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ADOPTING ENVIRONMENTALLY FRIENDLY LOGISTICS PRACTICES: ANALYSING SUSTAINABILITY STRATEGIES IN FINNISH COMPANIES

International Business
2024

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ABSTRACT

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Title	Adopting environmentally friendly logistics practices: analysing sustainability strategies in Finnish companies.
Year	2024
Language	English
Pages	38 pages
Name of Supervisor	Teemu Myllylä

This thesis explores the strategies and practices adopted by Finnish companies to reduce the environmental impact of their logistics operations. The study shows the importance of balancing environmental sustainability and logistics efficiency in order to compete in the global market.

The theoretical part explores the basic concepts of green and sustainable logistics as well as an understanding of the pillars of sustainability. Key principles of sustainable development such as reducing carbon dioxide emissions and the use of renewable resources are also analyzed. The research method is mainly based on the analysis of existing literature, including articles, reports, and available databases.

The results of the study show that Finnish companies are adopting different methods such as electrification of transport, optimization of delivery routes, using sustainable packaging, and alternate fuels.

Keywords: Secondary research, green logistics, environment, sustainable practices, Finnish Companies, Eco-friendly, Carbon footprint

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Abbreviations

UNC – United Nations Conference

IMO – International Maritime Organization

IEA – International Energy Agency

CSR – Corporate Social Responsibility

VTT – Technical Research Centre of Finland

VR – Finnish Railways (VR Transpoint)

GDP – Gross Domestic Product

CO2 – Carbon Dioxide

GHG – Greenhouse gas

SDGs – Sustainable Development Goals

LNG – Liquefied Natural Gas

EV – Electric Vehicle

LPI – Logistics Performance Index (World Bank)

TEN-T – Trans-European Transport Network

SECA – Sulphur Emission Control Area

1 INTRODUCTION

In recent years, sustainability has become a fundamental area of study for companies around the world, especially in sectors such as logistics that significantly contribute to environmental problems (McKinnon, Browne, Whiteing & Piecyk, 2015). Global supply chains are expanding every day, and this requires the development of greener logistics operations to reduce the environmental impact of transportation networks. Finland is a leader in sustainability and is an example of how companies can integrate environmental strategies in alignment with national and global sustainable development goals (Sustainable Development Report, 2021).

This thesis conducted as a part of my BBA studies at Vaasa University of Applied Science, within the Degree Programme in International Business, aims to explore the strategies and practices adopted by Finnish companies to improve environmental sustainability.

The research uses secondary research methods, in a particular literature review, to analyse existing reports, websites, books, etc. The result of this research will offer practical perspectives on the development of sustainability in logistics.

1.1 Background of the research

The increasing environmental impact of the logistics industry has become a major concern as the world faces the challenges of climate change. There has been a growing demand for greener logistics practices in recent years. Companies are under pressure from regulations, customer expectations, and a global shift towards greener practices to reduce their environmental impact. This thesis focuses on Finnish companies and their strategies to make their logistics more environmentally friendly (Mohsin et al., 2022).

Finland is well known for its commitment to sustainable development and provides a valuable example of how companies can integrate green practices into their logistics operations.

Transportation, which involves moving goods, is a crucial part of logistics. There are several types of transportation such as road, rail, water, and air. Each type and method of transportation has its advantages and disadvantages, costs, and environmental impact depending on factors, such as type of goods and destination.

However, large-scale transportation creates problems such as carbon emissions, pollution, noise, etc. These factors not only affect the health and environment in general but also create a challenge for Finish companies to adopt different ways to reduce their carbon footprint (Minzadegan, Shahriari, Mehranfar, & Abramović, 2022). In summary, we will look at the sustainability methods and practices of Finnish companies in their logistics to become environmentally friendly.

1.2 Research objectives and questions

This research aims to explore the meaning of green logistics, factors and to understand what strategies are used by Finnish companies to be environmentally friendly. Green logistics is a broad and complex topic that covers various aspects. Despite many solutions to protect the environment, completely sustainable alternatives are not yet in practice.

This study has three main objectives: firstly, to examine the current state of logistics operations and their environmental impacts; secondly, to identify and evaluate the environmental challenges faced by logistics operations; and third, to examine the strategies and practices adopted by Finnish companies to reduce the

environmental impacts of logistics operations. Based on this, the following research questions were identified:

Q1: What is the current situation of logistics operations in Finland and how do these operations impact the environment?

Q2: What environmental challenges do logistics operations face and how do they contribute to the overall footprint?

Q3: What strategies and practices are Finnish companies implementing to reduce the environmental impact of their logistics processes?

1.3 Purpose and method of the research

This research is a comprehensive and detailed analysis of the strategies and practices adopted by Finnish companies to improve environmental sustainability and will be conducted mainly through secondary research.

Secondary research is a research method that uses data that already exists. Existing data is summarized and compared to improve the overall validity of the study.

How to conduct Secondary research?

1. **Identify the research topic:** Determine what topic you need to research before you start. After this, make a list of the characteristics of the study and its objectives.
2. **Identify research sources:** Next, describe the information sources that will give you the most appropriate information for your research.
3. **Collect existing data:** After choosing sources of information, need to check the previously published data which is closely related to the topic of your research. They are available from different sources such as newspapers, libraries, etc.

4. **Combine and compare:** After collecting the data, evaluate and compare it to avoid duplication of information. Make sure that you collected the information from reliable sources.
5. **Analyse data:** Analyse the data, and if you still have questions that are not answered, review the process and get updated information (Adi Bhat, 2024).

The decision not to conduct surveys and interviews is based on the availability of data, and the aim of ensuring a cost-effective and to finish study on time.

The first part of this research looks at the theoretical foundation of sustainable logistics. This includes understanding the concept of sustainable logistics, the impact of logistics operations on the environment, and defining the role of Finnish companies in this.

The second part explores the environmental challenges faced by logistics operations. An in-depth analysis of the study will evaluate the environmental footprint and identify risks and impacts on sustainable development.

The main purpose of this research is to understand the strategies and methods used by Finnish companies to deal with environmental challenges. The result is important not only for Finnish but also for international companies seeking to improve the sustainability of their logistics operations. The goal is to make a significant contribution to the adoption of these strategies and methods that encourage environmental control in the logistics sector.

2 THEORETICAL FOUNDATION OF SUSTAINABLE LOGISTICS

2.1 The concept and meaning of sustainable logistics

Imagine the number of logistics operations taking place on the planet at this exact moment. Planes, ships, trains, trucks, vans, cars, motorbikes, and bicycles move millions of goods back and forth. Companies in the logistics sector are more than ever faced with numerous challenges: meeting the increasingly high demands of customers and responding to the climate emergency. Indeed, the different types of logistics are on the front line for the implementation of solutions that aim to develop a sustainable logistics chain that is more environmentally friendly (Chuanwen D., Boute R., Verelst M., McKinnon A., 2018, 42-57).

The logistics industry faces a lot of pressure to change its methods in an era where social responsibility and environmental issues are becoming more and more important. A key framework defining this shift is sustainable logistics, which aims to balance societal equity, environmental responsibility, and profitability.

The concept of sustainable development was first presented during the UN Conference on Environment and Development, which took place in Rio de Janeiro in 1992. More than 100 heads of state came together to define a plan of action for more sustainable development models (Nations, Report of the United Nations Conference on Environment and Development. Rio de Janeiro., 1992).

The Rio Summit played a crucial role in establishing sustainable development as a central global issue. Then, the World Summit on Sustainable Development in 2002 in Johannesburg met to evaluate the progress, the Johannesburg Plan of Implementation and commitments focused on sustainable consumption, production, water, sanitation, and energy (Nations, World Summit on Sustainable Development: Johannesburg Plan of Implementation., 2002)

Once companies take a close look at the topic of green logistics, they will quickly realize that it is not just about complying with emission limits and mandatory standards. The goals of green logistics include achieving both economic and environmental efficiency in equal measure, resulting in sustainable corporate value creation.

The key element of green logistics is sustainability. It refers to the ability to satisfy the needs of today's generation without minimising the ability of future generations to fulfil their own needs.

Sustainable development is based on three pillars of sustainable logistics: economic viability, social responsibility, and environmental responsibility.

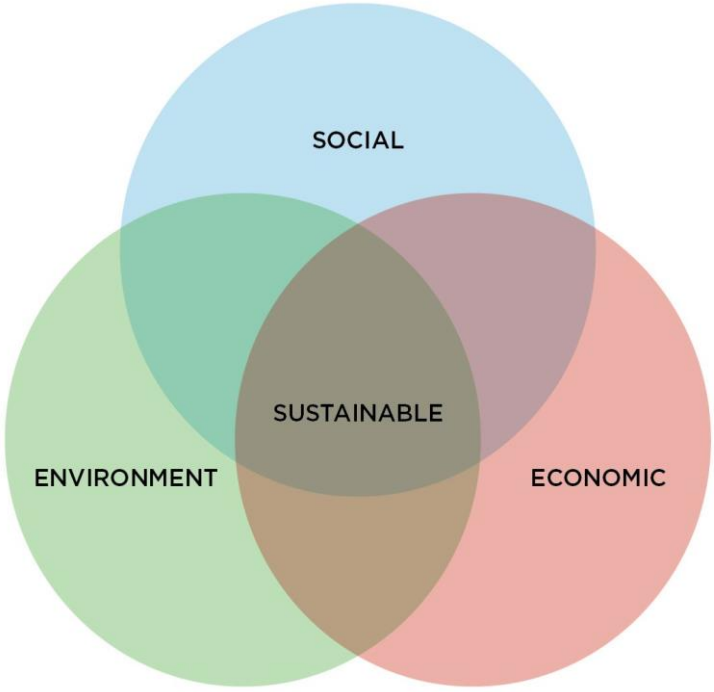

Figure 1. The Pillars of Sustainability.

- **Environmental responsibility**. One of the most important elements in sustainable logistics development. Logistics operations are a major contributor to global emissions, so it is important to prioritize strategies to reduce carbon footprints. This means switching to cleaner fuel sources, for example, optimizing transport routes to minimize unnecessary fuel consumption, and exploring electric or hybrid vehicles.

- **Economic responsibility.** By adopting sustainable practices, companies not only contribute to environmental protection but also ensure their long-term economic success. These practices often result in financial benefits that improve overall profitability in the future. For example, investing in energy-efficient warehouses can reduce energy costs over time.

- **Social responsibility.** Providing safe working conditions in warehouses, comprehensive training, and ethical practices throughout the supply chain. In sustainable logistics, companies are expected to actively contribute to the improvement of the communities in which they operate. (What is sustainable logistics? Examples and definition, 2024)

In summary, sustainable logistics is a complex framework that includes economic, social, and environmental responsibility in logistics operations. Companies can increase their operational efficiency and contribute positively to the environment and society by giving a high prioritization to these factors. Sustainable logistics is a strategic requirement for companies looking to succeed in a rapidly changing marketplace.

Companies that are interested in implementing green logistics practices, need to understand that their operations have an impact on the supply chain, not just their behaviour. This means collaborating with partners, such as suppliers to reduce their carbon footprint.

2.2 Impact of logistics operations on the environment

Understanding the concept of sustainable logistics gives a basic overview of the environmental impact of logistics operations. Many companies are trying to reduce the impact of their logistics on the environment by adopting “green” processes. This is what is known as sustainable logistics. This approach covers all flows of the supply chain, including production management, warehousing, packaging, and transportation.

To effectively reduce their environmental impact, companies must not only be environmentally responsible for themselves but also motivate their partners to do the same as well. This also applies to the service, that supplies the packaging and the carriers chosen to deliver the products. (McKinnon A., Browne M., Piecyk M., Whiteing A., 2015, 3rd ed).

Air Pollution and Carbon Emissions

Fossil fuels are a major component of transportation systems, and their burning produces small particles that significantly increase air pollution. In addition, these small particles are harmful to ecosystems and pose serious health risks, including the potential for human cancer, negative effects on newborn health, and reduced life expectancy. Respiratory and heart disease can be the result of the effects of carbon dioxide emissions in the air. (Organization, Health effects of particulate matter, 2022).

The logistics industry, especially road transportation, is one of the biggest contributors to carbon emissions. According to the report "Reducing Greenhouse Gas Emissions from Heavy-Duty Vehicles in Europe", major greenhouse gas emissions are produced by many vehicles, long distances, and heavy loads. (Reducing greenhouse gas emissions from heavy-duty vehicles in Europe, 2022). To mitigate these impacts, logistics companies can use GPS and route optimization programs to identify the most effective transit routes to reduce these impacts.

Marine Transportation

Every year, more than 10 billion tons of goods are transported by sea, making it an important part of global trade. The International Maritime Organization (IMO) supports marine environmental protection through several regulations. Air pollution, greenhouse gas emissions, waste pollution, and underwater noise, are only a few of the serious ecological issues that marine transportation still faces (*Global Environment Outlook 6*, n.d.).

Fuel Efficiency

One important component of more sustainable logistics operations is fuel efficiency. Companies may reduce costs for energy and greenhouse gas emissions by increasing fuel efficiency. Investing in newer, more fuel-efficient trucks or upgrading vehicles with aerodynamic features and low rolling resistance tires can result in significant fuel savings (The Environmental Impact of Trucking,2024).

Noise Pollution

Another important environmental problem is noise pollution created by various modes of transportation. The operation of trucks, trains, and airplanes creates significant noise from engines, tires, and other mechanical impacts. This noise pollution can be harmful to wildlife. **In Figure 2**, we can see the most common sources of noise pollution.

To reduce noise pollution, steps such as implementing more quiet engines, sound barriers, and strategic urban planning are necessary. Through these initiatives, some cities have successfully reduced noise levels and improved local wildlife (Organization, Environmental Noise Guidelines for the European Region, 2018).

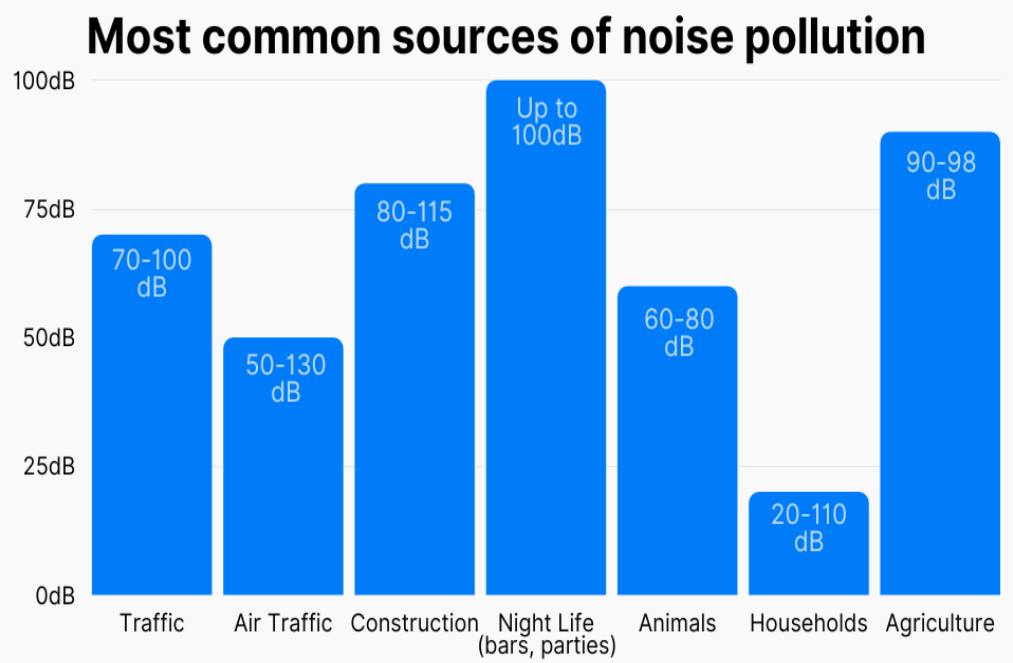

Figure 2. The most common sources of noise pollution.

In conclusion, it is critical to keep in mind that logistics operations can seriously impact the environment. This can affect things like air and water quality, noise pollution, and greenhouse gas emissions. Reducing this environmental impact requires initiatives like moving to fuel-efficient trucks, organizing the most effective routes for transportation, etc. Since the logistics industry continues to grow and develop every year, for now, it is more important than ever for companies to focus on sustainable supply chain methods and practices.

2.3 Role of Finnish companies in the development of sustainable logistics

Finland is one of the world's leading countries in sustainable development. The government organization Business Finland supports Finnish companies in reducing their environmental impact through innovative and eco-friendly methods in logistics. Companies focus on sustainable solutions in packaging, transportation,

and energy use. Finland is also a world leader in logistics, using its developed network of railroads, roads, and sea routes. According to the World Bank's Logistics Performance Index, Finland was ranked second out of 139 countries (World Bank, 2023).

Electrification of Road Transport

More than 90% of Finland's air emissions come from road transport, with heavy vehicles responsible for 40% of these emissions. The solution to the problem, the Finnish government aims to reduce emissions from road transport are 60% by 2030, 80% by 2040, and 90% - 95 % by 2050. To monitor these goals, they publish the Annual Climate Report. A key component of this strategy is the rapid electrification of transport, and the goal is to aim by 2030 to have one-third of all kilometers travelled by transport working on electricity (*Finland's National Climate Policy - Ministry of the Environment*, n.d.).

What does the electrification of transport mean? Transportation electrification is the process of switching to using electrical energy to run vehicles. Electric motors powered by batteries are used instead of using fuel such as gasoline or diesel. In 2022, the number of fast charging stations in Finland is set to increase by 120% as part of an effort to expand electric vehicle charging infrastructure. As a result of these improvements, Finland ranks seventh in Europe and is now recognized as a world leader in electric vehicle readiness (EV Readiness Index, 2022).

Rail and Air Transportation

VR Transpoint is Finland's government-owned railway company. The company is increasing the role of rail transport in reducing emissions through three key growth areas, such as green transformation, industrial investments, and combined transport. Compared to other modes of transportation, rail transport produces less emissions and consumes less energy, making it a key component in reducing transportation emissions.

Four of the 20 airports operated by Finavia in Finland – Ivalo, Kittilä, Kuusamo and Rovaniemi – have received airport carbon accreditation level 5, making them leaders in emissions control worldwide. These airports are working entirely on renewable electricity, and vehicles and equipment have switched to biofuels and renewable diesel. In addition, terminal heating is now provided by district heating systems powered by bioenergy. This combined strategy has reduced emissions by 98% over ten years, proving Finland's ability to achieve a balance between environmental responsibility and operational efficiency (Finavia,2024).

Additionally, Finland is making progress in the transition to electric aviation, a key focus for Finland in further decarbonizing air travel. Electric aircraft provide low-emission options for both passenger and cargo transportation, making them especially suitable for Finland's regional routes. By 2030, electric aircraft should be able to fly short distances, helping Finland achieve its climate goals and reducing its dependence on fossil fuels (Finnish Regional Airports Achieve Net Zero Carbon Emissions – Airport World, 2024).

Finnish Packaging Innovation

To produce environmentally friendly products, Finnish packaging companies use sustainable materials and certified forests. The packaging sector mostly uses wood-based materials, which is aligned with Finland's commitment to environmental responsibility and the ideas of the circular economy. According to Business Finland, about 69% of Finnish packaging exports are made of fibre, and it shows that the packaging sector is dependent on renewable and biodegradable materials (Business Finland, Sustainable Packaging). Innovation in sustainable packaging can be noticed in some Finnish packaging companies:

Paptic: Well-known for its biodegradable paper packaging, operating in more than 50 countries (Paptic, 2024).

Woodly: is a leader in developing wood-based films and provides recyclable materials with common packaging material (Plastic and Environment Archives - Woodly).

Sulapac: Delivers microplastic-free solutions, especially in cosmetics packaging (Sulapac, 2024).

Focusing on sustainable coatings, bio-barrier technologies, and biopolymer-based materials, the research institute, the Technical Research Centre of Finland (VTT), participates in international projects. For instance, the SUSBINCO project creates bio-based coatings and binders as substitutes for materials derived from fossil fuels. The project, which has been financed by Business Finland with €5.6 million, aims to develop commercialized, eco-friendly products (Kellock, M., 2023).

In conclusion, Finnish companies are making a strong contribution to the development of sustainable logistics, with a focus on reducing environmental impact and adopting environmentally friendly practices. Finland is already a world leader in logistics because of its efficient network of roads, railways and sea routes, and the country is committed to making transportation more environmentally friendly. One of the key elements of this strategy is the electrification of road transportation, which aims to significantly decrease emissions by 2030. The use of electric transport, biofuel-powered airports, and increased infrastructure for electric vehicles demonstrate Finland's initiative to create a more environmentally friendly future. In addition, the country's progress in rail and air transport, such as the green transformation of VR Transpoint and the carbon-neutral airports operated by Finavia, are examples of Finland's leadership in sustainable transportation.

The Finnish packaging sector is also a great example of sustainability. Finnish packaging companies are using renewable and biodegradable materials such as wood, contributing to the country's circular economy goals. The widespread use

of fiber-based packaging materials, which make up a significant part of Finnish packaging exports, shows the world how committed Finnish companies are to sustainability. Companies such as Paptic, Woodly and Sulapac are leaders in innovative products such as biodegradable packaging and recyclable wood film that offer environmentally friendly alternatives to traditional packaging materials. Finnish research institutes such as VTT contribute to the development of sustainable materials in addition to the initiatives of individual companies. The institute is continuously developing biobased coatings as substitutes for materials derived from fossil fuels. Finland's commitment to sustainability is a model for many countries and has also positioned the country as a leader in creating greener and more efficient logistics systems.

3 STRATEGIES AND PRACTICES OF FINNISH COMPANIES

Logistics play a crucial part in Finland's economy by connecting the country to both domestic and foreign markets. The pressure on Finland's logistics sector to reduce its environmental impact is growing every day. Since climate change and carbon emissions are attracting more attention, companies are searching for methods to operate in a more sustainable and eco-friendly way. This chapter will explore the current state of logistics operations in Finland, including their environmental

impact. The challenges that Finnish logistics companies have when trying to increase the sustainability of their operations will be discussed in this chapter. These challenges include issues such as limited infrastructure, the high cost of green technologies, and the complexity of adapting to new regulations.

In addition, the chapter will look at the strategies and practices that Finnish companies are using to reduce the environmental impact of logistics processes. It will show how companies are using innovative solutions such as electric vehicles, sustainable packaging, and smarter supply chain management to make their operations more environmentally friendly.

This overview will give an understanding of how Finnish companies are changing their logistics operations to meet environmental goals.

3.1 Current state of logistics operations in Finland and their environmental impact

Accessible and effective logistics services are essential for regions and businesses in order to stay competitive. As a result, logistics is crucial to a business's competitiveness. Costs, timely delivery, and efficiency all of these have an impact on how well companies serve their clients and how profitable their operations are. Compared to their competitors, Finnish companies have had higher logistics costs in recent decades. According to a logistics survey in 2018, Finnish logistics costs with GDP were around 11.2 percent, which internationally is a high number. Because of Finland's geographic distance from the major markets and EU nations, the logistic costs of heavy industries, such as the metal and forest sectors, are higher than those of the pharmaceutical sector. But when logistics companies, their customers, and the government work together, there is much more opportunity for improvement (Logistics – Logistiikan Maailma, 2021).

Finland's industries rely mostly on exports, because of the country's small domestic market and geographic location. Many Finnish companies operate in international markets, making efficient logistics systems essential for success in this sector. To stay competitive, important export-dependent industries like paper, chemicals, and machinery must reduce transportation costs and delivery times. For instance, it takes at least three to four days for shipping goods from Northern Finland to Central and Western Europe, demonstrating the challenges with logistics that companies face. These delays can increase costs, reduce delivery reliability, and impact customer satisfaction and competitiveness. In addition, logistics operations in northern and eastern Finland are complicated by cold winters and long distances (Finland - Market Overview, 2023).

As the foundation of the regional economy, Northern Finland has been internationally recognized for its growing industries, which include mining, forestry, metals, and chemicals. The importance of services, especially tourism, has increased significantly over time. Many critical industrial manufacturing facilities are strategically located along the Bothnian Sea coast, which is valuable because it places them close to sea-based logistical connections allowing for easier exports and transportation. However, as traditional industries are undergoing significant restructuring, particularly in the forestry sector, there has been a visible transformation in the region’s industrial focus (Special Features of Forestry in Northern Finland | Metsähallitus).

The energy industry is growing strongly in northern Finland. The construction of a nuclear power plant in Pyhäjoki will increase the logistical needs during construction. The growth in bioenergy use (the potential Kemi biodiesel plant and Rovaniemi power plant), if implemented, will have a significant impact on raw wood flows and increase the transport needs for energy wood. The transport of energy will also affect the lower road networks (Hanhikivi 1 Nuclear Power Plant, Pyhajoki, Finland, 2019).

Construction of new wind farms will increase specialized and other transport needs, especially during the construction phase. Big wind turbine players like Vestas are continuously growing their share of wind energy construction in Finland impacting the logistical roots with the transportation of heavy components (Plant & Energy Solutions, Vestas).

Tourism in Finland is expected to increase significantly. Foreign travel has the biggest potential to boost tourism in Northern Finland, which will raise demand for air travel as well as for road and rail travel. As the number of tourists increases, transportation services to popular tourist places will become more and more crucial. According to Statista, the Travel & Tourism market is expected to see a significant rise in revenue, with estimates that it will reach US$3,392.00m by 2024 (Statista, 2024).

Going back to the metal and forestry industries, it can be noted that the forest industry in Finland is the main source of wealth for the country. According to statistics published by the Finnish Forest Industries Federation, the share of forest industry exports varies from 97% to 48% depending on the product category. In 2023, the value of forest industry exports was 12 billion euros, 27% of which was cardboard exports. The share of paper and pulp was about 20%, and the share of sawn timber was about 15% (Forest Industry in Finland - Maa- Ja Metsätalousministeriö).

In Finland, the logistics market is consolidating as large organizations grow and smaller companies exit, offering complex logistics solutions to meet complex customer requirements. Regional differences exist despite generally well-functioning transport services, especially in rail transport, which remains highly monopolized and affects the competitiveness and diversity of services (Business Finland, Efficient logistics boost your business, 2020).

Despite the competition, the road transport industry faces difficulties like low profitability and growing fuel and energy expenses. Small businesses, which are more common in smaller cities, face significant competition from both domestic and foreign businesses as well as cost pressures. The local market has been impacted by the rise in shipping transport, which takes advantage of Finland's lower cost structure. The industry also faces a labour shortage (Three-quarters of Finnish Firms Affected by Labour Shortage, Reveals Survey, 2021).

In Finland, rail transportation is challenging due to monopolistic systems, high labour costs, and low competition. Due to the operator's current concentration on full train services, smaller shipments are now more expensive and are transported by road. Even with the latest legislation focused on liberalizing rail transport, only a small number of companies, like Proxion Oy and Ratarahti Oy, demonstrate the ability of competition. This could improve service diversity and lower costs. Rail freight service levels are decreasing, especially in northern Finland, because of investments in rail infrastructure that are primarily focused on passenger transportation (Digirail - Pursuing the European Lead in Rail Transport - Ministry of Transport and Communications, 2021).

The logistics industry in Finland has a significant impact by EU environmental policies, especially those related to reducing emissions and environmentally friendly transportation methods. By 2050, the European Commission wants to reduce CO2 emissions from transportation by 60% compared to 1990 levels. Maritime transportation is also regulated by strict regulations regarding the environment implemented by the International Maritime Organization (IMO), particularly with relation to emissions in Sulphur Emission Control Areas (SECAs), which include the Baltic Sea. Starting from 2015, ships operating in these zones must use low-sulfur fuel, liquefied natural gas (LNG), or sulfur scrubbers to reduce emissions. This regulation is expected to increase sea freight costs by up to 50%, potentially affecting international trade in northern Finland and the competitiveness of Finnish imports and exports. Transportation routes could

potentially be redirected to the Baltic Sea (European Commision, Reducing Emissions from the Shipping Sector).

In conclusion, this chapter has explained that the logistics industry in Finland is influenced by various factors, including geographical location, export dependence and the regulation in legal policy. Finland's logistics costs are higher compared to other countries, especially due to the long distances from the main markets and its industries such as forestry, metallurgy and chemicals. In addition, there are large regional differences in transportation services, northern Finland facing specific challenges due to cold weather conditions and limited infrastructure. Finnish logistics operations are also under pressure from environmental policies implemented by the EU, which aim to reduce emissions and promote sustainable transportation methods. The competitiveness of Finnish exports may be affected by these regulations, which are crucial for minimizing environmental effects but also expected to increase costs, especially for sea freight. Despite these challenges, there is potential for improvement. Finland's logistics sector is consolidating, with large companies offering integrated solutions to meet customer needs. Liberalization efforts in the rail transport market, focus on renewable energy development and restructuring of traditional industries may offer new opportunities to improve logistics efficiency and reduce environmental impact in Finland.

3.2 Challenges faced by logistics operations in Finland

The environmental impact of logistics can be estimated using several types of indicators. The energy efficiency of logistics can be calculated by comparing the consumption of energy with the number of goods transported and the amount of distance traveled (Green Logistics – Logistiikan Maailma).

“Doing more with less” is the definition of eco-efficiency. For example, material efficiency aims to improve transport performance through less energy

consumption and lower emissions. Finland's transport network includes infrastructure for road, rail, water, and air transport, and is part of the trans-European network. The transport network is 454,000 kilometers long, including 78,000 kilometers of public roads, 26,000 kilometers of streets, and 350,000 kilometers of private and forest roads. There are about 880 km of highways in Finland, 55,000 km of national and municipal roads, and 41,000 km are low-use roads. The railway network is 5,944 km, more than half of which are electrified. The Finnish route is highly rated by Western European companies for its simple, reliable, and minimal freight loss compared to other routes. Finland has direct rail connections to Russia and rail connections to Sweden and Germany, as well as direct freight connections to Russia and Sweden. Ferries also carry lorries to Sweden, Estonia, Poland, and Germany (TEN-T Networks - Finnish Transport Infrastructure Agency, 2023).

As we have already identified in chapter 3.1, Finland's geographical position in the EU is logistically challenging due to its distance of about 2,000 kilometers from Central Europe, which creates additional shipping time and costs for Finnish companies compared to their Central European competitors. On the other hand, Finland's geographical position also offers opportunities for increasing international air traffic, especially intercontinental air traffic, as Finland is the shortest and fastest route from Western and Central Europe to Japan and from the East Coast of America to the Far East. Helsinki-Vantaa Airport is used as a center for long-distance flights (Enabling the Most Extensive Expansion in the History of Helsinki-Vantaa Airport).

Over the past few years, Finland has faced significant migration to growth centers, as a result that people have moved to areas with better work opportunities due to successful industrial companies and offices. This has increased the average walking distance, and more than 25% of working Finnish citizens have a workplace outside their municipality. This is because of the improving mobility of Finnish citizens: investments in road infrastructure and automobilization have increased the

distances between home, work, shopping, school, and hobbies. This has created a problem in sustainable development, due to the mobility of modern society (Helamaa, 2021).

In summary, a well-developed and effective transport network in the country, which includes road, rail, sea, and air transport, is the foundation of its logistics operations. Despite this, Finland's geographical location creates specific challenges, such as higher transport costs and longer delivery times for exports to Central Europe. At the same time, Finland uses its position as a strategic center for intercontinental air transport, offering faster connections between Europe, Asia and America. Population migration to the centers of urban growth has increased the need for sustainable logistics strategies. Increased automobilization and road infrastructure investments are responsible for longer commutes between cities, which lead to environmental problems. Achieving sustainable development goals is dependent on eco-efficiency principles, such as minimizing energy use and transportation-related emissions. Collaborating between government, industry and society will be crucial for all to solve these problems.

3.3 Evaluation of strategies and practices adopted by Finnish companies to reduce the environmental impact of logistics processes

The adoption of sustainable logistics practices by Finnish companies has been motivated by both factors, external factors such as government regulation and global sustainability goals, and internal factors, such as cost efficiency and innovation. Finnish companies have applied several strategies to reduce the environmental impact of logistics operations, focusing on key areas such as transport, energy use, and circular economy practices. This chapter will evaluate the effectiveness and challenges of these strategies and look into cases from Finnish companies.

A significant development in Finland's logistics industry is the move towards electrification of transport, especially road and sea transport. Companies such as

Posti, Finland's national postal service, are among the leaders in electrifying their vehicles (Posti, 2024).

Companies are looking to reduce their carbon emissions by investing in electric vans and exploring alternative fuels for long-distance freight transport. However, despite the environmental benefits of switching to electric trucks and vans, the rapid adoption of electric vehicles (EVs) faces challenges related to infrastructure, battery technology, and the need for an extensive charging network. Finland significant increase in the numbering of EV charging stations in 2022 (Finland Receives EU Funding to Expand Electric Vehicle Charging Network, 2023).

Sustainable logistics reduces waste, costs, and CO2 emissions. This has a positive impact on the company's reputation in the global marketplace. Today, companies that are committed to sustainability attract more attention and deserve respect in society. Companies with sustainable supply chains and green logistics are attractive to partner companies.

Customers want to know where products come from and how environmentally friendly, they are transported. Those who offer transparency in their logistics operations attract more new customers and secure their long-term loyalty.

In the future, only those who focus on eco-operational performance and cost efficiency and minimize their ecological footprint will be in front of the competition. Companies that provide sustainable logistics increase their attractiveness as employers.

With the growing focus on environmental challenges, green logistics is becoming a key element of corporate strategies. The fundamentals of green logistics include reducing emissions, using resources efficiently, and minimizing carbon footprints. These practices not only indicate environmental compliance but also represent a strategic investment in the future of businesses.

Supply chain optimization is crucial for successful green logistics. That's why transport companies need to identify and implement strategies to make their supply chain more sustainable: measuring the carbon footprint of transport, selecting suppliers that follow environmentally friendly practices, reducing transport distances, or integrating technology to improve tracking and reduce errors. Optimized supply chain is not only good for the environment, it can also reduce costs and increase productivity.

The use of sustainable packaging is another key green logistics strategy. This will not only reduce the amount of produced waste but also help create a responsible brand image. For companies switching to green packaging first will require a big investment, but the long-term environmental and economic benefits will be significant.

4 CONCLUSION

In conclusion, the aim of this research is to provide a better understanding of the environmental challenges faced by Finnish companies and finally to identify effective strategies and methods to improve the environmental sustainability of logistics operations. As discussed earlier, green logistics is not only about dealing with emission targets and standards but also includes environmental and economic efficiency that creates sustainable corporate value.

Green logistics refers to the implementation of environmentally friendly practices and strategies in the logistics industry. The main goal of green logistics is to

minimize the negative environmental impact of logistics activities while improving the efficiency and profitability of supply chains.

Today, all companies are looking to reduce the environmental impact of their logistics. To achieve this, they need to move towards green processes. This is what is known as sustainable logistics. It applies to all parts of the supply chain, from managing production to managing storage, packaging, and transportation.

Reducing the ecological footprint is a key goal of green logistics. Each stage of the logistics process, from production to delivery, provides opportunities to reduce environmental impact. This can be achieved by implementing low-emission vehicles, using renewable energy sources or implementing route optimization processes to reduce fuel consumption. Optimizing logistics processes, not only helps to protect the environment, but also increases the profitability of Finnish companies. By planning routes for cargo delivery using innovative software tools, it is possible to plan more fuel-efficient routes and combine transportation needs, therefore reducing transportation emissions.

The impact of environmental policies, especially from the European Union, is also crucial for Finnish logistics operations. As the European Union aims to reduce transport-related emissions by 60% by 2050, Finnish companies must implement strict emission regulations, especially in maritime transportation, where regulations like those implemented by the International Maritime Organization (IMO) increase costs and affect international trade routes. Even so, Finnish companies are looking they ways how to improve their environmental performance through a variety of strategies. An increasing shift towards electrification, supply chain optimization, use of alternative fuels and adoption of circular economy practices shows the country's commitment to reducing its environmental impact.

However, challenges in achieving fully sustainable logistics practices still exist in Finland. High fuel costs, labour shortages and monopolistic practices in the rail transport sector continue to the impact on efficiency of Finland's logistics operations. In addition, vehicle electrification is on the increase level, the required infrastructure to support electric vehicles (EVs) is still developing in Finland, and the transition to renewable energy in the transport sector still faces serious challenges.

The use of sustainable packaging is another key strategy for green logistics and companies such as Woodly, Paptic, and Sulapac are playing a big part in the development of the Finnish packaging industry.

Solving the challenges of high logistics costs, lack of infrastructure and environmental regulations is key to ensuring a sustainable future for Finland's logistics industry and for all Finnish companies. Continuing to invest and improve innovation in green technologies will allow Finnish companies to reduce their environmental footprint and save competitive in the global marketplace.

The future of Finnish logistics is a future where sustainability and efficiency in the industry go together and also not only benefit the business, but also society and the environment as well.

4.1 Limitation

This thesis has only used data on Finnish logistics companies and their sustainable logistics practices. The first limitation is that the research methods focus only on Finnish logistics companies. Finland is an example for many other countries because of its commitment to sustainable development, but the results may not be applicable to other countries.

Another limitation is that this thesis has used a secondary research method, which means collecting and using existing literature, reports and sources from publicly

available websites, books, research papers, etc. This method has the advantage of collecting data in a short period of time, but not all sources provide up-to-date statistics or analysis. For this reason, some results may be based on outdated information, which may affect the results regarding the current strategies and practices used by Finnish companies.

Making conclusions about sustainable logistics, it is possible to notice how sustainable practices and methods are changing every year and how this sector is developing. The methods and practices that Finnish companies have adopted in their logistics operations can become outdated over time.

The limited access to different statistical data has made the research more complicated, as most websites are not publicly available and Finnish companies do not often publish their sustainability strategies.

4.2 Recommendations for further research

This research focuses on the strategies and practices used by Finnish companies to improve the sustainability of their logistics operations and how to be eco-friendly. In order to deeply understand the sustainability in logistics, it is recommended to use a different research method in future research.

A better way is to use primary data such as surveys of Finnish companies and interviews with employees in the industry, for example, logistics managers or coordinators. Through direct communication with managers, it is possible to get a personal opinion about the problems and challenges that companies face in reality.

The practice of sending out a large number of questionnaires and surveys to all Finnish companies will help to evaluate the behavior and practices related to the implementation of sustainable logistics.

An important recommendation for further research is to focus on a specific sector, for instance on sustainable packaging or how supply chains trying to be optimized. Through a detailed analysis of a specific topic, it is possible to find out the strategies that apply specifically to that area.

Further research on the topic of sustainable logistics and the methods and practices used is possible through case studies of logistics companies. The experience of companies that have already implemented green initiatives in their logistics operations can be used as an example of the implementation of successful practices in other companies. This will not only allow other Finnish companies to apply these methods but also allow them to share these practices on a global level.

The recommendations suggested above are aimed to understand the importance in today's world of studying the concept of sustainable logistics. Secondary data that are collected through book reviews, websites, and existing reports provide an understanding of basic theoretical concepts, but they do not provide a real understanding of the challenges in companies.

The research doesn’t have primary data, interviews and questionnaires with company employees can provide a clear understanding of the real implementation of strategies in logistics operations. In the future, the research will help Finland to progress in sustainable development and to be recognized in the global market.

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