and increase in competition. External funding is an important driver for some 3PLs with limited resources. (Evangelista et. al 2017, 359)

Other internal factors are the possibility of improving the company image in the market, requests and support from top management and strategic board, company size, financial status as well as service areas. Top management and strategic board of 3PLs may have requests for environmental activities but support from top management is essential for the environmental activities to be successful. Top management support shows in practice as strategies, environmental policies and standards as well as creating a team responsible for environmental efforts. (Evangelista et. al 2017, 359; Sureeyatanapas et. al 2018, 11-13)

Sureeyatanapas et. al (2018, 11) state that 3PLs with more than 200 employees implement sustainability initiatives more than smaller companies. Large 3PLs have more power to change their operations without major effects on sales and costs while smaller 3PLs have limited resources which limits proactivity towards sustainability. Smaller 3PLs merely follow environmental regulations with an objective of reducing operation costs, but larger 3PLs can add value to their products as well. Large 3PLs must also focus on environmental care to prove their efforts of corporate sustainability to the public. (Sureeyatanapas et. al 2018, 11) However, Ho et. al (2014, 179) conclude that company size is not significant for logistics because small companies are more flexible in implementing changes and even embrace the changes.

Financial status determines how much 3PLs can implement sustainability initiatives since sustainability initiatives are associated with high costs. 3PLs with higher profitability can use more resources in developing their environmental efforts while companies with smaller budgets can solely focus on their sales and reducing costs. Service area determines a level of implementing sustainability initiatives to some extent. 3PLs, which offer services internationally to customers execute sustainability efforts to a much greater level as they are more aware of the environmental issues in general. (Sureeyatanapas et. al 2018, 11)

Vienažindienė et. al (2021, 12) concluded that 3PLs implement activities of green warehousing especially due to wanting to fulfill their own environmental missions and improve competitiveness of the company as well as because of requirements from customers and public. Sustainable waste management is mostly practiced due to the need

to improve the environmental performance of the company. The most impactful driver for implementing green transportation in logistics was the need for subsidies and other benefits followed by public requirements. (Vienažindienė et. al 2021, 12-14)

Quality of human resources can have an impact on influencing sustainability initiatives for 3PLs. Adoption of sustainability initiatives requires knowledge, complex co-ordination and changes to processes. Employees need extensive training and human resources can effectively distribute innovations and knowledge because of their competent learning capabilities. Simultaneously, 3PLs should provide organizational support by improving their organizational learning capabilities and providing employees organizational resources with better accessibility. Organizational support is relevant within the process of adopting sustainability initiatives to motivate employees to implement green behavior. (Ho et. al 2014, 181)

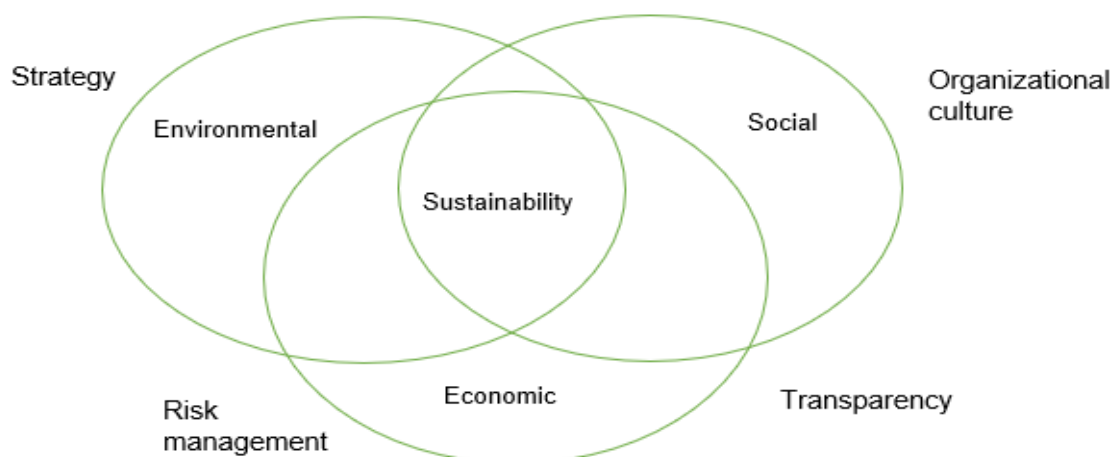
4. Sustainable supply chain management

There are many definitions for sustainable supply chain management (SSCM) depending on the chosen perspective. SSCM has been adapted to various constructs in many fields of studies, and therefore has multi-disciplinary origins from logistics, purchasing and transportation. (Panigrahi et. al 2019, 1003; Font et. al 2008, 260) Carter and Rogers (2008, 368) take strategic interorganizational perspective and define sustainable supply chain management as *“the strategic, transparent integration and achievement of an organization’s social, environmental, and economic goals in the systemic coordination of key interorganizational business processes for improving the long-term economic performance of the individual company and its supply chains”*. Font et. al (2008) have defined sustainable supply chain management more simply leaving supply chain activities out and focusing on internal processes. According to Font et. al (2008, 260) sustainable supply chain management *“adds sustainability to existing supply chain management processes, to consider environmental, social and economic impacts of business activities”*.

In this research, a definition by Pagell and Wu (2009) is applied as it highlights sustainable supply chain. Pagell and Wu (2009, 38) defines sustainable supply chain management simply as *“specific managerial actions that are taken to make the supply chain more sustainable with an end goal of creating a truly sustainable chain”*.

Sustainable supply chain management is heavily linked to a theory of triple bottom line. Carter and Rogers (2008, 369) present a framework for sustainable supply chain management where all aspects of sustainability are working as a base for organizational sustainability (figure 8).

Figure 8. A framework of sustainable supply chain management (Carter & Rogers 2008).



The framework of SSCM includes four supporting facets which are risk management, transparency, strategy and culture. The supporting facets are not meant to be entirely “*mutually exclusive*” and therefore the facets should be integrated into SSCM activities. Risk management is a supporting facet because companies must “*understand and manage its economic, environmental and social risks in the supply chain*” and companies are slowly starting to understand risk management as part of their sustainability. Supply chain risk management can be utilized through contingency planning and more agile supply chains. (Carter & Rogers 2008, 366-368) Chen and Kitsis (2017, 1461) highlight that risk management in SSCM must also handle disruptions created by stakeholders and not solely financial disruptions.

Transparency is extensively included in organizational sustainability. Transparency recognizes a need to actively engaging stakeholders in the sustainability activities by utilizing their feedback and input to improve supply chain processes. Sustainability activities should be transparent and reported to stakeholders to maintain reputation and legitimacy. Transparency could be developed with horizontal coordination. The SSCM activities and other sustainability initiatives must be integrated into the strategy and culture of a company rather than being independent programs. However, sustainability initiatives cannot overlay the corporate strategy. (Carter & Rogers 2008, 367-368)

The economic goals of the organization must be recognized long before any environmental and social activities are undertaken, and the adopted activities must be aligned with the recognized economic goals. Environmental and social initiatives are seen as expensive, and therefore win-win situations of sustainability initiatives are often overshadowed by the total cost of the initiative. Facilitators for the implementation of sustainable supply chain management are risk management with an emergency plan for supply chain disruptions, organizational culture, sustainability strategy aligned with an overall strategy of organization and communication and engagement with stakeholders. (Carter & Rogers 2008, 369)

Practices of sustainable supply chain management include a wider range of activities compared to traditional supply chain management. The practices consider environmental and social values alongside economic values with an objective of achieving profitability and sustainability. (Giunipero et. al 2012) Core practices of SSCM are purchasing, manufacturing, distribution, value proposition, customers and product use as well as reuse, recycling and return (Panigrahi et. al 2019, 1002). SSCM practices in an upstream of a supply chain ensures sustainability for the whole supply chain while also improving the sustainability performance. Practices in a downstream of the supply chain however reflect

transparency of the whole supply chain to customers. (Kähkönen, Lintukangas & Hallikas 2018, 518)

Chen and Kitsis (2017, 1460) mention communication, risk management, collaboration, trust building and information sharing as key relational practices of SSCM, which are interconnected to each other. As sustainability is achieved in a collaboration with supply chain partners in the supply chain, companies must focus their sustainability performance through relational practices rather than solely through internal practices. Communication is essential to exchange knowledge and information between the supply chain partners as well as facilitate risk management by proactively detecting sustainability risks. It is important for companies to communicate and be aware of sustainability risks in their supply chains as focal companies are seen to be responsible for their suppliers. Information sharing enables optimal coordination within the supply chain and balances the information asymmetry within all the supply chain partners regarding products and processes. (Chen & Kitsis 2017, 1460-1461)

In addition to communication, collaborations with stakeholders such as customers, suppliers, NGOs and government are an essential part of implementing SSCM. Collaborations can provide new opportunities and identify sustainability objectives. Proactive collaboration enables value-adding practices with less resources than before. For collaboration to be successful, there must be trust between the stakeholders. Trust can be built through long-term investments in the relationships and maintaining the relationships over time. Shared values, commitment and common vision foster the relationship as well. (Chen & Kitsis 2017, 1461)

To implement SSCM activities, companies must link stakeholder pressure, moral motives and management commitment with the activities. A wide range of stakeholder pressure and moral motives are seen as antecedents of sustainable supply chain management. Alongside the stakeholder pressure, a need to improve relationships with the stakeholders is a major driver of SSCM. (Chen & Kitsis 2017, 1454-1457) Tseng. et al (2015, 457) concluded that SSCM is used as a tool for companies to proactively address sustainability related factors within their activities rather than being reactive regarding the sustainability efforts.

The end goal of sustainable supply chain management is to achieve sustainable supply chain nonetheless of chosen perspective in implementing the SSCM. True sustainability in a supply chain is achieved when economic, environmental and social performance are all balanced. Successful achievement of sustainability incorporates multiple activities where

an organization includes social, economic, and environmental goals in strategic vision and long-term objectives. Environmental and social aspects of sustainability can also be extended beyond the organization to supply chain activities. (Pagell & Wu 2009; Carter & Rogers 2008)

According to Zailani et. al (2012, 330), practices of sustainable supply chain management positively affect sustainable supply chains, especially economic and social aspects. Kähkönen et. al (2018, 518) concluded in their research that practices of sustainable supply chain management represent a significant amount of companies' sustainability performance, but significance of the practices depends on practices' strategic type and importance.

Sustainable supply chain is truly sustainable when a supply chain performs well on traditional, economic measures while also performing well on measures of social and environmental dimensions over extended period. Sustainable supply chain would allow businesses to continue forever if customers are willing to pay. (Pagell & Wu 2009, 38) Barbosa-Póvoa, da Silva & Carvalho (2018, 400) provide more specific definition and define sustainable supply chain as *"complex network systems that involve diverse entities that manage the products from suppliers to customers and their associated returns, accounting for social, environmental and economic impacts"*. To be sustainable, supply chains must comply to include by-products of the supply chain, consider a lifecycle of a product, and optimize products from a total cost standpoint (Linton et. al 2007).

Nowadays, sustainable supply chain is *"a cornerstone to any company that seeks to achieve sustainable goals"*. Companies must control their supply chains sustainably in collaboration with all supply chain stakeholders as it is not enough to be sustainable solely within own activities. Interest for sustainable supply chains in companies is high, but most fail to implement tangible efforts. The reason for failing to provide sustainable supply chain may be the fact that true meaning and management of sustainable supply chains are not clear within the companies. There are numerous sustainability initiatives and standards available which may discourage companies from finding the best practices for them. Therefore, a clear understanding of sustainable supply chains is essential. (Barbosa-Póvoa, da Silva & Carvalho 2018, 399-400)

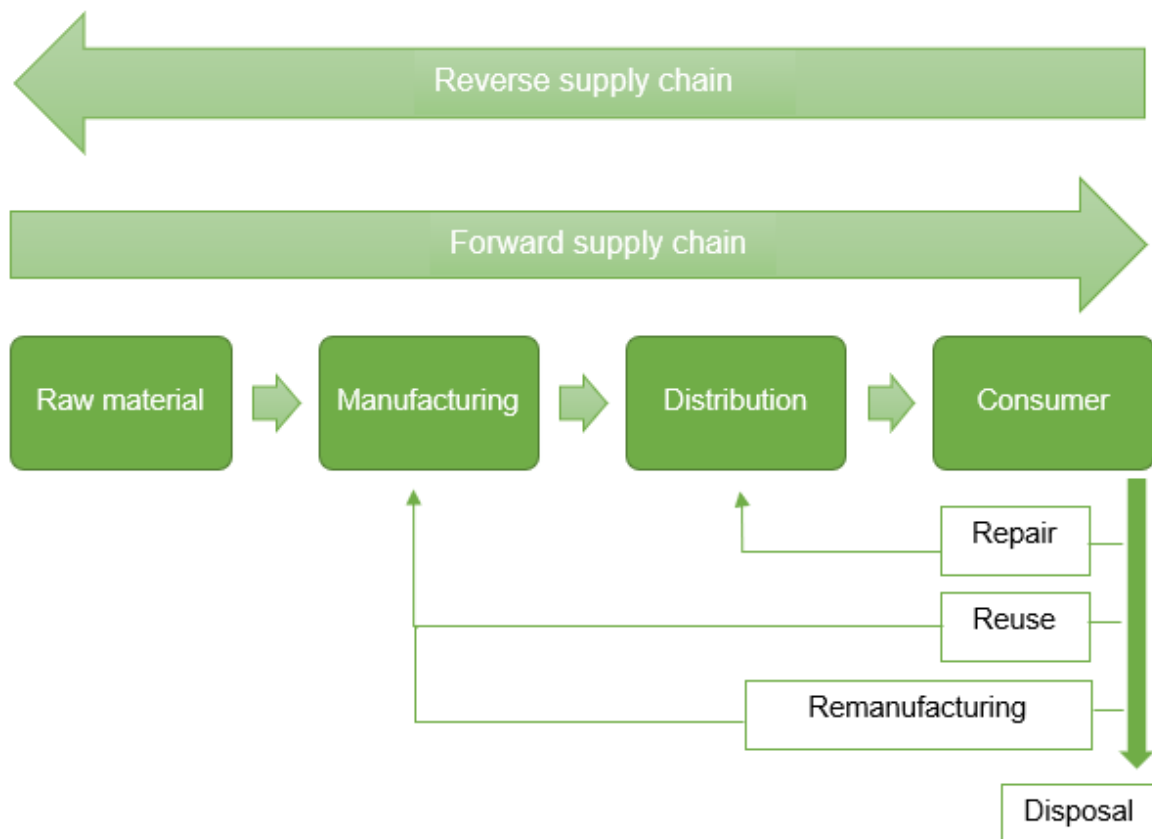
The importance of understanding the different parts of the supply chain is essential for achieving sustainable supply chains. The supply chain can be separated into a value-adding chain, distribution chain and reverse logistics chain alongside the supply chain part itself. Supply chains as well as distribution chains consist of transportation, warehousing,

information flow and purchasing. Distribution chains come after value-adding chains which consist of innovations, conservation of natural resources, sustainability and material safety. Reverse logistics chain occurs latest in the supply chain where waste disposal, reuse and recycling are handled. Sustainability initiatives can be implemented in all those various parts of a supply chain to achieve a sustainable supply chain. (Dey et. al 2011, 1243-1244)

Closed-loop supply chains (CLSC) are defined in academic literature to be the sustainable supply chains. Quariguasi Frota Neto et. al (2010, 4463) define closed-loop supply chains simply as *“supply chains where care is taken of items once they are no longer desired or can no longer be used”*. This refers to creating collection and recycling systems for end-of-use products which are no longer being used. Govindan, Soleimani and Kannan (2015, 603) define CLSC in more detail as *“the design, control, and operation of a system to maximize value creation over the entire life cycle of a product with dynamic recovery of value from different types and volumes of returns over time”*.

In the concept of closed-loop supply chains, there are reverse supply chains besides typical forward supply chains. A forward supply chain flows unidirectionally from suppliers towards consumers via manufacturers and distributors. However, the reverse flow works through the supply chain back to manufacturing from consumers. The reverse supply collects the products used by customers and reintegrates them back to the network of supply chains. There are two different products in reverse flows – end-of-life products and end-of-use products. End-of-use products still have some value in them and can be reused after remanufacturing and repairing, but end-of-life products have no economic value in them. Therefore, end-of-life products are recycled and disposed. (Souza 2012, 7-9; Peng et. al 2020, 2) Figure 9 below displays a general form of a closed loop-supply chain.

Figure 9. Closed-loop supply chain. (Adapted from Peng et. al (2020)).



Closed-loop supply chains promote circular economy and sustainability. There are numerous sustainability related benefits from operating closed-loop supply chains. It has been recognized that closed-loop supply chains minimize resource input, mitigate environmental footprint of the supply chains and reduce energy leakage. (Peng et. al 2020, 2; Quariguasi Frota Neto et. al 2010, 4463) Bhatia and Kumar Sruvastava (2019, 7344) highlight that closed-loop supply chains improve social performance as well.

The main objective of a closed-loop supply chain is still however to provide and improve economic benefits from end-of-use products. It is stated that closed-loop supply chains are not designed for minimizing costs but to create more opportunities for revenue. There are numerous ways companies can benefit economically from a reverse supply chain such as re-selling spare parts and virgin material or refurbishing equipment. Products received back from the reverse supply chain often still are valuable. (Peng et. al 2020, 2; Quariguasi Frota Neto et. al 2010, 4463)

As tempting closed-loop supply chains sound from a perspective of environmental and economic as well as social sustainability, there are factors which should be addressed before extending the supply chain. Quariguasi Frota Neto et. al (2010, 4478) stated that a

life-cycle analysis of the entire life of a product as well as locating environmental hot-spots in the supply chain must be done before implementing closed-loop supply chains. Bhatia et. al (2019, 7356) concluded that environmental concerns are the most critical factor for successfully implementing CLSC. Therefore, companies must be conscious about their environmental performance, implement governmental legislations and be aware of natural resource limitations. (Bhatia et. al 2019, 7356)

The transition to closed-loop supply chains may require a more significant change. Closed-loop supply chains might require some companies to re-design their products for re-use, disassembly and remanufacturing. Production must be also sustainable which includes use of clean process technology and environmentally friendly materials. The production factors must be considered already while designing the product. Production quantities of new and reproduced products must be determined. (Bhatia et. al 2019, 7356)

Souza (2012, 9) introduces some strategic, tactical and operational issues which may occur in closed-loop supply chains. Most of the possible issues were identified in a strategic level in which issues of network design, collection strategy, trade-in and buy-back programs, supply chain coordination, take-back legislation and an impact of activities on new product design were determined. In a tactical level, possible issues were identified in acquisition of product returns and returns disposition since companies must decide how many, when and what quality of products to acquire from returns as well as what to do to them – recycling, remanufacturing, dismantling or repairing. Planning of disassembly as well as routing, scheduling and lot sizing were identified as operational issues in closed-loop supply chains. (Souza 2012, 9)

5. Conducting the research

The next chapter will discuss in detail how the research was conducted. The first chapter discusses applied research methodology. After discussion of the research methodology, data collection methods are determined with a short description of the case company. The case company has wished to remain anonymous for the publishing and therefore a more detailed description of the company is not possible. However, this does not affect analysis or the context of the research as readers will have enough information from the empirical chapter. Last in the chapter, data analysis methods of the research are introduced.

5.1. Research methodology

The research is conducted as qualitative research due to the nature of the research questions and a studied phenomenon. According to Bluhm et. al (2011, 1869) qualitative research pursues to describe, interpret and explain issues of a phenomenon. Qualitative research is relevant to addressing individual experiences and discovering hidden processes in individuals, teams and organizations. There are four defined, typical characteristics of qualitative research. The first characteristic is the fact that the research happens in a natural setting of chosen organizations. Second, collected data is participant's own perceptions of their experiences. The third characteristic is that data collection methods and analysis may change as the research develops in time. Qualitative research allows researchers to adapt to a new unfolding research situation rather than remain with an original plan and expectations. Fourth and last characteristic is that data collection methods and analysis are not standardized. (Bluhm et. al 2011, 1870-1871)

The research methodology applied is a case study. According to Kähkönen (2011, 31) case study is suitable and valuable research method for researching the field of logistics, supply chain management and supply management. Case study allows in-depth analysis of a phenomenon and provides "*rich and profound data*" (Kähkönen 2011, 31).

Case study has been defined as "*an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*". Case study answers questions that start with how, who and why. Data about the phenomenon is collected in its context such as a company, an industry or a country. Case study allows the phenomenon to be studied in its natural state and therefore research questions are answered with a full comprehension of complexity of the studied phenomenon. (Farquhar 2012, 5-8)

There are three types of case studies – exploratory, explanatory and descriptive. Exploratory aims to define questions for a study and determine feasibility while explanatory case study explain events based on cause-effect relationships. (Kähkönen 2011, 33) This research is a descriptive case study as it aims to present a description of the phenomenon within its context. The research consists of one case company and therefore is also identified as a singular case study.

5.2. Data collection

The research uses both primary and secondary data. Primary data was collected by a semi-structured interview, which was scheduled in advance. Adeoye-Olatunde and Olenik (2021, 1360) state that semi-structured interviews allow interviewer to explore the themes further during the interview rather than sticking solely to pre-set questions. This emphasizes the understanding of the studied phenomenon as the aim in semi-structured interviews is to *“better understand the participant’s unique perspective rather than a generalized understanding of the phenomenon”* (Adeoye-Olatunde & Olenik 2021, 1360). Azungah (2018, 387) confirm that semi-structured interviews respond well to “how” and “why” questions and allow interviewees to express their emotions, experiences and perspectives.

Open-ended interview questions, as seen in appendix 1, provided a flexible structure with the main themes of the thesis while also allowing open conversation and additional questions for the interviewees. The interview questions were informed in advance for the interviewees to help preparation for the interview. Some clarifying questions were asked during the interview besides the pre-set questions. The interview was conducted on 12.4.2023 via Teams for easier data collection and ability use video- and audio-recording as well as automatic transcription for effective data analysis. Recording also allows interviewer to be more present during the interview (Adeoye-Olatunde & Olenik 2021, 1363).

The interview was conducted as a group interview with two representatives from the case company. The representatives were advised by HR representative to represent responsibility actions of the case company because of their experience and work responsibilities within the company. The representatives are working as a part of QSHE team (Quality, Safety, Health and Environment) or closely with the QSHE team. It is important to understand the experiences and backgrounds of the interviewees in the fields of logistics and sustainability for a context and analysis of the results.

Interviewee A has an experience of 12 years in logistics as well as within the case company. The interviewee started in air freight and then continued to sales in air freight and to marketing team. Nowadays the interviewee works as the QSHE manager and has been responsible for maintaining quality management system as well as environmental management system and health and safety management systems over the past four years. The interviewee also has responsibility of implementing national sustainability programs, which are managed globally. The interviewee has a study background in logistics, but none in corporate responsibility.

Interviewee B has an experience of 20 years in logistics with various of transport modes. The interviewee started working in sales for air freight at first but has expanded sales experience to other transport modes as well over the years. The interviewee has been working for the case company for 7 years and has had progressive responsibility for CSR within the case company as they have taken part in QSHE actions. The interviewee has a study background in corporate responsibility.

The case company is a medium-sized third-party logistics provider operating in Finland but does have a global presence in nearly hundred countries via a mother company. Therefore, the focus of research did not limit solely to Finland. The case company offers global end-to-end logistics services while managing services from warehousing and freight forwarding to distribution and return logistics. They also have expertise in managing complex supply chain solutions whether in sea, air or road logistics. The case company aspires to be a sustainability leader in the field of logistics and transition customers' supply chains to more sustainable as they are one of the leading forwarders in sea and air freight globally.

The latest sustainability report of the case company has been utilized as secondary data to fulfill data collection and provide additional information. Sustainability report was published in 2022 and retrieved from a public source. The sustainability report has more global focus than the interview as it covers all global activities occurring in the facilities. The sustainability report has been done in accordance with the Global Reporting Initiative (GRI) standards and Sustainability Accounting Standards Board (SASB) related to requirements for a logistics industry. The report was reviewed in detail after the interview in the data analysis step.

5.3. Data analysis methods

Data analysis was conducted based on a transcription as well as video- and audio-recording of the interview and the sustainability report. All the data was analyzed and reported in a

way that the interviewees and the case company remain anonymous and unrecognizable in the results. Focus on the data analysis was on the context of research questions. Other irrelevant, additional information was delimited.

As the interview was recorded with the consent of both interviewees, the recording provided initial transcription automatically. The interview was transformed into a proper transcription based on the initial one. The transcript was checked for accuracy and clarified by removing filler words.

From data analysis methods, coding, theme identification and content analysis were utilized for both primary and secondary data in order to answer the research questions. The methods were chosen based on data collection methods to provide an effective process of analysis. According to Adeoye-Olatunde and Olenik (2021, 1364) coding is a first step of analyzing qualitative data and defined as *“the process of identifying and labeling topics, similarities and differences in the interview data”*. Coding was the first data analysis method done manually using notes and highlights. The coding was done as a part of theme identification since key terms and themes were recognized and categorized during the coding process.

After performing coding and theme identification to the transcription and secondary data, data was analyzed further utilizing content analysis. According to Krippendorff (2019) define content analysis as *“a research technique for making replicable and valid inferences from texts (other meaningful matter) to the context of their use”*. Approach to analyzing data with content analysis depends on how the studied object is perceived. In content analysis there are content as texts, recorded speech, websites, visual communication or even cultural artifacts and art, which should be analyzed to answer research questions. An analytical construct and a context chosen by the researcher limits the analysis. There should be validating evidence, which justifies results of the content analysis. The result from content analysis should be reliable, replicable and valid. (Krippendorff 2019)

6. Results of the research

This chapter presents the results of the research and answers to the research questions. The main research question is how third-party logistics providers can affect sustainability of supply chains? Sub-research questions aim to find out barriers and incentives influencing the implementation of sustainability initiatives for third-party logistics providers. The sub-research questions are as follows - What are the incentives influencing the adoption of sustainability initiatives? What are the barriers of sustainability initiatives for 3PLs?

In the beginning of the chapter, sustainability and perceived expectations for third-party logistics providers as well as environmental impacts from logistics from a perspective of a third-party logistics provider are stated. When the base knowledge for the research is established, research results for the research questions are presented starting with the main research question. Incentives and barriers of sustainability initiatives are presented last in the following chapter.

6.1. Sustainability and expectations

It is important to know how the interviewees perceive sustainability from the perspective of a third-party logistics provider as there are various definitions of sustainability in academic literature, but rarely from the perspective of 3PLs. The knowledge regarding sustainability and its expectations will create a baseline for the other research results. Therefore, the interviewees were asked to define sustainability especially from the perspective of logistics and third-party logistics providers. Sustainability was defined with a focus on environmental sustainability, but other aspects of sustainability were acknowledged as well.

The interviewees stated that sustainability was not recognized 20 years ago in logistics, and nobody was interested in the topic when they started working in the industry. Only a few years ago sustainability was recognized in a larger scale and raised into people's awareness especially in a context of logistics. The change may have been due to new legislation in the EU. Nonetheless, sustainability is even used in a strategic role nowadays. Sustainability has increased its strategic role because at the beginning it was seen as "*nice to have*" strategically, but now sustainability is seen as the focal point of the strategy. Sustainability is integrated in the strategy and can also be seen in sales materials used as an inducement for new customers and to create customer loyalty. Sustainability is also a strategic way to acquire new employees.

Interviewee A defined sustainability in their logistics operations as seen in a quote below. For the case company, the aim in sustainability has always been to operate in a way that causes no harm to the people nor environment. Influence as well as responsibility of the case company within sustainability was recognized while stating that they must operate sustainably in a way that next generations have a chance to live comfortably on Earth in the future.

“No harm to the people and environment”

Interviewee B agreed on the definition, but highlighted how difficult sustainability is to execute in practice in the logistics industry even though there is a strong will to operate sustainably. Legislation guides the case company for more sustainable actions and therefore sustainability is also a must. Therefore, the interviewee concluded that *“sustainability is a must but also a want”*.

Requirements of governance were also highlighted besides legislation and standards. Sustainability in logistics was defined from legislative perspective as *“operating in accordance with all laws and regulations to support environmental sustainability”*. An example of this is dangerous goods shipments, which require approval from a dangerous goods advisor in order to depart within standards of international laws regarding dangerous goods. This procedure is a part of risk management and prevents possible accidents which could lead to significant environmental losses.

As can be seen in the definitions, there are pressure and expectations for third-party logistics providers to operate sustainably. Interviewees were asked what they are expected in terms of sustainably and where those requirements originate from. Most of the pressure and expectations originate from customers.

Interviewees stated that customers require reporting and data about sustainability for their decision-making. Case company is capable of reporting emissions per shipment and therefore customers expect the data.

Alongside reporting and data collection, customers expect the case company to compensate financially some or even all the costs for choosing more sustainable transportation options since the sustainable option increases the total price of shipment. Sustainable logistics require a large amount of investment, but no one (3PLs, carriers nor customers) is willing to pay for all of it on their own. Interviewee B stated that this is a regular conversation during the bidding process with big customers – customer requiring financial

compensation for choosing sustainable option and giving a certain number of volumes of shipments in return. However, smaller customers expect that the case company has sustainable solutions ready and offered for them.

All customers expect the case company to follow legislation and fulfill basic requirements of sustainability without even asking. Government and other legislative organizations also put pressure on the 3PLs by restricting the legislation even further in the future.

Some big customers have even put sustainability requirements for a bidding. Therefore, case company must approve documents and fulfill sustainability requirements of the customer even before they can bid. For the bidding process, some customers may require that the case company has sustainability program, concrete sustainable solutions, certified standards such as ISO14001 and ability to report emissions.

6.2. Environmental impacts from logistics

It is also relevant to know as a base information and for the analysis what specific environmental impacts the interviewees acknowledge in their logistics operations since there are various environmental impacts recognized in the academic literature as seen in chapter two previously. As the research focuses solely on environmental sustainability, other aspects of sustainability and their impacts were not discussed.

The interviewees acknowledges that the logistics industry has a significant share in affecting the environment by their operations. Several environmental impacts from logistics operations were identified by the interviewees. All the environmental impacts can be seen in table 5 below.

Environmental impacts of logistics	
Greenhouse gases	Global warming
Noise	Waste from vehicles
Waste from operations	Heavy water usage

Table 5. Environmental impacts of logistics.

All greenhouse gases were recognized as the most significant environmental impact from logistics activities. Out of all greenhouse gases, carbon dioxide emissions seem to be the most significant. A scale of the environmental impacts was also recognized. Interviewees were aware that the logistics industry is responsible for around eight percent of global emissions and stated that the case company has a significant share in emitting greenhouse gases. It was stated that almost 99 percent of the emissions are from scope 3 supply chains where the case company does not have direct control. Sea and air logistics create most of the scope 3 emissions out of all transport modes from the case company. The focus of the case company in sustainability is currently on the prevention of greenhouse gases and commitment of preventing global warming of 1.5 celsius.

“We are, in this industry, really, really dependent on fossil fuels.”

Interviewee B stated that logistics industry is heavily dependent on fossil fuels which is tightly linked to an amount of greenhouse gases emitted. The case company supports stopping the use of fossil fuels and energy transition to more environmentally friendly fuels in the logistics industry. The energy transition is difficult to implement because ships, aircraft and other vehicles are long-lived and therefore it is not easy to change fuel intake of the vehicles quickly to suit environmentally friendly fuels.

Besides greenhouse gases and global warming, noise was recognized as an environmental impact from the logistics operations. It was stated that all vehicles create a lot of noise which

may disrupt people – engines of ships resonate in the sea and air and trucks create noise in cities.

All the vehicles create waste, which was also recognized as an environmental impact by both interviewees. Wheels of the trucks leave pieces of rubber on the road as well as release chemicals to air. Large amounts of waste are generated in ships from the personnel as well as from maintenance of the ships. All waste, such as food waste and washing water, from the ships are released straight to the seas. Waste is also generated in warehousing in which packaging creates potential wood, cardboard or plastic waste. Maintenance and cleaning of the vehicles and other equipment, such as crates for re-use, use a large amount of water as well, which then creates opportunities for water stress or even scarcity.

6.3. Environmental sustainability initiatives in supply chains by 3PLs

Numerous environmental sustainability initiatives, which can be applied in supply chains by third-party logistics providers, were recognized. Main themes of the sustainability initiatives can be categorized into following groups based on the materiality matrix of the case company:

- Management of dangerous goods
- Waste management and recycling
- Greenhouse gas emissions
- Efficient use of resources

These groups represent the most important issues for the case company and its internal and external stakeholders. The significance of the groups is based on influence on assessment and decision-making of stakeholders as well as reporting of the impacts of the case company. Therefore, the groups are prioritized when implementing environmental sustainability initiatives. According to the materiality matrix, management of dangerous goods are seen as the most significant issue followed by efficient use of resources, greenhouse gas emissions and lastly waste management and recycling.

The case company can affect sustainability of supply chain through data collection and analysis. Data collection is essential for assessing carbon footprints along the supply chains. In order to implement initiatives for reducing emissions, data is captured and analyzed for all three scopes of supply chains and for all transport modes. Case company utilizes measure-avoid-reduce approach to carbon reduction with the help of data.

By utilizing data, emissions within supply chains can be tracked per shipments and linked to specific customers. Data management and analytics allows an overview for customers about their shipment volumes across trade lanes and visualization of impacts from the shipments. Customers can also set their own emission targets and track the performance against the set targets as well as make transport decisions based on the data. The customer emission data provides an opportunity for analytical points to create and implement environmental initiatives in collaboration with customers. Data regarding energy consumption (gas and electricity) at all sites is also captured and analyzed to implement efficient energy initiatives such as renewable energy. Alongside the energy consumption data, the sites report water usage, amount of waste to landfill and recycling efforts monthly.

The case company leverages the data about emissions, water usage and energy consumption to expand and develop its own services to offer customers more solutions that avoid or reduce greenhouse gas emissions and other externalities. These solutions include operational optimization and consolidation, new transport technologies and low-carbon fuels for example. Over 98 percent of emissions of the case company are generated in a supplier network and at service of customers, which makes the development of sustainable solutions and collaboration with global supply chain partners essential to offer the most sustainable transport solutions for the customers.

The case company offers inbound and outbound warehousing services to their customers. Therefore, waste data is recorded and collected from all sites monthly to develop services offered in supply chain waste management. The aim for waste management is to achieve zero waste while exploring circular concepts in the supply chains. Interviewees stated that customers are advised regarding packaging methods and packaging materials for outbound activities to achieve sustainable packaging and create zero waste from the packaging. As an example, one client implemented a full waste reduction program which included reducing overall packaging consumption, removal of plastics as much as possible and reusing inbound cardboard. Optimizing sustainable packaging has been reported to save annually hundreds of tonnes of plastics and over thousand tonnes of CO₂ emissions according to the case company.

There are four different strategies for creating sustainable packaging – reduce, reuse, recycle and replace. Reduction of packaging materials aims to reduce the overall consumption of high-performance materials, latest technologies and process automation. In reusing materials, packaging materials such as pallet lids and wraps are re-used, and

other re-useable solutions implemented. Conventional packaging materials can also be replaced with bio-based or paper-based materials in the replacement strategy. Lastly there is an option to use recycled packaging materials. Besides the materials, the case company advises their customers how to pack their shipments sustainably since the more the shipment weights, the more emissions it generates during its route.

The case company invests in new technologies to acquire sustainable options for customers alongside collecting data for the service and product development. The case company acknowledges that, as a third-party logistics provider, they are not able to force technologies in the logistics industry, but they want to be enabler for driving the adoption of lower-carbon intensive solutions. Transformative low-carbon technologies are in development in the logistics industry, but none of the technologies have settled permanently into the markets. Therefore, case company actively participates in and supports projects which enables transformative sustainable solutions.

“As a third-party logistics provider, cannot force technology readiness in the industry”.

“We are not an industrial partner in position to develop sustainable technologies for the transport industry.”

As one of the new sustainable technological solutions, case company has invested into further development of their own fleet of delivery trucks with focus on electrification. The case company has started to replace heavy-duty trucks with medium-sized battery electric trucks for short-haul journeys up to 250 kilometers to reduce scope 3 emissions. For longer distances, technologies such as hydrotreated vegetable oil (HVO) fuel have been experimented with in collaboration with several customers. The interviewees informed that the case company has also developed gas trucks to reduce emissions for last-mile deliveries, which has grown tremendously due to the consumption habits of customers. One gas truck is already in operation while another one is in production. Other innovative technologies, such as solar panels on vehicles, have been also experimented with.

The case company has prioritized development of low carbon fuels as another technology solution. As mentioned, the case company has experimented with HVO fuel for road vehicles. For maritime, biofuels are offered as a low carbon fuel option for customers and in aviation sustainable aviation fuel (SAF) is enabled. Rail transport is currently powered by renewable energy and electricity. Strategy for alternative fuels include development of hydrogen synthetic fuels for aviation, e-/blue ammonia and e-/bio-methane for maritime and

fuel cell electric trucks for long-distance road transportation. However, in general all low carbon fuel solutions for vehicles are being studied, trialed and adopted by the case company.

Use of alternative fuels reduces CO₂ equivalent emissions and the case company reported that their customer saved around 30 000 tonnes of CO₂ equivalent emissions in a year by using alternative fuels. The process for using alternative fuels has three steps. At first, the customer selects any route or service for their need with a conventional fuel vessel on. Biofuel required for the CO₂ equivalent reduction is consumed by a vessel on another lane using the biofuel. Then the reduction is allocated to the customer's cargo and receive documentation of low-emission transport for proof.

Interviewees mentioned that it is essential to make an effort to introduce and offer the sustainable solutions for customers to achieve a sustainable supply chain. Sustainable options and other alternative solutions must be in conversations with customers regularly and a part of the sales process. The customers are made aware of the sustainable options and reminded about them as well as about the fact that the case company can create these different solutions for them. Therefore, the customers can make more knowledgeable decisions regarding sustainability of their supply chains and be more aware of the environmental impacts of their shipments.

"We do however have the ability to work with a variety of partners and suppliers to offer the most sustainable and non-carbon intensive solutions available on the market".

When in a discussion about possible shipments with customers, the case company at first suggests the more ecological transport modes. Aviation is the most carbon intensive of all transport modes and therefore maritime and railway are suggested, if possible, depending on the needs, requirements, and urgency of a customer. The case company offers a range of other solutions to customers such as emission measurements and alternative fuels. Carbon compensation service for scope 1 and 2 emissions is also offered, but in limitation since compensation only transfers the responsibility further. By engaging in the customers for common cause, the case company is more likely to achieve sustainable supply chains.

Through operational optimization and consolidation, the case company can influence the environmental sustainability of supply chains. Operational optimizations include initiatives such as:

- no empty running of vehicles or containers
- consolidation
- optimal routing
- combining different transport modes
- hybrid services; sea-air service
- maximizing occupancy

Sea and air logistics contribute the most to scope 3 emissions and as a result the case company have begun to offer a hybrid solution, which combines the best features of both transport modes. A dedicated team manages the hybrid shipments since it is not traditional multimodal service. The hybrid service was originally designed to save customers money and time, but now customers see the hybrid service as key value proposition for more sustainable transport options because the hybrid service was reported to generate 50 percent less emissions than air freight solution solely. Besides the hybrid service, case company practices multimodality for operational optimization.

Interviewees stated that the case company aim for optimal routing by planning the routing as simple as possible without additional travels. Another initiative is maximizing occupancy of vehicles and other equipment by consolidation. The case company aims that there would not be empty vehicles or containers operating since it generates pointless emissions and consumes resources. As an example, shipments from all transport modes are sorted and consolidated in the destination port into trucks by final destination for last-mile delivery with collaboration of suppliers to avoid multiple concurrent deliveries. Customers are also consulted regarding needed space for their shipment to achieve optimal occupancy.

Successful management of dangerous goods shipments ensures safety of environment as well as people's health and safety. Management of dangerous goods is controlled by internal policy which promotes safe and compliant transportation of dangerous goods as well as assists in risk elimination or mitigation. The internal policy is implemented via national and local processes, work instructions, training, and monitoring systems. Incidents of dangerous goods shipments are reported and investigated. The dangerous goods shipments are also internally checked before the departure by dangerous goods safety advisor to ensure their safe transport. The dangerous goods safety advisor checks the documentation of the shipment against legislation of dangerous goods depending on the transport mode.

Data collection & analysis	Operational optimization & consolidation	New transport technology	Low carbon fuels
Investment in technology	Packaging and its material	Waste management	Collaboration with supply chain partners
Customer engagement	Electrification of vehicles	Consultation and advise for customers	Management of dangerous goods

Table 6. Environmental initiatives implemented by the case company.

Table 6 above concludes all environmental initiatives the case company implements to pursue a sustainable supply chain for their customers. Development of sustainable solutions and progress towards sustainable supply chains continues for the case company. For future environmental sustainability programs and initiatives, case company aims to reduce waste and plastic materials from contract logistics operations, install solar panels on trucks and use electric vehicles for airport freight transfer.

6.3.1. Implementing environmental sustainability initiatives

To comprehend the process of implementing sustainability initiatives as a third-party logistics provider better, the interviewees were asked how they implement environmental sustainability initiatives and how the process begins. Understanding of the implementation is relevant for the analysis and a full comprehension of barriers and incentives affecting the implementation.

The process of implementing environmental sustainability initiatives begins with offering customers sustainable options in sales. The concrete, sustainable options are as an example use of biofuels, sustainable transport options and compensation of GHG emissions. However, compensation is not encouraged to customers as much compared to other options since compensation only transfers the responsibility of environmental impacts forward to someone else. The case company offers tools in sea freight for customers to allow comparison of sustainability between various carriers' ships and lanes since there are differences depending on speed of the lanes and age of the ships. This shows customers that they can make concrete decisions about sustainability in logistics.

When implementing sustainability initiatives in scope 1 and 2 supply chains, decisions are made regarding own infrastructure, vehicles and equipment. Questions, such as what kind of buildings and terminals the case company owns and what energy the infrastructure uses, are discussed when contemplating the implementation of the sustainability initiatives. The

case company aims to utilize renewable energy in their buildings to the extent they have a choice in energy contracts.

The case company invests in and supports new international projects to create opportunities for implementing the environmental sustainability initiatives. For example, the case company is actively involved in a project lead by the European Union in which road infrastructure of Germany is being developed. Both interviewees stated that the case company also practices lobbying in the context of international projects.

The environmental sustainability initiatives are implemented with the guidance of legislation, certified standards and internal management systems. Internal management systems guide the sustainability initiatives on an everyday basis to assure everything is working as planned. All targets for the initiatives are measured. If the targets are not met, there are discussions of what can be done from now, what risks apply to the initiative and what opportunities the situation offers.

On the governance side, there is a designated person working within the board of directors who is responsible for global sustainability of the case company. The head of global sustainability place sustainability targets within the whole concern for which measures are set, measured and monitored. Sustainability targets and measures are set every year and should be fulfilled. The sustainability targets are science-based targets based on absolute reduction method. The head of global sustainability reports the sustainability measures and achievements annually.

” We want to be the best partner in building sustainable tomorrow.”

Even before there is discussion about sustainable logistics with customers, implementation of sustainability initiatives begins in setting of strategy and targets. Sustainability is heavily integrated to the targets of the case company as they want to be the best partner in building sustainable tomorrow. Sustainability is seen as the focal point of their strategy and vision.

6.4. Barriers of environmental sustainability initiatives

Numerous barriers to implementing sustainability initiatives in logistics were recognized. Table 7 below concludes all barriers for implementing environmental sustainability initiatives from perspective of a third-party logistics provider. Letter E symbolize external barrier, and letter I symbolize internal barrier.

Lack of infrastructure E	Lack of green energy E
Lack in supply of low-emission vehicle (long-distance) E/I	Insufficient availability of alternative fuels in ports E
Technology E	Energy contracts E/I
Insufficient production of biofuels E	Money E/I
Legislation E	Politics E
End-users E	Customers E

Table 7. Barriers for implementing environmental sustainability initiatives.

Both interviewees stated lack of infrastructure as the top external barrier. Lack of infrastructure is especially seen in across border transportations, where infrastructure changes between the countries. The case company may have capabilities for sustainable transportation, but if infrastructure does not support the transportation in certain countries, the transportation ends there. The lack in infrastructure, in terms of electrification and charging stations, is seen within Finland between capital region and other cities. As an example, interviewee B explained that they have capacity to deliver short-distances shipments via electric trucks, but capacity to charge electric truck on the road is not sufficient for longer distances due to lack of availability in charging stations.

Besides lack of charging stations, there is a lack of stations which provide biofuels and other alternative fuels. For example, there is only 50 airports in the world which provide biofuels for aircrafts. Interviewee B state the number to be minimal compared to the number of all airports in the world. Similar situation occurs in maritime with alternative fuels. Interviewees see the insufficient availability of alternative fuels as a barrier since vehicles can not invest in certain alternative fuel if the fuel is not available in the next port or even the route.

In general, current technology and its lacking in development is seen as a barrier for implementing sustainability initiatives. As third-party logistics provider, the case company can not force technology achievements in the industry, but solely support and invest in them. Therefore, role of the case company is enabler of technology by driving the market and its developments in adoption of lower-carbon intensive solutions further.

“As the transport industry transitions to a net-zero future, transformative low-carbon technologies are in development but have not fully penetrated the market, particularly in areas such as sea and air freight which represent the mainstay of international trade”.

Due to lack in technology, there is also lack in supply of low-emission trucks for long-hauls transportations, which are essential for the sustainable shift. Current technology only supports low-emission vehicles for short-haul journeys while development for longer transit is lacking. There is some technology development regarding fuel cell electric trucks for long distances but is linked with high complexity and uncertainty regarding the new technology, equipment, and infrastructure.

Interviewee B highlighted lack of green energy as an external barrier. Related to the charging station for electric stations, interviewee stated that even if there would be sufficient amount of charging stations, energy in the stations should be green energy. Transportation is not emission-free, if the energy for the charging station were generated via coal power. Therefore, there must be alternative, sustainable modes such as wind and solar for energy production. Similarly, energy production for biofuels should be also generated by utilizing green energy to be classified as carbon neutral fuel. Insufficient production of biofuels is seen as a barrier to some extent as well.

Besides utilization of green energy in the vehicles, the case company aims to utilize renewable energy in their buildings and terminals globally. However, the use of renewable energy is limited due to energy contracts. Energy contracts determines the usage of energy mode, and the case company is not able to influence on the matter.

Money is seen as an internal and external barrier to some extent, but more as a big roadblock. Interviewee B state that we think too much of money and revenue while suggesting that there should be another measurement alongside monetary value since the transformation to sustainable solutions and supply chains is more than money. Measuring solely monetary value creates issues of payment and questions such as:

“Who pays for all of this?”

” Who has the money to create sufficient infrastructure? That is the problem”

Interviewee A inform that the case company would have possibilities to invest more in the sustainable solutions and technologies such as the gas trucks, but if customers or anyone

else are not willing to pay more for the sustainable solutions, it is not profitable for the business.

End-users are seen as a barrier as well in the context of money and who pays for the sustainable developments. If the shippers are not willing to pay for the sustainable solutions in logistics, the decision about sustainability lays on the customer and if they are willing to pay the additional costs within the price of the product. At the end, consumers should change their consumption habits and appreciate more sustainable goods for the manufacturing companies to produce sustainable goods profitably. Then the manufacturing companies would have opportunities to finance sustainable logistics solutions for their shipments.

Legislation is mentioned as a barrier because it creates asymmetry to the markets and competition. As an example, the European Union implements a legislation but developing countries do not have similar restrictive legislation for their businesses. This creates unfair and difficult competitive positions for the businesses in European Union. Interviewees inform that the European Union will implement a lot more restrictive legislation regarding air and sea freight and their emissions, but it is uncertain how the targets will be met.

“Is everybody committed?”

Politics are recognized as a barrier since politics have an influence on global environmental agreements and therefore on operations and performance of the case company. As an example, interviewee A mentioned departure of the United States from the Paris Agreement, which raised questions about commitment of countries.

6.5. Incentives of environmental sustainability initiatives

Few factors were recognized as incentives affecting the implementation of environmental sustainability initiatives positively. Some of the incentives were seen as barriers simultaneously depending on the perspective. Table 8 below concludes all incentives for implementing the sustainability initiatives. Letter E symbolizes external factors and letter I symbolize internal factors.

Legislation E	Governmental pressure and support E
Tax on unsustainable solutions E	Requirements of customers E
Own willingness I	New employees I

Table 8. Incentives of affecting implementation of environmental sustainability initiatives.

Legislation is considered a major factor for influencing the implementation. Legislation is a mandatory tool which requires companies to develop and implement sustainability initiatives in their operations. Interviewee B state that legislation as well as governmental pressure and support are necessary for the sustainability initiatives but can be seen as both an incentive and a barrier. Emissions and a need for energy has only increased during previous years even though logistics industry has made a lot of work in a field of sustainability. Therefore, a good will is not enough and stronger means are required from government and legislation. Without governmental and political pressure, companies will not develop their operations further enough regards to sustainability.

Interviewees mentions tax incentives as one factor from governmental support which may affect implementation of the sustainability initiatives positively. Tax on unsustainable solutions and financial support for the sustainable solutions from politics are what affects positively the implementation. As an example, interviewee B mentioned that compensation costs less than using biofuel for a shipment which does not motivate the companies to choose sustainable logistics solution. Therefore, increase in price for the unsustainable options would be needed so that there would be a real chance for environmentally friendly innovations.

Requirements and sustainability targets of customers act as an incentive for the case company. As mentioned, some customers may have sustainability requirements even for the bidding process, which needs to be fulfilled in order for possibility to participate in the bidding. Requirements of customers for sustainability usually originate from end-users and consumers, and then reflect onto the case company. By requiring sustainability actions from third-party logistics providers, customers create pressure for them.

As an internal incentive, new employees were recognized. Interviewee B state that most of millennials consider sustainability as a criterion in selecting a new workplace. Therefore, it is essential for the case company to display for new potential employees that they have sustainability agenda. As one example, the case company collaborates with universities

and coordinates visitor lectures for university courses regarding sustainable logistics and arranges visits for their offices and terminals to showcase the operations. This is an opportunity for the case company to showcase their work in sustainability and appeal to the students as a sustainable employer.

Besides new potential employees, case company's own willingness to do more than required by legislations and standards and indicate sustainable image is seen as an incentive. The case company has ambitious targets in sustainability which some are the first ones in the industry and aims to be a pioneer regarding sustainability. Even though, initiatives for ESG (Environmental, Social and Governance) are recognized as purely costs in the new strategy of the case company, sustainability is still the focal point for all activities and something that the case company wants to pursue voluntarily.

7. Discussion

This chapter will discuss and analyze the results of the research while relating to previous research of the topic. The aim for the analysis is to compare similarities and differences between the result and the previous research while relating to theory. The results are reflected one research question at the time which allows a clear, complete answer to the research question.

7.1. Environmental sustainability initiatives

Concerning the main research question – How third-party providers can affect sustainability of supply chains? – the results indicate that third-party logistics providers have various opportunities and some concrete solutions to affect sustainability of supply chains with their own environmental initiatives. This result is aligned with the previous research which suggest various environmental sustainability initiatives in logistics (Lieb & Lieb 2010; Baz & Laguir 2017; Froio & Bezerra 2021).

Numerous environmental initiatives recognized in the research, such as low-carbon fuels, collaboration with supply chain partners, customer engagement, operational optimization and consolidation as well as waste management, have been mentioned in previous studies (Evangelista et. al 2017; Froio & Bezerra 2021; Baz & Laguir 2017; Sureeyatanapas et. al 2018; Vienažindienė et. al 2021). The environmental sustainability initiatives adopted by a third-party logistics providers can be seen in every field of green logistics – transportation, warehousing, packaging, administration and logistics data management and waste management. Therefore, it can be concluded that 3PLs utilize the whole scale of green logistics practices. Third-party logistics providers also utilize both point and supply chain initiatives in balance to affect sustainability of supply chains.

The environmental sustainability initiatives recognized in the research are categorized in a figure ten below into the sustainability dimensions created by Robbins & Page (2012) in order to display characteristics of the initiatives. The figure strengthens the idea that 3PLs have variety of opportunities to influence sustainability in supply chains whether internally or externally via innovations and efficiency. Data collection and analysis is not in the figure as it can be seen as enablement of all the initiatives and a tool for monitoring and measuring the initiatives. Third-party logistics providers can implement environmental initiatives versatile as the initiatives can be found in every category of the sustainability dimensions.

Figure 10. Environmental sustainability initiated adopted in sustainability initiative dimensions (Adopted from Robbins & Page (2012)).



Through consultation for customers and operational optimization, which include practices such as optimal routing, combining different transport modes, hybrid service and maximizing occupancy, third-party logistics providers can influence sustainability externally with a focus on the environmental effects of their operations. On the sustainability dimensions, these practices aim more for efficiency and control than developing products and systems. Alongside initiatives of consultation and operational optimization, initiatives of waste management, management of dangerous goods as well as packaging and its materials are recognized in the efficiency dimensions but on the side of internal, which focus on services and practices.

Third-party logistics providers can affect sustainability of supply chain also through innovating and developing their products, services as well as systems and processes. Internal initiatives for such approach are new transport technologies, low carbon fuels and electrification of vehicles and equipment. On the contrary, external initiatives are collaboration with supply chain partners, customer engagement and investments in technology.

Some new environmental sustainability initiatives adopted by 3PLs were found during the research. The initiatives of data collection and analysis, investment in technology and management of dangerous goods shipments were recognized as new initiatives during the research. Data collection and analysis as well as investment in technology can be seen as more prominent and active initiatives of 3PLs in developing sustainability further while management of dangerous goods shipments is a passive initiative, which simply aims to avoid environmental disasters within the logistics operations.

Data collection and analysis is the one of the most prominent initiatives how third-party logistics providers can affect environmental sustainability of supply chains since the data allows 3PLs to create, implement and develop their own sustainable solutions and services as well as monitor the adopted sustainability initiatives along the supply chains. Data management also allows tracking of emissions per shipment for customers and an overview of the shipments and environmental impacts. Therefore, data collection and analytics is seen as a baseline for all the sustainability initiatives adopted by third-party logistics providers. It was found that customers also require the data collection and analytics about sustainability and emissions of their shipments, which is aligned with a statement of Langley (2023).

In addition to data collection and analysis, investing in technology to develop and provide sustainable solutions is also one of the most prominent initiatives for third-party logistics providers to affect environmental sustainability of supply chains. Zailani et. al (2011) has also stated that 3PLs consider technology as an important tool for advancing environmental sustainability. Third-party logistics providers are not capable of developing transformative sustainable solutions for the whole logistics industry alone, but through investments in sustainable technologies within their own operations and equipment, 3PLs are able to provide more sustainable supply chains. An example of these sustainable technologies are electrification of vehicles and low-carbon fuels.

However, 3PLs can enable transformative sustainable technologies by actively participating in and supporting the development projects for the technologies as well as by utilizing the new innovations when they are introduced to the market. Therefore, it can be concluded that 3PLs are enablers for sustainable technologies in supply chains. By supporting and participating in technological projects and developments, 3PLs can influence the sustainability of supply chains the long-term.

Both initiatives of data collection and analysis and investments in technology are aligned with an ideology in the concept of logistics 4.0, which was developed due to demands for

sustainability and aims to include technological innovations to logistics in addition to the traditional logistics activities according to Winkelhaus and Grosse (2020). This strengthens the relationship between technology and data management to provide sustainable supply chains.

Initiative of management of dangerous goods shipments was recognized as a new environmental sustainability initiative in comparison to previous academic literature, but not as fundamental initiative as initiatives of collection and analysis of data and investments in technology. Management of dangerous goods shipments is more neutral initiative by aiming to ensure safety of environment via safe and compliant transportation of dangerous goods shipments. The initiative does not affect every possible supply chain as it is limited to dangerous goods shipments.

7.2. Barriers

Numerous barriers for adopting environmental sustainability initiatives for third-party logistics providers were recognized in the research. The result is aligned with previous research (Baz & Laguir 2017; Abbasi & Nilsson 2016; Evangelista et. al 2017, Froio & Bezerra 2021; Tacken et. al 2014), which have all identified variety of internal and external barriers for the adoption of environmental sustainability initiatives in logistics industry. It seems that despite meeting many obstacles, third-party logistics providers are more willing to adopt the sustainability initiatives than they are capable of in terms of the business environment in the logistics industry. Abbasi and Nilsson (2016, 280) even state the characteristics and fragmentation of the logistics industry as a barrier.

Most of the recognized barriers were external factors in which third-party logistics providers have very limited influence on in terms of overcoming the barrier. The external barriers were lack of infrastructure, lack of green energy, insufficient production of biofuels, legislation, insufficient availability of alternative fuels in ports, technology, politics and end-users. These barriers prevent or slow 3PLs to adopt the environmental sustainability initiatives within their operations to achieve sustainable supply chains.

None of the barriers were identified as solely internal barriers, which differ from previous research of Baz and Laguir (2017), Abbasi and Nilsson (2017), Froio and Bezerra (2021) and Tacken et. al (2014). Previous research has shown that lack of qualified employees, lack of IT skills, managerial issues and fear of decrease in a quality of service act as internal barriers (Baz & Laguir 2017; Abbasi & Nilsson 2017; Froio & Bezerra 2021; Tacken et. al 2014), but results of this research did not recognize them as barriers. Due to lack of

recognized internal barriers, it could be assumed that 3PLs have made efforts to overcome the internal barriers and are now facing barriers externally to adopt the sustainability initiatives. Research conducted by Zailani et. al (2011) concluded also that third-party logistics providers have begun to change their operations to be up to standards of green perspectives. However, there is still some contradiction since Langley (2023,55) state that 19 percent of 3PLs do not have a sustainability program and even if 3PLs do make an effort towards sustainability 40 percent is reported as average in their sustainability practices and 20 percent lag behind.

However, few of the barriers were identified as both internal and external. These barriers were energy contracts, lack in supply of low-emission vehicles for long-distance transport and money. Third-party logistics providers have some influence on those barriers but are not capable of removing or solving them independently since the barriers are dependent on another party such as a customer or supplier. Previous research has only recognized money as a barrier out of those three barriers (Baz & Laguir 2017; Froio & Bezerra 2021; Tacke et. al 2014).

Baz and Laguir (2017, 1466) recognizes money as a barrier from the perspective of high investment costs, uncertainty of payback on green investment and lack of funding. On the contrary, Tacke et. al (2014, 69) and Froio and Bezerra (2021, 7) relate the financial issues to customers and imply that money and customers are barriers since customers are not willing to pay their share of the costs for sustainable solutions, which create conversation of payment obligations. Wolf and Seuring (2010, 85) as well state that shippers can be a barrier as they make all the critical choices of shipments leaving 3PLs with limited flexibility regarding environmental sustainability. Results of this research align with the statements of Tacke et. al (2014), Froio and Bezerra (2021) as well as Wolf and Seuring (2010) in terms of money and customers since 3PLs may have the finances to invest in environmental sustainability, but the effort is unprofitable if customers are not willing to pay for the sustainable solutions and services. However, end-users of the goods are also seen as a barrier in this context as they are the one who must pay for the sustainable solutions in the end within the price of a product.

The one of the most prominent barriers for 3PLs is the lack of sufficient infrastructure to implement environmental sustainability initiatives, which is supported by Abbasi and Nilsson (2016). Abbasi and Nilsson (2016, 280) revealed that infrastructure regarding fossil-free fuels and its production contain many technological uncertainties. This research agrees with the result of Abbasi and Nilsson (2016) as well as highlights that lack of charging stations

for electric vehicles and the alternative fuels for every transport mode and a change in transportation infrastructure across borders are significant barriers for achieving sustainable supply chains in logistics.

Alongside insufficient infrastructure, technology has been recognized as a significant barrier for 3PLs to implement sustainability initiatives. Technology improvements and infrastructure are closely linked to each other in some areas which explain the importance of the factors. Abbasi and Nilsson (2016) have also concluded technology and its uncertainties as a barrier. In a global market, uncertainties of fossil-free fuels and infrastructural changes in productions as well as investments to the new changes in transportation infrastructure are technological barriers according to Abbasi and Nilsson (2016,280). Result of this research recognized different aspects of technology as barriers compared to Abbasi and Nilsson (2016). Lack in current technology was highlighted in the results of the research especially since 3PLs are not capable of independently forcing new technologies in the logistics industry. As an example, there is lack in supply of low-emission trucks for long-haul transportations due to lack in current technologies.

As a result of case analysis, some new factors were recognized as barriers to environmental sustainability initiatives for third-party logistics providers. These new barriers, which previous research did not mention, were lack of green energy, insufficient availability of alternative fuels in ports, lack in supply of low-emission vehicles for long-distance, energy contracts, insufficient production of biofuels and politics. This may indicate that there has been development in the field of sustainability as new factors generate.

7.3. Incentives

Even though, there are numerous barriers discouraging the adoption of environmental sustainability initiatives, the result of research indicate that variety of incentives have an influence for third-party logistics providers to implement the sustainability initiatives. The result is also aligned with previous research of Transporeon (2022), Evangelista et. al (2017), Sureeyatanapas et. al (2018), Vienažindienė et. al (2021), Oberhofer and Dieplinger (2014) as well as Tacken et. al (2014), since all the previous research has identified numerous internal and external incentives.

Most of the identified incentives were external factors, which aligns with a statement of Baz and Laguir (2017, 1467) which state that *“most of the drivers behind third-party logistics providers’ environmental sustainability are external”*. Legislation, governmental pressure and support, tax on unsustainable solutions and requirements of customers were

recognized as the external incentives for adopting environmental sustainability initiatives by 3PLs. Previous research had also identified these external factors as incentives (Vienažindienė et. al 2021; Transporeon 2022; Evangelista et. al 2017; Tacke et. al 2014; Oberhofer & Dieplinger 2014; Ho et. al 2014).

Legislation as well as governmental pressure and support are significant incentives for 3PLs regarding environmental sustainability. Evangelista et. al (2017) and Vienažindienė et. al (2021, 12) recognize legislation as an incentive, but highlights that requirements of legislation have a weak impact on 3PLs to adopt environmental sustainability initiatives compared to economic incentives because legislation is seen as merely a minimum requirement. On the contrary to previous research, results of this research emphasize more the significance of legislation as an incentive for 3PLs to implement environmental sustainability initiatives. Legislation is seen as a necessary incentive since third-party logistics providers do not develop their sustainability efforts further enough voluntarily. However, it should be highlighted that legislation can also act as a barrier simultaneously in some situations.

Vienažindienė et. al (2021, 16) and Ho et. al (2014, 180) imply that governments should provide financial, technical and educational resources since companies desire to receive subsidies and other benefits from the government. Transporeon (2022) state that government support for carbon reduction tool and tax incentives for low-emission vehicles encourage 3PLs the most. Governmental support and incentives are recognized as an important incentive, but only tax incentives were mentioned. Tax on unsustainable solutions and financial support for the sustainable solutions from government are highlighted as the incentives of governmental support since they create a profitable environment for environmentally friendly innovations. Other initiatives for governmental support were not mentioned.

Requirements and pressure of customers have been recognized as a major incentive for third-party logistics providers. Previous research has stated pressure from customers as an incentive as well but included pressure from other stakeholders such as competitors and partners also (Oberhofer & Dieplinger 2014; Evangelista et. al 2017; Tacke et. al 2014). Requirements from customers regarding sustainability create pressure for 3PLs to maintain their sustainability actions within a certain standard. It is essential for 3PLs to listen to requirements of their customers in order to maintain their business.

Only few incentives were identified as internal factors during the case analysis. The internal incentives are new employees and own willingness of a company to do better in a field of sustainability. Previously Vienažindienė et. al (2021) had recognized companies' own willingness to implement sustainability actions as an incentive, but the incentive was heavily linked to economic targets and achievement of competitiveness in the industry. This research highlights companies' own willingness as more genuine and non-transactional since the goal of being a pioneer regarding sustainability in the logistics industry was acknowledged.

Most of the incentives recognized in this research had already been stated in previous academic literature. Only the internal incentive of new employees was a new incentive compared to previous research. Ho et. al (2014) discussed quality of human resources as an incentive, but none have discussed alluring new employees to work at a company as an incentive. Nowadays job-seekers, especially millennials, consider sustainability as one of the criterions. Therefore, it is essential for companies to acquire a sustainability program and showcase job-seekers the concrete efforts in sustainability.

8. Conclusions

By utilizing a qualitative approach, the research explored the role of third-party logistics providers on advancing environmental sustainability in supply chains. The main research question is *“How third-party logistics providers can affect sustainability of supply chains?”* while sub-research questions are *“What are the barriers of sustainability initiatives for 3PLs?”* and *“What are the incentives influencing the adoption of sustainability initiatives?”*. The main aim of the research is to provide wholesome understanding of the role of third-party logistics providers have regarding advancing the environmental sustainability in supply chains. Other aims of the research are to discover how 3PLs can advance the environmental sustainability of supply chains as well as challenges and incentives related to the adoption of the environmental sustainability initiatives. The research was conducted as a singular case study and utilized primary data from a group interview and secondary data from the latest responsibility report of the case company.

A major conclusion of the research is that third-party logistics providers have various opportunities and initiatives to influence environmental sustainability of supply chains. The most prominent environmental sustainability initiatives adopted by 3PLs are data collection and analysis initiative and initiatives regarding new transport technology. Data collection and analysis can be seen as enablement of the initiatives since data allows 3PLs to create, implement and develop sustainable solutions and services as well as monitor the adopted sustainability initiatives. Even though initiatives of new transport technology are prominent, 3PLs are not capable of creating transformative sustainable, technology solutions for the whole logistics industry. However, through investing and participating in technology projects as well as providing current sustainable technologies for customers, 3PLs are able to provide sustainable supply chains via technology. Therefore, it can be concluded that 3PLs are enabler of sustainable technologies in supply chains.

In addition, 3PLs can affect environmental sustainability of supply chains through operational optimization, consolidation, collaboration with supply chain partners, customer engagement, investments in technology, packaging, electrification of vehicles, usage of low carbon fuels as well as management of waste and dangerous goods shipments. Out of all the initiatives, management of dangerous goods shipments was recognized as a new initiative compared to previous research.

It can be concluded that most barriers were external factors and none of the barriers were identified solely as an internal barrier. Therefore, 3PLs have limited influence on the matters. External barriers are lack of infrastructure, lack of green energy, insufficient

production of biofuels, legislation, technology, insufficient availability of alternative fuels in ports, politics and end-users. Lack of internal barriers could be explained by 3PLs focus in changing their operations to be up to standards of sustainable development. The most prominent barriers are lack of sufficient infrastructure and current technology.

Few barriers were recognized both internal and external factors. These barriers were energy contracts, lack in supply of low-emission vehicles for long-distance transport and money. 3PLs have some influence on these barriers but are not capable of removing them independently.

At the moment, more barriers than incentives occur in the logistics industry for 3PLs to adopt the sustainability initiatives. Due to various barriers, 3PLs are able to act sustainably only to some limited extent. However, it seems that despite meeting many obstacles, 3PLs are more willing to adopt the sustainability initiatives than they are capable of, in terms of the business environment in the logistics industry.

The most identified incentives were external factors. Legislation, governmental pressure and support, tax on unsustainable solutions and requirements of customers were recognized as the external incentives for adopting environmental sustainability initiatives by 3PLs. In addition to external incentives, new employees and own willingness were recognized as internal incentives. Most of the incentives recognized in this research had already been stated in previous academic literature. Only the internal incentive of new employees was a new incentive compared to previous research.

Out of all incentives, legislation, governmental pressure and support as well as requirements and pressure from customers are the most prominent incentives for 3PLs regarding environmental sustainability. Legislation is seen as necessary, even though it is a minimum requirement. Within governmental support, tax initiatives and financial support were highlighted. Requirements of customers is a major incentive as it keeps constant pressure on 3PLs.

As the research discuss implementation of environmental initiatives from the perspective of third-party logistics providers, some may find the research useful for managerial purposes in the logistics industry. For third-party logistics providers, this research provides concrete sustainability initiatives to achieve sustainable supply chains as well as an overview of barriers and incentives which may help implement the initiatives. The identified barriers and incentives for the implementations can help policymakers, managers and other

stakeholders to comprehend more holistic view of the sustainability issues and required initiatives.

This research would merit from future research since a field of logistics and sustainability combined, especially from the perspective of 3PLs, has not been researched to its fullest potential according to Marchet, Melacini and Perotti (2014). Even though this research contributed to the managerial field, more research about the topic would be useful for the developing sustainability in the logistics industry.

Future studies of the topic would benefit from bigger samples since this research was conducted as a singular case study, which struggles with a generalization. In addition to bigger sample, a different perspective would be appreciated such as a perspective of a carrier or a shipper. The different perspective would provide depth to the topic. The implementation process for the environmental initiatives requires more research, and even in a larger scale than the logistics industry, as there is uncertainty how future targets set by higher governmental organizations will be fulfilled going forward.

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Appendices

Appendice 1. Interview questions:

1. Background and previous experience in the field of logistics and sustainability?
2. Can you define sustainability from the perspective of logistics and 3PLs?
3. What environmental impacts occur in logistics operations?
4. How third-party logistics providers can affect the sustainability of supply chains?
5. Where do the responsibility requirements come from for the 3PLs? What is expected in terms of sustainability from you?
6. How do you implement environmental sustainability initiatives?
7. What internal and external factors influence the adoption of sustainability initiatives in logistics?
8. What are the internal and external barriers for adopting sustainability initiatives for third-party logistics providers?