

**PATHWAYS TO NET ZERO: A COMPARATIVE STUDY OF  
CLIMATE GOALS AND STRATEGIES OF PROMINENT FINNISH  
COMPANIES**

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**ABSTRACT**

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Title Pathways to Net Zero: A Comparative Study of Climate Goals and Strategies of Prominent Finnish Companies.	
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<p>Abstract</p> <p>With the global push for carbon neutrality gaining momentum, it is crucial to understand the strategies and actions taken by companies to set and achieve their climate goals. The objective of this research is to document and compare the climate pathways of nine prominent Finnish companies using the foundation framework of Science Based Targets initiatives (SBTi) as a conceptual framework. The companies are Nordea Bank, Sampo, Nokia, Fortum, Neste, UPM-Kymmene, Stora Enso, Kone, and Kesko. The study also aims to investigate the role of offsetting in the companies' climate goals. The study begins with a background discussion on carbon neutrality and its significance in addressing the challenges posed by climate change. The research questions driving this study aim to explore the measures adopted by the companies, the scope of these measures, reporting frameworks, and sustainability governance incorporated to achieve their climate goals. Data was systematically collected from company sustainability and annual reports. The data analysis employed a theory and content-driven analysis approach, allowing for a comprehensive examination of company actions, reasoning, and logic in climate goal setting. The collected data was compared against the SBTi foundation framework, which offers a rigorous set of requirements and validation protocols for comparing the quality and transparency of climate goals. The main results of the study showcase the diversity of climate objectives and pathways adopted by the selected companies and shed light on the role of offsetting in company climate goals. These companies demonstrated a comprehensive approach to addressing climate change by actively contributing to the global transition towards a net-zero economy. Furthermore, the study investigated the reporting mechanisms and governance structures implemented by the companies. The involvement of companies in carbon offsetting initiatives was examined to understand their relevance to achieving climate goals. Overall, this research contributes to understanding the climate goals of prominent Finnish companies in the context of carbon neutrality and net zero. The findings highlight the strengths and weaknesses of the climate objectives of Finnish companies and their alignment with the Paris Agreement. The qualitative research approach employed in this study enabled a comprehensive exploration and comparison of the climate goals, shedding light on their contributions to the transition towards a sustainable future.</p>	
Key words: Net zero, Carbon Neutrality, Science Based Target initiatives (SBTi), Finnish Companies.	
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**TIIVISTELMÄ**

Tekijä	
Työn nimi	
Oppiaine	Työn laji
Päivämäärä	Sivumäärä
Tiivistelmä	
Asiasanat	
Säilytyspaikka	

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# 1 INTRODUCTION

## 1.1 Background of the Study

Carbon neutrality refers to the state where net carbon dioxide emissions from human activities are equal to zero (IPCC, 2018). It involves achieving a balance between the amount of carbon emissions produced and the amount removed from the atmosphere to dampen the consequences of climate change. The concept has gained prominence in recent years as countries, cities, and corporations commit to reaching net-zero emissions in the near future (Chen, 2021). Carbon neutrality can be achieved through various means, including reducing carbon emissions and removing carbon dioxide from the atmosphere (Reay et al., 2013). Reducing carbon emissions can be accomplished through measures such as using energy-efficient technologies, clean energy sources, and resource conservation, while removing carbon dioxide from the atmosphere can be accomplished through activities such as afforestation, reforestation, and carbon capture and storage (IPCC, 2018). The amount of greenhouse gases in the atmosphere has increased as a result of anthropogenic activities, primarily due to the combustion of coal, natural gases, and fossil sources, which has contributed to global warming and its associated impacts, including rising sea level, uncommon weather patterns, and water and nutrition scarcity (IPCC, 2014). In light of this, achieving carbon neutrality is seen as a means of mitigating these impacts and avoiding the worst effects of climate change. Keeping global warming below 1.5 °C - 2 °C above pre-industrial levels was acknowledged as an absolute necessity in the Paris Agreement, thus creating a heightened awareness trend among several countries and businesses to curb their emissions (COP26, 21).

This awareness has over time translated into more serious and strategic planning (Wu et al., 2022) and has manifested in the form of climate goals and net zero targets. A journey towards a net zero economy adopted in the Paris Agreement in 2015 has been ratified by over 150 members of the United Nations Framework Convention on Climate Change (UNFCCC). In addition, it has also been widely recognized and accepted by businesses, investors, and civil society organizations as a necessary step in securing a sustainable future (Wang et al., 2018).

Over 5000 companies have committed to taking some form of climate action, while 1800 companies have set a range of targets with the aim of achieving net zero emissions (SBT, 2023). Countries including France, Sweden, and Denmark, along with several member countries of the European Union, including Finland, have already set comprehensive plans in the form of policies, regulations, and commitments to achieve net zero emissions in accordance with the Paris Agreement (Fominova, 2022). The Ministry of Environment in Finland has



formulated a plan to achieve carbon neutrality and become the foremost fossil-free welfare society by the year 2035 as part of their climate objectives, which include reductions in greenhouse gas emissions across all industries and bolstered carbon sequestration capabilities (Ministry of the Environment, 2022).

Since our current reliance on fossil fuels is unsustainable and carbon neutrality is a reliable answer to our energy problems, there is a desperate need to take immediate action to reduce carbon emissions and develop viable alternatives, and the growing focus as a solution to this problem has presented itself in the manner of carbon neutrality (Chen, 2021). The importance of achieving carbon neutrality has been reaffirmed as a significant component in the effort to combat climate change (IPCC, 2018). The global push for carbon neutrality is a symbol of progress and an urgent attempt to avoid the serious repercussions of global warming. Reaching a net-zero emissions scenario holds significant importance for various reasons. Initially, it can assist in mitigating the consequences of climate change by restricting the quantity of greenhouse gases present in the atmosphere (Kirkby, 2019). The achievement of carbon neutrality can contribute to the deceleration of global warming and subsequently mitigate the hazards posed to our ecosystems and food systems (IPCC, 2014). This can be accomplished through the reduction of emissions and the extraction of carbon dioxide from the atmosphere. Furthermore, investing in clean energy sources and energy efficiency measures can aid in the promotion of sustainable development and economic growth, which, according to the International Energy Agency (2017), will open up new gateways for job opportunities and provide room for the promotion of green technologies, which will help in the promotion of biodiversity and the protection of ecosystems through investment in climate goal-setting initiatives (UNEP, 2017).

In reaching a net zero state, which could be a monumental stride toward halting the damage being done to our environment, we need to bring the level of emissions down to the pre-industrial level (Tollefson, 2017). Though carbon neutrality has umpteen benefits in our fight against climate change, it is not a one-shot solution to the problem. Chen (2021) refers to the requirement of positive carbon solutions in addition to initiatives and programs designed to avoid and remove emissions. To reach a state of zero emissions, there is urgency to replace our current sources of energy with renewable energy sources, capture, extract, store, and utilize anthropogenic CO<sub>2</sub>, reuse solid wastes, reduce energy consumption, increase energy efficiency, and increase carbon sinks in land and ocean. The aim is to make renewable sources of energy such as solar, biomass, wind, hydro, geothermal, and tidal as inexpensive as fossil fuels while improving the industrial processes of carbon capture, removal, and storage, which have the potential to play a major role in the achievement of a net zero state (Chen, 2021). Chen (2021) states carbon neutrality as the next phase of the industrial revolution, the article paper highlights the success of the previous industrial revolutions in

context to our reliance on natural resources and the use of fossil fuels, which ultimately lies at the heart of the problems in the human-nature connection.

Achieving a carbon-neutral state necessitates the use of different pathways. One way to reduce carbon emissions is to use clean energy sources, like wind and solar power, to make buildings use less energy (IEA, 2017). The International Energy Agency (IEA) says that energy efficiency measures alone could account for more than 40% of the emissions reductions needed to reach carbon neutrality by 2060. (IEA, 2017). Another way is to put money into afforestation and reforestation, which means planting trees to take carbon dioxide out of the air (UNEP, 2017). A study by Fuss et al. (2018) found that afforestation and reforestation could help cut emissions by up to 25%, which is needed to meet the Paris Agreement's 1.5°C goal. Carbon capture and storage (CCS), a process of taking carbon dioxide from industrial processes and putting it underground or in other long-term storage facilities, is a pathway to achieving a carbon neutral state (IPCC, 2018).

Attaining a carbon-neutral or net-zero state comes with a number of obstacles. The significant technological cost combined with the changing operational structures and practices needed to cut emissions and remove carbon dioxide from the environment is one of the major hurdles (Fuss et al., 2018). There are substantial upfront expenses connected with creating new technologies like CCS, and afforestation and replanting can be costly as well (IPCC, 2018).

## **1.2 Significance and Objectives of Study**

The Intergovernmental Panel on Climate Change (IPCC, 2018) places significant emphasis on the reduction of global emissions and decarbonization as crucial components in the battle against climate change. Setting climate goals is therefore regarded as a strategy for mitigating and preventing the most severe consequences of climate change. In order to effectively implement measures that align with the Paris Agreement and achieve more ambitious objectives, it is crucial for companies to prioritize the quality of their climate targets (COP26, 2021). This has resulted in widespread adoption of net zero standards such as the Science Based Target Initiatives among various business entities, which is a key objective of the United Nations' Race to Zero campaign (UNFCCC, 2021).

The global push for net zero and carbon neutrality is a symbol of progress and an urgent attempt to avoid the serious repercussions of global warming. To reach a net zero state, which represents a significant step towards mitigating the environmental harm being inflicted on our planet (Tollefson, 2017), there is an increasing amount of pressure on all global actors, which includes business entities and corporations. This pressure has created a growing relevance for

adopting climate goals in the form of net zero goals, carbon neutrality, net positive, et cetera, from the point of view of companies, and their choices in setting these goals are being closely monitored. Even though various corporations and businesses have pledged and committed to achieve net zero emissions to curb warming to 1.5 C above pre-industrial levels, there is no one clear pathway to realize it. There is a common understanding that reaching the aforementioned state will require setting targets according to climate science and also adhering to regulations and policies to reflect transparency. The burden of achieving this goal is particularly pressing for wealthier nations and companies, which must take significant steps to rapidly transform their objectives into actions and eliminate their dependency on fossil fuels while also assisting emerging economies with technology and financial resources (COP26, 2021).

In the course of this research, the global shift towards achieving net zero emissions, as perceived by nations and companies, is examined and discussed. Additionally, this study aims to comprehend current carbon management tactics and the impact of carbon markets, while also exploring emerging trends in the field.

### **1.3 Research Questions and Methodology**

This study will take a closer look at the Science Based Target initiatives (SBTi) as a conceptual framework for comparing and classifying the climate goals and pathways chosen by different Finnish companies. Science Based Targets initiative (SBTi) has been at the forefront of converting climate science into a structure that enables corporations to establish ambitious climate objectives. This framework enables impartial evaluation of climate goals and targets using a rigorous set of requirements and transparent validation protocols (Carrillo Pineda et al., 2020).

The objective of this study is to document the net zero trajectories adopted by prominent Finnish corporations and tabulate their strategies against the framework provided by the foundation paper on Science Based Targets (Carrillo Pineda et al., 2020). The objective is to document company actions, their reasoning, and their logic in climate goal setting. With increasing numbers of companies adopting net zero targets, there is a need to address the attitude with which these goals are being set. In addition to documenting climate goals, other aspects such as sustainability governance, reporting mechanisms, and carbon compensation measures have been recorded as well. In order to compare the results against the SBTi framework, it was necessary to study and collect this data to answer the following research questions:

1. What are the climate objectives and pathways of prominent businesses in Finland? This question will entail an examination of the various measures

adopted by companies, the scope of such measures, the reporting framework, and sustainability governance to achieve their climate goals.

2. What role does offsetting play in this? This question seeks to understand the relevance of compensation schemes in the climate goals and pathways of the chosen businesses.

Nine prominent Finnish businesses have been chosen to this end, and the data was systematically collected from sustainability reports and annual reports of companies and analyzed using theory and data-driven content analysis.

## **1.4 Flow of Discussion**

The study commences with a comprehensive examination of existing literature and a theoretical framework to guide the research. The initial segment of the theory provides an overview of the broader context, followed by a gradual progression towards the conceptual framework used to answer the research questions. The literature review commences with a broad discourse on carbon neutrality, subsequently discussing carbon neutral pathways and sector-specific examples, followed by the function of carbon compensation markets within the context of climate goals and overall climate strategy. This approach facilitates the examination of climate goals within the context of net zero and carbon neutrality. This framework offers a basis for comparing the varying strategies employed by Finnish companies in relation to climate compensations.

Following the general theoretical framework, the emergence and use of net zero standards are elaborated. This part offers a deeper, more detailed understanding of Science Based Target initiatives (SBTi), alongside a concise introduction to the guiding principles, logic, and structure followed by this framework. This chapter plays a crucial role in the analysis as it illustrates the rationale behind various net zero standards and the decision in selecting the SBTi framework.

The subsequent chapter entails a presentation of how data has been systematically collected from sustainability and annual reports, as well as outlining the choice of content analysis as a method of data analysis. Following the methodology, the study proceeds to present the results, leading to the closure of the study with conclusions.

## 2 CONCEPTUAL FRAMEWORK

### 2.1 Realizing Carbon Neutral Pathways

This section delves into the various measures and approaches that can be adopted as climate goals in order to achieve a carbon neutral or net zero state. The text highlights the categorization of net zero strategies into reduction and removal strategies, demonstrating the imperative for optimizing both mitigation and adaptation efficiencies. The discourse surrounding setting climate targets emphasizes the integration of mitigation and adaptation as the preferred approach to combating climate change. The section also emphasizes the importance of policies and regulations, including low carbon policies, taxation, carbon markets, and targeted regulations, in setting climate goals. Furthermore, sector-specific pathways in the energy sector and carbon capture technologies are documented to explore the current dialogue and gain a broader understanding of mechanisms and structures. This chapter lays elemental knowledge for understanding and comparing the carbon-neutral trajectories of Finnish companies. It provides a conceptual framework by discussing carbon neutrality, its importance, methods to achieve it, and the challenges involved.

The literature highlights the division of net zero strategies into two main approaches, namely reduction strategies and removal strategies (Chen et al., 2022). The former involves transitioning to renewable fuels, adopting low-carbon technologies, and enhancing energy efficiency, while the latter involves increasing carbon sinks and deploying technologies such as Carbon Capture and Storage (CCS) and Carbon Capture, Usage and Storage (CCUS). These two approaches fall under the broader category of mitigation strategies aimed at reducing carbon emissions. In recent years, there has been a growing recognition of the need to also adapt to the realities of climate change. This involves building resilience and flexibility into our infrastructure and frameworks. Historically, adaptation and mitigation were treated as separate approaches to addressing climate change, but the understanding among policymakers has shifted towards combining these two strategies for more effective outcomes (Chen et al., 2022).

In their review on carbon pathways, Chen et al. (2022) highlights the negligence of adaptation strategies, as frequently policymakers are centered on the challenge of eliminating emissions through reduction and removal efforts. In the same review, the many reasons for deviation in strategy are credited to inadequate monetary resources, a limited multi-disciplinary approach, and insufficient accountability measures. Thus, mitigation strategies, including reduction and removal strategies, are crucial for achieving net zero targets. Additionally, the need for adaptation strategies that build resilience and flexibility into our systems

has gained recognition as a critical aspect of addressing climate change. The integration of both mitigation and adaptation strategies is emerging as a preferred approach to combating climate change.

In figure 1, Chen et al. (2022) illustrates the synergy that can be achieved from specific action paths across different sectors of the economy. The utility of the listed solutions relates to being resilient to change and reducing or eliminating carbon emissions.



Figure 1 Synergy between mitigation and adaptation in different pathways. (Chen et al., 2022)

The integration of mitigation and adaptation strategies is essential for effective climate change management. A key element in achieving this integration is an understanding of the interconnectedness between these two approaches. Reducing emissions can limit exposure to climate change-induced problems (Zhao et al., 2018), while an approach that combines both mitigation and adaptation must be carefully planned to avoid any negative impacts on either approach (Chen et al., 2022). It is therefore the responsibility of regulators and policymakers to conduct a comprehensive evaluation of such collaborative strategies to increase awareness of any adverse consequences that may arise. This holistic approach to climate change management requires a thorough understanding of the interactions between mitigation and adaptation and a careful evaluation of potential impacts before implementing any strategy.

On the road to net-zero, the policies and regulations undertaken and implemented in the form of reporting and governance by companies are paramount to their progress, Chen et al. (2022) strongly affirm the implementation of low carbon policies in the form of taxation, establishing carbon markets, and targeting regulations based on the analysis of regional and national paradigms.

## **2.2 Examples of sector specific pathways**

The following sub-sections will look at pathways concerned with the energy sector and carbon capture technologies, including the role of policies and governments, while also factoring in the issue of mitigation and adaptation in the way these pathways have been formulated. As an example, the dialogue in the Energy sector and Carbon Capture Technologies has been documented because the former sector is facing increasing global pressure given the use of fossil resources, a major source of anthropogenic emissions, and the transition to renewables plays a significant role in global climate goals. The latter has been recorded as it represents novel technologies being adopted by global actors, including Finnish companies, in their missions to achieve climate goals.

### **2.2.1 Energy sector**

The energy sector is one of the most significant contributors to global emissions. While the production process in the energy industry is undoubtedly a major contributor to global emissions, it is important to acknowledge that the demand for energy is continuously growing. As we transition towards alternative sources of energy that have low-carbon, renewable characteristics, it is essential to focus on efficient usage. This would entail both technological and tactical changes to ensure effective patterns are followed throughout the lifecycle of energy production and usage (Fawzy et al., 2020).

Mitigating emissions and achieving neutrality in the energy sector requires long-term vision and strategies that promote sustainable energy usage and energy-saving technologies (Chen et al., 2022). It is crucial to prioritize not only the transition to renewable sources of energy but also to ensure that energy is used efficiently to minimize emissions and meet sustainability targets (Tollefson, 2017). Therefore, policymakers and industry leaders need to work together to implement comprehensive and effective strategies that prioritize both sustainable energy production and efficient usage (Broekhoff, 2022).

In order to meet the goals of the Paris Agreement, there is a need to transition away from traditional energy sources, primarily those based on oil and fossil fuels, to low-carbon or renewable energy technologies. However, progress

towards achieving these goals is hindered by the anxiety and fear surrounding the potential consequences of climate change, and the lack of prompt economic benefits is a concern for many monetary institutions and businesses alike.

The implementation of cost-effective technologies is crucial to enabling a shift in the energy sector towards sustainability, and policymakers play a central role in facilitating the necessary frameworks and structures to support a green transition (Broekhoff, 2022). In order to achieve the necessary progress, policymakers must prioritize the development of supportive policies and incentives for the adoption of sustainable energy technologies. This may include initiatives such as regulatory reporting for businesses, subsidies for research and development, and general frameworks that promote sustainable practices. Furthermore, there is a need to enhance public awareness and engagement in sustainable practices, including the adoption of renewable energy technologies. This can be achieved through the development of public awareness campaigns, education and outreach programs, and the promotion of public-private partnerships to foster collaborative action towards achieving net zero goals (Chen et al., 2022). Policymakers must prioritize the development of supportive frameworks and incentives to enable the adoption of sustainable technologies while also promoting public awareness and engagement in sustainable practices. This will require collaborative action from governments, businesses, and individuals alike to achieve a sustainable and prosperous future.

### **2.2.2 Carbon Capture Technologies**

Carbon Capture Utilization is a novel technology that involves the extraction and absorption of carbon emissions from the atmosphere or directly from certain carbon-intensive operations (Wilberforce et al., 2021). The captured carbon is then piped to underground storage areas, where it remains safely stored for a prolonged period of time (Wilberforce et al., 2021). Alternatively, the captured carbon can also be used in certain manufacturing processes. While this technology provides a means to remove CO<sub>2</sub> gases, it also encourages the continued usage of fossil-based fuels (Chen et al., 2022). The implementation of Carbon Capture Utilization technology presents potential benefits for mitigating the negative impacts of carbon emissions on the environment. By capturing and storing carbon emissions, this technology has the potential to significantly reduce the amount of CO<sub>2</sub> gases released into the atmosphere (Wilberforce et al., 2021). Moreover, the use of captured carbon in manufacturing processes has the potential to provide a sustainable and cost-effective source of carbon (Chen et al., 2022). It is important to note that the implementation of this technology also has its limitations and drawbacks. While it may reduce the amount of carbon emissions released into the atmosphere, it does not address the root cause of the issue, which is the continued usage of fossil-based fuels. Furthermore, the implementation of this technology may be cost-prohibitive, and its efficacy in



reducing carbon emissions remains subject to further research and development (Chen et al., 2022).

While Carbon Capture Utilization technology provides a potential means for mitigating the negative impacts of carbon emissions, its implementation should not be viewed as a substitute for a broader shift towards sustainable and renewable energy sources (SBT, 2023). Rather, it should be viewed as a complementary approach to reducing carbon emissions, in conjunction with broader climate goals aimed at reducing our reliance on fossil-based fuels. The potential of Carbon Capture Utilization (CCU) and Carbon Capture Utilization and Storage (CCUS) as means to cut emissions from carbon-intensive sectors has been a topic of interest in both research and academia (Chen et al., 2022). Certain industries, such as the oil and petroleum manufacturing sectors, have shown a growing interest in this avenue (Hodgson, 2023). The implementation of CCU and CCUS technologies has been met with opposition from some actors due to concerns that it promotes the continued exploitation of fossil resources (Hodgson, 2023). These concerns stem from the fact that the implementation of CCU and CCUS technologies does not address the root cause of the issue, which is the continued usage of fossil-based fuels.

While the use of CCU and CCUS technologies may provide short-term benefits in terms of reducing carbon emissions from certain sectors, they should not be viewed as a substitute for a broader shift towards sustainable and renewable energy sources. Rather, they should be viewed as a complementary approach to reducing carbon emissions in conjunction with broader initiatives aimed at reducing our reliance on fossil-based fuels.

## 3 CARBON NEUTRAL PATHWAYS

### 3.1 Countries

Over the last decade, international agreements have emphasized the significance of limiting global warming to a range of 1.5°C - 2°C (COP26, 21). Various countries have committed to these agreements; however, the net zero pathways adopted by nations differ not only on a national level but also vary regionally (Chen et al., 2022).

As countries strive to accomplish the aims of COP 21 (Paris Agreement) by actualizing net zero throughout their economic activities either by removing or reducing carbon emissions, their efforts to do so will have to be reflected through economic, environmental, and social actions (Chen et al., 2022), and initiatives would have to be implemented differently based on certain established structures and current frameworks. For example, a heavily populated city requires a different carbon neutral pathway as compared to an industrial manufacturing town or a farming-dominated region (Chen et al., 2022). Though a myriad of solutions have been surfaced by multiple actors across the globe in attempts to decrease emissions removal, these approaches have not been sufficient in realizing net zero goals (Chen et al., 2022). This conundrum has highlighted the need for deeper collaboration. While it is anticipated that countries will formulate measures that are suitable to their particular situation in dealing with climate problems, the expectation is to collaborate with global governments to also address and find solutions that can be implemented on a global scale (Buchanan et al., 2022).

The differences in the carbon pathways chosen by countries are reflected in the regulations and policy choices made. In their review, Chen et al. (2022) emphasize the differences in the climate goals of countries, and these can contrast depending on when the country wants to achieve neutrality and what actors they choose to realize these goals. For example, China intends to reach net zero by 2060 by increasing energy conservation efforts, implementing novel technology, and concentrating efforts on maintaining carbon sinks, thus expecting to hit their emissions peak around 2030 (Zhao et al., 2022). Another study by Sen et al. (2021) looks at how, in Australia, educational and research institutes have continually augmented national climate policies through knowledge creation and encouraging pursuit of climate-related topics. Of the 194 member countries of the United Nations Framework Convention on Climate Change, currently only 12 countries have achieved carbon neutrality, and the majority of the members have paved the way for their net zero goals to be realized between 2050 and 2070 (Chen et al., 2022). However, due to the differences in climate policies between

countries, opportunities have been limited for mutually beneficial cooperation in tackling climate change issues (Chen et al., 2022).

Carbon neutral pathways mean achieving less emission in every aspect of our modern economies, and this pressure surmounts on a greater scale upon the notably richer countries of the Greater North to take significant initiative in rapidly transforming their objectives into actions, all the while eliminating their dependency on fossil resources and assisting the emerging economies with technology and monetary resources (COP26, 2021).

### **3.1.1 Finland's Carbon Neutral Pathway**

Finland plans to make key legislative and policy changes to ensure environmental degradation is penalized and will continue to increase regulations to curb any further ecological loss and increase the use of renewable resources. Finland has demonstrated a proactive stance in recognizing the necessity of a green transition. As a global actor and EU member, Finland has participated in numerous climate negotiations over time. Furthermore, Finland has made significant progress in acknowledging and striving to integrate climate goals. By 2030, Finland intends to reduce GHG's in the effort sharing sector by 50% and establish a pathway towards achieving carbon neutrality by 2035 (Ministry of the Environment a, 2022). Finland plans to achieve the emissions reduction target proposed by the European Commission for 2030 in agriculture, transport, building-specific heating, and waste management. The Finnish government has developed a comprehensive climate action plan that aims to tackle the issues of climate change, biodiversity loss, and overconsumption as integral components of the sustainability crisis (Ministry of the Environment b, 2022). To address the underlying causes of these issues, the government has adopted a holistic approach. The attainment of the objective is facilitated by the implementation of novel climate policy resolutions, the realization of low-carbon energy and heat generation. The country has also planned mitigation efforts to advocate a circular economy and the pursuit of a low carbon impact food policy. Finland plans to make key legislative and policy changes to ensure environmental degradation is penalized and will continue to increase regulations to curb any further ecological loss and increase the use of renewable resources (Ministry of the Environment a, 2022).

Ultimately, achieving carbon neutrality will require a concerted and coordinated effort from governments, companies, and communities nationally to ensure that future generations inherit a sustainable planet.

## 3.2 Companies

There is growing relevance to adopting climate goals from the point of view of companies and their choices in doing so. Companies have to make the difficult decision of whether or not to implement emissions targets, select the most effective method for meeting the requirements, and select the ideal pathway and targets in order to maximize their profits and progress towards a sustainable future (André & Valenciano-Salazar, 2022). Though adopting climate goals comes with some costs, like getting certified, which can affect operating costs, studies at the firm level have shown that companies think they can get higher prices or a bigger share of the market if they have strong climate targets (Galán-Valdivieso et al., 2019). These goals can improve the company's green image, public recognition, and social and environmental legitimacy.

A study conducted by André & Valenciano-Salazar (2022) explores why particular industries are more likely to acquire the certification to show decarbonization efforts and how and why businesses have become increasingly concerned with issues of intergenerational equality and ecological sustainability. These efforts can be seen in the form of green initiatives, accreditations, and ecolabels and are approaches to sustainable behavior that are pursued on a voluntary basis (Wang et al., 2018). André & Valenciano-Salazar (2022) categorize studies of the uptake of carbon neutral programs and pathways by companies into two broad categories: economic and non-economic. Profit and public favor are examples of economic drive; one study (Okereke, 2007) finds a direct link between a firm's reputation and their willingness to inculcate carbon-reducing initiatives, with profit seeking as a primary motive. While non-economic motivation manifests in the form of concern for the environment and society. Other motivating factors include the presence of social and political pressure as well as the expectation of stricter control (Galán-Valdivieso et al., 2019). Irrespective of motivation factors, it is important that companies be transparent about their efforts to become carbon neutral if they want to be taken seriously by the public and wider society. Disclosure of this sort gives credibility to the carbon neutral title and provides an indication of how open businesses are about their environmental practices. Liesen et al. (2015) report that the pressure from stakeholders is what makes companies report their GHG emissions and gain social legitimacy. Gal'an-Valdivieso et al. (2019) also said that stakeholders need to know about how companies manage their carbon emissions because this is a key piece of information for proving legitimacy. Firms may respond to the risk of losing legitimacy by taking part in sustainable projects and sharing information about how they treat the environment.

The laws that make up the most prominent legislative strategy to encourage sustainable habits have been criticized for being ineffective, complicated, rigid,

and slow (André & Valenciano-Salazar, 2022). Ascertaining a carbon neutral pathway does not contain guidelines or a set of standards that are common to all institutes emitting greenhouse gases; rather, it is a combination of factors that are unique, for example, depending on the industry or business. Broadstock et al. (2021) point to this difference and highlight how goals and aims towards achieving net zero for a particular business could contradict the aims and goals of another. Thus, carbon neutral pathways need to be cautiously constructed, and it is important to weigh the pros and downsides of each strategy as well as their interconnection and potential effects on economic growth, social equity, and environmental quality (Broadstock et al., 2021). And barring the complexity involved in creating such pathways, there remain numerous obstacles and challenges. For instance, reaching carbon neutrality is a huge financial undertaking, which could potentially destabilize smaller businesses and other such actors (Broadstock et al., 2021). Even though various corporations and businesses have pledged to achieve net zero emissions, there is no one clear path to realize it. There is a common understanding that achieving climate goals will require innumerable tools, regulations, policies, and mixed strategies.

Precedently, to get to a point where their emissions are carbon neutral, businesses need to compile preliminary emissions inventories, assess and validate emissions, and develop strategies (Zhao et al., 2018). These goals can be set with certain reporting and valuation methods that have established a reputation, such as the Science Based Targets initiatives (SBTi), Emissions Trading Directive, ISO 14064, and Greenhouse gas Protocols (André & Valenciano-Salazar, 2022).

This paper will take a closer look at the Science Based Target initiatives (SBTi) as a conceptual framework for identifying and classifying the net zero pathways chosen by different Finnish companies. The validity and significance of this standard will be discussed in great detail in the following section.

### **3.3 Science Based Target initiatives (SBTi) and net zero standards**

The notion of achieving carbon neutrality has rapidly transitioned from being a subject of academic discourse to a guiding framework aimed at mitigating climate change within a remarkably brief span of time (Carrillo Pineda et al., 2020). As the proliferation of net zero targets has occurred, apprehensions regarding their reliability have also emerged (Hale et al., 2021). It has been imperative for policymakers to give precedence to the quality of net zero targets in order to effectively implement Paris-compliant measures and achieve more ambitious objectives (COP26, 2021), and this has contributed to the broad

adoption of net zero standards among various business entities, which has been the primary aim of the Race to Zero campaign initiated by the United Nations (UNFCCC, 2021), although its implementation remains in its early stages (Hale et al., 2021). A study conducted by Hale et al. (2021) presents a comprehensive evaluation of the net zero targets implemented among countries, cities, and companies. The findings with regards to companies reveal that while the concept has gained widespread adoption, there exists a significant degree of disparity with respect to their time frame, implementation, scope, utilization of offsets, organizational structures, and other desirable attributes (Hale et al., 2021). Though the concept has been widely recognized and implemented rapidly within the last decade, it is currently in its nascent stage as a policy tool.

There is a growing debate surrounding the efficacy and significance of net zero targets, and critics are advocating for a shift towards achieving "real zero" as opposed to net zero (Stabinsky, 2021). The absence of a universally recognized standard and the lack of transparency in the targets established by corporations have contributed to the emergence of disbelief in the form of net zero greenwashing (Stabinsky, 2021). Additionally, both activists and researchers have brought to light the prospect of employing carbon offsetting mechanisms as a means of achieving neutrality rather than prioritizing the reduction of emissions throughout the value chain and operations. Though the role of compensation markets in achieving a net zero scenario is considered crucial, this being said the global reliability of these markets remains speculative (Schneider & La Hoz Theuer, 2018).

Given the widespread adoption of neutrality, it is imperative to track the prevalence of associated standards and evaluate their efficacy. Net zero standards define norms pertaining to transparency, scope, reporting, and time frames for companies (Carrillo Pineda et al., 2020). This would facilitate not only comparisons but also enable an assessment of a company's progress in meeting the set targets. Without the use of net zero standards, there is failure to address significant inquiries; for instance, is it advisable to prioritize achieving net zero targets for heavy industry while the smaller industries adopt a lenient approach without equal oversight? In the absence of net zero standards, the accomplishments of individual sectors may not be sufficient to attain the overarching climate objectives outlined in the Paris accord (Rogelj et al., 2021). While having loosely defined targets that are not subject to any specific criteria may be preferable to having no targets at all, it is imperative that we do not neglect the importance of adhering to standards, as failing to do so could result in significant harm in the near future. Therefore, it is essential to consider the effectiveness and impact of established targets by taking into account the oversight of standards.

The necessity for standardization in establishing net zero objectives stems from the divergence in the approaches employed by various companies. For instance, some entities solely focus on their scope 1 and 2 emissions, while others opt to incorporate solely CO<sub>2</sub> in their neutrality strategies. Additionally, certain companies elect to offset their emissions through compensation markets (Rogelj et al., 2021). In this paper, the climate targets of prominent Finnish companies have been assessed, and the collected data from the companies has been methodically utilized to determine the strength and efficacy of the climate objectives and subsequently evaluated. As a means to measure the efficacy and scope of the targets set by companies, a standard was required as a yardstick, and evaluating targets against an already established standard that is widely recognized in the market is the aim of this thesis paper.

The UNFCCC's "Race to Zero" campaign (2021) has prompted both state and non-state actors worldwide to establish targets. However, with regard to non-state actors, particularly companies, there exists a deficiency in the adoption of appropriate standards that would facilitate the development of a vigorous net-zero strategy (Leaders Arena, 2021). The selection of a suitable standard to align with a company's strategy is contingent upon various organizational characteristics, including but not limited to the company's size, emissions profile, and type of industry. Net zero standards, such as the Science Based Target initiatives (SBTi), facilitate the establishment of feasible targets through the integration of reliable benchmarks. This contributes to the regulation of disparate efforts undertaken by companies; the act of regulation can determine the necessary additional exertion in the event that a particular industry encounters technological or financial limitations, thereby enabling other industries to compensate for the shortfall and ultimately achieving global neutrality by the middle of the century (Rogelj et al., 2021). The foremost net zero standards that are incorporated by companies comprise of the Science Based Target Initiative's (SBTi's) Corporate Net zero standard, Carbon Disclosure Project's Climate Disclosure Framework and lastly, the Task Force on Climate-related Financial Disclosure's Guidance on Metrics. Figure 3 shows a brief distinction between the three standards. The theoretical framework for this paper will, however, consider only SBTi's.

In this study, for the purpose of assessment and evaluation of Finnish companies, the guiding principles and criteria have been adopted from the foundation paper of the Science Based Target initiatives (Carrillo Pineda et al., 2020). More information on the choice of the standard has been discussed in the following subchapter.

Framework	TCFD	SBTi	CDP
Date Released	October 2021	October 2021	November 2021
Target Group	Companies of any size, looking to report on governance of climate risks and opportunities	Companies of 500+ employees, that are looking to establish SBT Targets, goals, and plan to reach 2050 Targets	SMEs with fewer than 500 employees
Net-Zero & Targets Timeframe	Interim: 5-10 yrs, Medium-Long term: for 2030 and 2050 with Net-Zero by 2050	Near-term: 5-10 yrs, long-term: by 2050	Near-term: 5-10 yrs with the aim of reducing GHG emissions in the long run
Structure	Guidance on 3 pillars of climate metrics, climate targets and transition plans	A standard based around near-term SBT, long-term SBT, mitigation beyond value chain and neutralization of any residual emissions	Consists of Core Modules and additional modules for SMEs to align climate disclosures
Content for companies to report	All should disclose on 7 recommended categories of climate-related metrics while setting targets that build on these metrics.  <ol style="list-style-type: none"> <li>(1) Greenhouse gas (GHG) emissions (MT of CO<sub>2</sub>e)</li> <li>(2) Transition Risk (Amount or %)</li> <li>(3) Physical Risk (Amount or %)</li> <li>(4) Climate-related opportunities (Amount or %)</li> <li>(5) Capital development (reporting currency)</li> <li>(6) Internal Carbon Pricing (Price in reporting currency, per MT of CO<sub>2</sub>e)</li> <li>(7) Remuneration (Percentage, weighting, description, or amount in reporting currency)</li> </ol>	4 key elements for the creation of a credible Net-Zero target: <ul style="list-style-type: none"> <li>• Near-term Science-Based Targets (continuously re-set when met)</li> <li>• Long-term Science-Based Targets</li> <li>• Mitigation beyond the value chain</li> <li>• Neutralization of any residual emissions</li> </ul>	Report climate goals and adopt the core modules immediately; integrate the additional modules within 3 years <ul style="list-style-type: none"> <li>• Core Modules <ul style="list-style-type: none"> <li>○ Measure</li> <li>○ Commit</li> <li>○ Action and Impact</li> </ul> </li> <li>• Additional Modules <ul style="list-style-type: none"> <li>○ Energy Reporting</li> <li>○ Value Chain Emissions</li> <li>○ Management and Resilience</li> <li>○ Climate Solutions</li> </ul> </li> </ul>
Emissions covered	Absolute Scope 1, 2; encourages disclosure on Scope 3.	Scopes 1,2,3	Scopes 1 and 2 and where necessary Scope 3.

Figure 2 Different net zero standards that currently exist in the market (Leaders Arena, 2021)

### 3.4 Science Based Target initiatives (SBTi) in assessing Climate Goals

The Net-Zero Standard developed by the Science Based Targets initiative (SBTi) is a pioneering accreditation or standard that assesses the alignment of companies' net-zero objectives with the Paris Agreement's objective of limiting global warming to 1.5°C through scientific means (WWF, 2021). Carrillo Pineda et al. (2020) have reported that a significant proportion of global emissions, approximately one quarter, are attributed to certain organizations; these entities have pledged to achieve carbon neutrality by mid-century, indicating their commitment to the goals outlined in the Paris Agreement. In this context, the Science-Based Targets (2023) offer an extensive and science-based understanding of the concept of net zero as well as a structured framework for achieving climate goals (SBT, 2023). The increasing involvement of organizations in the pursuit of net zero underscores the significance of this movement (Carrillo Pineda et al., 2020). However, a considerable number of companies still lack clarity on the means to achieve the global climate goals (Stabinsky, 2021). Therefore, there is an imminent need for pathways that have been validated by climate science and are consistent with global climate goals.



The Science Based Targets initiative (SBTi) has been at the forefront of converting climate science into a structure that enables corporations to establish ambitious climate objectives. This framework enables impartial evaluation of climate goals and targets using a rigorous set of requirements and transparent validation protocols (Carrillo Pineda et al., 2020). The reliability of SBT has been derived from the means of interpreting climate science into practical guidelines for business organizations. The SBT framework (Carrillo Pineda et al., 2020) has led them to provide sector-specific measures for business organizations while incorporating transparency in the process and allowing visibility to stakeholders.

The objective of this study is to evaluate the net zero trajectories adopted by prominent Finnish corporations and juxtapose them with the recommendations provided by the foundation paper of Science Based Targets (Carrillo Pineda et al., 2020). It is important to note that this analysis will only appraise specific dimensions and will not furnish a full understanding of the net zero objectives of the selected companies. The SBT foundation framework (Carrillo Pineda et al., 2020) has served as a basis for comprehending the targets embraced by corporations and, to a certain degree, facilitating feasible comparisons.

The evaluation of company climate goals and targets is conducted in accordance with the foundations of Science-Based Targets (SBT) for corporations, thereby assessing the pathways that satisfy the two prescribed conditions of SBT for corporations, namely:

- *Reducing scope 1, 2, and 3 emissions to zero or to a residual level that is consistent with reaching net-zero emissions at the global or sector level in eligible 1.5°C-aligned pathways*
- *Neutralizing any residual emissions at the net-zero target year and any GHG emissions released into the atmosphere thereafter (Carrillo Pineda et al., 2020).*

One of the fundamental tenets of the Science-Based Targets (SBT) initiative is the recognition and integration of the global climate goal to limit warming to 1.5 C with minimal or no overshoot in its recommendations. As such, the SBT framework requires companies to establish their targets while considering this goal and to achieve it by reducing emissions throughout their value chain (Carrillo Pineda et al., 2020). Another integral aspect of SBTi's is the concept of *mitigation hierarchy*, which places emphasis on the reduction and abatement of emissions from a company's value chain and own operations rather than using compensation measures such as offsetting programs to fulfill climate goals.

In addition to the above-mentioned factors, the SBTi framework (Carrillo Pineda et al., 2020) includes three principles in assessing the resilience and robustness of climate goals and targets: Principle 1 ascertains, Principle 2 verifies, and Principle 3 confirms. The criteria of these three principles, in conjunction with the specific

climate targets of the companies, can be employed to tabulate the company climate goals into five different strategies. While the first three strategies do not adhere to global climate goals, the last two strategies do.

Strategy	Value chain emissions abatement	Measures to balance unabated value chain emissions	Principle 1: consistent with no net accumulation of GHGs in the atmosphere?	Principle 2: consistent with the attainment of the Paris Agreement and SDGs?	Principle 3: business model resilient in a net zero economy?
<b>Strategy 1</b> Replacing abatement with carbon credits representing emission reductions	Value chain emissions are abated by an arbitrary amount	Unabated emissions are balanced by carbon credits representing emission reductions	No	No. The Paris Agreement cannot be attained without halting accumulating of GHGs in the atmosphere	No. Retaining a relatively high-emissions business model is unlikely to meet stakeholder expectations
<b>Strategy 2</b> Replacing abatement with avoided emissions		Unabated emissions are balanced by avoided emissions due to sold products or services			
<b>Strategy 3</b> Replacing abatement with negative emissions		Unabated emissions are balanced by an appropriate amount of CO <sub>2</sub> removal			
<b>Strategy 4</b> Abatement of emissions in line with science	Value chain emissions are abated at a rate consistent with Paris-aligned climate change mitigation scenarios	Unabated emissions are balanced by an appropriate amount of CO <sub>2</sub> removal.	Yes, if CO <sub>2</sub> sequestration is permanent	No. Overreliance on CO <sub>2</sub> removal generates trade-offs with other social and environmental goals	Uncertain. Overreliance on negative emissions may not address stakeholder expectations
<b>Strategy 5</b> Climate positive approach		During the transition to net zero, unabated emissions are compensated.  When net zero is achieved, emissions are balanced with an appropriate amount of CO <sub>2</sub> removal			

Figure 3 The five strategies and principles of the SBTi framework (Carrillo Pineda et al. 2020).

The SBTi framework, as proposed by Carrillo Pineda et al. (2020), incorporates three principles to evaluate the resilience and robustness of climate goals and targets, in addition to the aforementioned factors. Principle 1 emphasizes the need for abatement measures that target all GHG's within a company's value chain. According to Principle 2, a corporation's climate objectives and benchmarks must conform to the most recent climate science and align with global climate targets, including the Paris Agreement, the Sustainable Development Goals, and the overarching objective of restricting warming to 1.5 C. Principle 3 endeavors to verify the comprehensive strength of a corporation's climate goals and necessitates that corporations adjust and enhance their ability

to withstand climate-related hazards in order to ensure the continued viability and operational effectiveness of the business. The three guiding principles, in conjunction with the companies' particular climate targets, have been utilized to categorize climate objectives into five distinct strategies by Carrillo Pineda et al. (2020). Although the initial three strategies fail to align with the global climate objectives, the final two strategies meet the criteria. The five strategies and principles are aptly explained with the aid of Figure 3.

## 4 THE ROLE OF COMPENSATION MARKETS

### 4.1 State of Carbon Markets

This section provides an analysis of the measures implemented by companies to mitigate their emissions impact subsequent to abatement measures and includes participation in either the compliance or voluntary carbon markets. According to the SBTi foundation framework (Carrillo Pineda et al. 2020), there are two distinct functions of offsetting measures in the path to net zero. The first involves utilizing offsetting programs during the process of transitioning to net-zero, while the second involves employing offsetting measures to eliminate residual emissions from the value chain at net-zero. The framework places significant emphasis on prioritizing abatement measures based on science-based targets and places great importance on reducing emissions from both internal operations and the value chain rather than relying on compensation initiatives.

Some of the assessed companies are participants in the EU ETS and have a mandatory obligation to participate in the emissions trading system. A few companies use voluntary compensation programs to offset certain aspects of their operations. Some companies participate in both the EU Emissions Trading System (ETS) and utilize voluntary offsetting services to address residual emissions that fall outside the scope of the emissions trading framework. However, to align with the SBTi framework (Carrillo Pineda et al. 2020), companies are required to set rigid science-based targets that prioritize reduction efforts from operations and the value chain, and this is emphasized in the mitigation hierarchy.

Though the role of compensation markets in achieving a net zero scenario is considered crucial, the global reliability of these markets remains speculative (Schneider & La Hoz Theuer, 2018). This chapter lays the foundation to document and understand the use of compensation measures in the climate pathways of Finnish companies. It provides a conceptual framework by discussing the state of current Voluntary and Compliance markets, their importance, and also highlights the requirement for a global carbon price, an issue that several Finnish companies also consider a hindrance plaguing the reliability of carbon markets.

As a means to muster and organize resources, carbon markets are envisioned as a tool to carry on the aims of various climate negotiations and agreements that have taken place on a global scale. By facilitating the exchange of carbon credits, compensation markets encourage climate action by rewarding those who take steps to curb greenhouse gas emissions, and these actions can range from

replacing nonrenewable fuels with renewable energy to increasing the capacity of carbon storage or sinks in natural ecosystems (Wei et al., 2021). A framework for trading greenhouse gas emission reductions and non-market strategies to support mitigation and adaptation were created under Article 6 of the Paris Agreement, which permits global entities to voluntarily work together to accomplish emission reduction targets. This framework falls under the much-debated Article 6 of the Paris Agreement, and the institution that is tasked with governing and leading this framework is the Conference of Parties (COP). In accordance with the terms of the Paris Agreement, Article 6 relates to the creation of global carbon markets where countries can exchange carbon credits. Emission reductions may be transferred to another country in accordance with Article 6 if their transfer has been approved by the selling nation's government, but only one nation may apply the emission reduction to its Nationally Determined Contributions (NDC) (Gault, 2021). In order to prevent overestimating global emission reductions, it is crucial to minimize duplication of efforts. To prevent this, an accounting method called "corresponding adjustment" was introduced by the agreement on Article 6 (World Bank, 2022).

The World Bank (2022) estimates nearly 50% of anthropogenic emissions can be extracted from the atmosphere if carbon markets are facilitated in a manner that allows for a transparent and accountable exchange of compensation credits. As the carbon compensation markets have evolved, a greater number of governmental institutions, business organizations, and the general public have come to favor offsetting as an effective tool in the challenge to curb climate change, and as a result, efforts to reduce carbon emissions have progressed from focusing solely on CO<sub>2</sub> footprint to addressing a more comprehensive compensation strategy (Wei et al., 2021). Carbon Markets have evolved since their inception under the Kyoto Protocol and are continually changing according to new regulations, guidelines, and the growing body of knowledge that has revealed the dynamic nature of climate change and its real-time and future repercussions.

Abnett and Nasralla (2022) argue that despite the rapid evolution of carbon markets, there are several hindrances that have limited the scope and growth of the market. These roadblocks are identified from the perspective of individual nation-states as well as general market actors. One of the major hindrances is the lack of standardization in the market (Jones, 2022). This is due to countries being unable to settle on a lengthy list of climate-related issues, which spills over to regulatory issues such as the need for transparency and methods to ensure the elimination of double-counting of compensation credits (Abnett & Nasralla, 2022). These problems have festered to such an extent that they have curbed the pace of negotiations on a global scale.

One of the prime concerns with having transparency within compliance and voluntary markets is the issue of emission leakage, where industries faced with stringent policies on the permissible limit on emissions have merely transferred their energy-intensive activities beyond the parameters of the country's borders (Newell et al., 2013), though the issue was much more prominent during the initial establishment of carbon markets and witnessed a massive transfer of manufacturing and other such energy-intensive processes to developing and underdeveloped countries due to the lack of rigid environmental laws and policies. However, this issue surfaced once developing countries such as China and India were steadily contributing high volumes of emissions, and the concern rang high bells in international conferences (Kedia, 2016; Schimmel, 2021). Even before Article 6 of the Paris Agreement, which is pertinent to the global mechanism and framework for the cooperation and interconnectivity of different carbon markets, this issue was at the forefront of discussion as carbon markets were still in their initial phase of implementation (Newell et al., 2013).

Despite the challenges, carbon markets have the potential to play a significant role in mitigating greenhouse gas emissions.

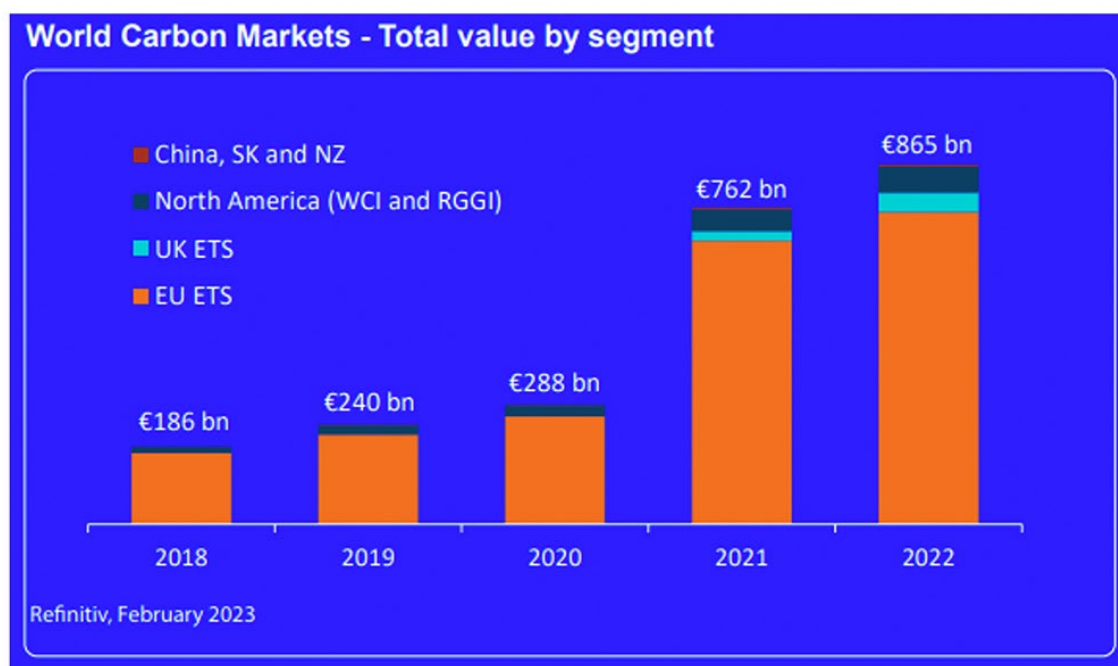


Figure 4 The fiscal state of different compliance markets from 2018-2022 (Jones, 2022).

## 4.2 Challenges of global carbon price

There has been increased advocacy for carbon pricing ever since the Paris agreement (Gault, 2021). In the U.S., a public declaration signed by a few notable

economists gained traction as several thousand more economists signed onto the declaration in support of the idea to establish a global carbon price (Akerlof et al., 2022). A similar campaign was undertaken by the European Association of Environmental and Resource Economists, which recorded close to 1800 economists from around the world in favor of establishing a carbon price either through the means of taxation or through an existing cap-and-trade system (EAERE, n.d.). Many private firms and financial institutions, under pressure from shareholders and environmental activists, have increasingly broadened their declared objectives to curb their emissions, acknowledging the need for a carbon price. Numerous monetary organizations have published articles endorsing carbon pricing as the most effective means of achieving climate change goals (Gault, 2021; Weber, 2020; Solomon, 2019). Governments were asked to include pricing carbon as a method to lower emissions in the 2013 Conference of Parties, which took place in Bali (Gault, 2021). The pressure to bring about a global carbon price mechanism was brought about by major European energy companies (BP Global, 2015), as they required strict regulation to navigate their carbon pathways. According to Jim Yong Kong, the previous president of the World Bank, the concerted effort on a worldwide scale to impose a mechanism to control carbon prices was enormous from corporations (IMF, 2015). This can be seen as a watershed moment, signaling the beginning of the transition from discussion of economic systems required for sustainable development to the actual execution of regulations and pricing policies that could bring about a desired pathway towards a carbon-neutral world (Gault, 2021).

However, in spite of the surmounting pressure from various global actors to establish a mechanism for a goal carbon price, the Conference of Parties in 2015 failed to address this request, and alternatively, Article 6 of the Paris Agreement was the ultimate solution offered by the tedious efforts of the Paris Agreement (UNFCCC, 2016). A report published by the Organization of Petroleum Exporting Countries (WOO, 2020) released an independent forecast of how their carbon neutral pathways are predicted to look in the near future in the context of the current policies and regulations. The prediction states the eminent failure of the Paris Agreement targets if we are to proceed without a globally established carbon price, and the report emphasizes the need for the price of carbon in order to combat climate change in due time. However, the limitations of this report are such that it pertains to industrial and energy-generating organizations only.

### **4.3 Voluntary and Compliance Markets**

As global actors race towards setting robust climate goals, carbon markets have expanded both as a financial instrument and a policy tool (BNEF, 2022). Figure 4 shows the major markets that currently exist. There are over 30 compliance markets around the world (Solomon, 2020); however, within the scope of this

study, we will be assessing the climate goals and pathways of Finnish companies, and as such, this paper will only discuss the European Union Emission Trading System (EU ETS) and voluntary carbon markets.

#### **4.3.1 European Union – Emissions Trading Sector**

The compliance market under the European Union, namely the EU Emissions Trading System, is currently the most prominent of the established carbon markets, not only in size but also in terms of monetary value. This market mechanism, which was implemented in 2005 as a manner of realizing the goals under the Kyoto Protocol, has, according to the European Commission (2022), helped drive down carbon emissions from various energy industries by over 30% while continuously raising earnings and income through the auction of the credits. This market-based mechanism has since its establishment undergone 3 different stages of development and is currently in its 4th phase. This is a manner in which to cultivate it in order to ensure that the mechanism continually evolves to match the goals of various international climate agreements as well as the goals of the member states of the European Union (European Commission, n.d.).

The trial phase of the EU ETS program, which allotted gratuitous permits to certain energy-producing and heavy energy-consuming industries and placed restrictions on emissions limits, was created to have the European Union ready to comply with the commitments made under the Kyoto Protocol (Newell et al., 2013). Under this cap-and-trade mechanism, a large portion of the permits were given for free during the first two stages, and each member state of the Union had the capacity to decide the allotment of these permits within various industries of the economy (Newell et al., 2013). This has brought in a number of compelling arguments against a compliance market in general, where the most polluting actors from different industries were invited to take part in a market where the primary intention was to curb emissions; however, with the allocation of free permits, these industries were encouraged to continue releasing high emissions all the while being given the opportunity to trade credits and secure an additional source of revenue (Stabinsky, 2021).

Through the initial stages, free permits were distributed; these were later on responsible for EU ETS building up a sizable secondary ancillary market where market actors traded regulated permits on market exchange, which displayed high levels of financial liquidity and conformity in the market (Newell et al., 2013). Furthermore, the emissions trading system has played a crucial role in facilitating compliance among companies by imposing caps and thereby regulating emissions. This mechanism incentivizes companies to reduce their greenhouse gas emissions by intensifying their abatement efforts and enhancing their operational efficiency (European Commission, n.d.). The companies involved in the EU ETS derive advantages from the ability to establish a more comprehensive range of climate objectives and mitigation tactics without being



encumbered by inherent uncertainties as their carbon limits are already set by the EU ETS (European Commission, n.d.). The European Union Emissions Trading System (EU ETS) has facilitated the funding of green technologies by promoting research and motivating companies to establish more ambitious climate objectives and benchmarks (IETA, 2019).

### 4.3.2 Voluntary Markets

One of the prime deficiencies across the voluntary carbon markets is a matter of standardization; due to this, a lack of comparability between initiatives leaves the market open in a turbulent state, where the lack of reliability opens up the problems of double-counting credits and the value and caliber of the credit (Jones, 2022). Hence, the International Organization of Securities Commissions (IOSCO) states that the need for compliance and stricter policies is very much required if voluntary compensation markets are to play a role in net zero pathways; IOSCO foresees a need for a greater number of regulatory bodies with the focus on establishing clear and reliable frameworks (Jones, 2022).

In addition to the regulatory, transparency, and general accountability issues that have formed a consistent theme around voluntary carbon markets, several NGOs and human rights organizations point out the lack of criteria established by the member states of the Conference of Parties to protect human rights (Human Right Watch, 2022). The problem is not just the lack of guidelines in this regard, but a consequence of this that would transfer the responsibility to national governments to create their own baseline of human rights guidelines in the context of voluntary market initiatives and programs. Carbon offsetting schemes that forcibly evict local populations and Indigenous peoples from their lands are one of the many issues that have arisen as a result of loose national policies (Human Right Watch, 2022). It is clear to see why a flood of criticism by non-Governmental actors is a legitimate fear in this concern, as businesses and countries are placing high dependency on carbon markets and have already poured in colossal investments, could be enticed by regimes that do not meet human rights or environmental criteria for compensation projects.

Over the years, knowledge about carbon markets has grown exponentially, and compliance carbon markets are the largest and most valuable category of emissions trading systems (Newell et al., 2013). However, with increasing attention now being paid to the voluntary carbon markets, there are an abundance of questions and concerns that were not anticipated or recognized when compliance markets were initially implemented. Among the many questions, the most prominent ones are along the lines of how can these markets across various jurisdictions be connected? How are these markets expected to handle the unavoidable requirement for periodic shifts in the fundamental laws and regulations put in place by national and international governance bodies? And how can international agreements and conferences such as the COP

(Conference of Parties) best advance the fragmented, nationally emerging carbon markets.

## 5 METHODOLOGY

### 5.1 Research method

Qualitative research is associated with empirical research, while quantitative research is associated with behavioral research with results presented in a narrative style (Lichtman, 2017). However, this is just the surface-level difference between the two methods. Other significant differences stem from the rules, guidelines, and values that each particular branch of research dictates.

One of the significant differences between qualitative and quantitative research lies in the purpose of the research. Quantitative methods are generally used to understand an assumption or provide detailed information, while qualitative studies have the purpose of understanding a phenomenon in a more natural setting (Creswell & Creswell, 2018). Qualitative research is conducted in a real-world setting where a phenomenon naturally occurs, while quantitative research relies on setting up a controlled environment in which the study can be conducted (Creswell & Creswell, 2018). Qualitative research is also associated with subjective interpretation, which means that the results derived from a study are often presented in a narrative style unique to the researchers conducting the study. This provides researchers with ample flexibility in conducting a study exclusively or even peculiarly. Qualitative studies tend to be more ritualistic in setting the boundaries of how the study will be conducted (Mahoney & Goertz, 2006). This distinction highlights the evolution and dynamic nature of a qualitative methodology (Lichtman, 2011).

Further emphasis on the role of researchers in qualitative research brings about norms pertaining to the role a researcher is to take up within these methodologies. Lichtman (2011) points out that qualitative researchers take up a reflective role, and hence the space for it being a dynamic methodology.

Lichtman (2011) draws our attention to external validity from the broader research community. The nature of qualitative research is subjective at its core, which has raised questions about the validity and reliability of results (Lichtman, 2011). Qualitative research is often criticized for lacking the rigor and scientific objectivity of quantitative research (Creswell & Creswell, 2018). However, qualitative research has its own strengths in providing in-depth and rich data that can lead to a better understanding of the research topic. This thesis employs a qualitative research framework for these reasons.

The relevance of carbon neutrality and net zero in the current scenario is of utmost importance, given the exponential growth in businesses and corporations setting net zero goals to achieve neutrality. The focus of this thesis is to answer research questions through a qualitative study. In order to achieve this, the initial

part of the thesis involved discovering the current state of the carbon market, pathways, the various actors involved, and emerging pathways to achieve carbon neutrality, net zero, or similar climate-related goals. This involved studying the nuances these actors face and drawing common trends with regards to the goals they want to achieve.

The Paris Agreement has resulted in a noteworthy augmentation of corporate climate commitments (UNFCCC, 2021). This highlights the significance of achieving carbon neutrality in the present context and underscores the imperative for enterprises to undertake decarbonization measures to attain this objective. The relevance of carbon neutrality and net zero in the current scenario cannot be understated. The exponential growth in businesses and corporations setting net-zero goals highlights the importance of decarbonization to achieve these goals. The need for standards and science-based targets is essential in this transitional period towards carbon neutrality. The literature discussed in this thesis provides insights into the importance of setting ambitious targets, standardization, and decarbonization in order to achieve carbon neutrality.

## 5.2 Data collection

In this study, Finnish companies from the Forbes 2000 list were selected as a representation of prominent companies established in the country. These companies were evaluated and ranked on the basis of sales, profits, assets, and market value (Forbes, 2022). There are a total of nine Finnish companies that have qualified on this list, and for the purpose of this study, they were considered an ideal representation of the leading business organizations in the country. The study systematically examined the data to extract the climate information pertinent to climate targets, offsetting measures, reporting, and governance. The data was obtained from publicly available sources provided by the companies, including sustainability reports, annual reports, blogs, published articles, and news releases. To retrieve the necessary information, a search was conducted on Google by utilizing specific keywords.

- i. Company's name net zero
- ii. Company's name Sustainability
- iii. Company's name offsetting
- iv. Company's name EU ETS

RANK ^	NAME	COUNTRY	SALES	PROFIT	ASSETS	MARKET VALUE
260.	Nordea Bank	Finland	\$13.56 B	\$4.5 B	\$648.83 B	\$40.26 B
395.	Sampo	Finland	\$15.9 B	\$3.03 B	\$66.86 B	\$27.29 B
406.	Nokia	Finland	\$26.24 B	\$1.92 B	\$45.54 B	\$29.66 B
443.	Fortum	Finland	\$132.85 B	\$872.3 M	\$170.19 B	\$15.64 B
671.	Neste	Finland	\$17.91 B	\$2.09 B	\$14.19 B	\$36.31 B
803.	UPM-Kymmene	Finland	\$11.6 B	\$1.52 B	\$20.44 B	\$18.74 B
818.	Stora Enso	Finland	\$12.01 B	\$1.49 B	\$21.64 B	\$15.68 B
896.	Kone	Finland	\$12.43 B	\$1.2 B	\$11.05 B	\$25.87 B
1410.	Kesko	Finland	\$13.36 B	\$675.9 M	\$7.92 B	\$10.53 B

Figure 5 The list of Finnish companies which have been assessed, from the Forbes Global 2000 list. (Forbes, 2023).

The data and information collection processes relied heavily on the information provided by the companies, which proved to be a satisfactory source of information. The data collected was aimed at extracting information relevant to the climate goals of the companies, this included a list of attributes which are listed below:

- a) **Net Zero Information:** The purpose of this category was to comprehend the comprehensive net zero targets and commitments of companies. It was subsequently subdivided to gather data on the present status of net zero targets, the manner in which the net zero targets have been described, the company's membership in the UNFCCC's Race to Zero initiative, and the timeline of the company's commitment to net zero or similar climate targets.
- b) **Information about short-term targets:** The present classification was employed to amass data pertaining to the company's short-term and interim objectives. The evaluation criteria were derived from the Science Based Targets initiative's foundational document (Carrillo Pineda et al., 2020). Given that near-term targets are integral to evaluating a company's climate objectives, they were accorded significant importance. This section was subdivided to ascertain whether the organization has established short-term objectives, the current status of these objectives, the timeframe within which they are expected to be achieved, and the baseline year utilized for comparison purposes. Additionally, any obstacles encountered by the company in attaining these objectives have been documented.

- c) **Information about Long term-targets:** Data pertaining to the company's long-term climate targets. This section was subdivided to ascertain whether the organization has established long-term objectives, the current status of these objectives, the timeframe within which they are expected to be achieved, and the baseline year utilized for comparison purposes. Any obstacles encountered by the company in attaining these objectives have been documented.
- d) **Scope and Coverage of Targets:** The evaluation of the companies' climate targets was conducted to determine the comprehensiveness of their commitments and to establish the range of emissions taken into account, encompassing not only CO<sub>2</sub> emissions but also other greenhouse gases.
- e) **Reporting Mechanism and structure:** The data gathered within this section proved crucial in comprehending the corporate governance framework and arrangements implemented by the organizations. This facilitated comprehension of the primary individuals responsible for accountability as well as the measures implemented by said individuals to ensure the efficacy of their climate objectives.
- f) **Carbon offsetting initiatives and involvement:** Information regarding a company's voluntary or compliance participation in carbon markets has been collected to understand the relevance of offsetting in the carbon neutral pathways of the chosen businesses.

The collected data from the companies was methodically utilized to determine the strength and efficacy of the climate objectives and subsequently evaluated against the criteria outlined in the foundation paper of the Science Based Target initiatives (Carrillo Pineda et al., 2020). The gathered data was utilized to determine the extent to which the climate objectives of the companies satisfy the three Guiding Principles outlined by STB (Carrillo Pineda et al., 2020) and to evaluate how the climate targets can be categorized against the five strategies laid out in the aforementioned publication. The structure used to collect the data has been presented in the Appendices.

### 5.3 Analysis - Data and theory driven content analysis

Qualitative research has advantages in providing in-depth and rich data that can lead to a better understanding of the research topic. This research uses qualitative methodologies because the aim is to gather information in exploring a relatively new and emerging phenomena (Mahoney & Goertz, 2006). Whereas quantitative research is beneficial to practical and empirical data analysis,

qualitative research can be used in an understanding of phenomena in a more natural setting, where the researcher has leeway to provide subjective interpretation, in a unique narrative style (Creswell & Creswell, 2018). The qualitative data collected in this thesis has been interpreted using a theory driven content methodology in combination with a data driven content methodology. Content analysis can be described as a methodology which offers a structural approach to draw conclusions using written, visual and verbal data (Bengtsson, 2016).

The possession of a certain level of prior experience is advantageous for researchers engaged in content analysis, as it allows the identification of inconsistencies and potential pitfalls (Bengtsson, 2016). However, it is important to note that such experience may also lead to the emergence of researcher bias, particularly if objectivity is not upheld throughout the research process (Bengtsson, 2016). The use of content analysis offers a considerable amount of discretion to researchers, despite the fact that this is an undeniable benefit, it raises questions about the dependability of the findings, which is why it is essential to keep an objective perspective and a structured approach throughout the research process (Bengtsson, 2016).

In order to maintain a structured research approach, some steps and considerations were followed as laid out by Bell et al. (2019), in addition to the guidelines offered by Bengtsson (2016). The process was as follows:

- i. Collecting data from various sources as described in previous section
- ii. Reading through the collected data at least a few times, and making additions where necessary
- iii. As familiarity with data was achieved, marginal notes were made about significant remarks or observations.
- iv. At this point, the collected data was tabulated in various groups
- v. Before further sub classification into concepts, the data set was combined through one more time
- vi. The data was classified into different categories and themes and was analysed to draw results.

An example of this process has been presented in the Appendices, which shows how data was interpreted to obtain results for Section (6.5) The Role of Offsetting.

In the course of this study, a theory driven content analysis was used to link theoretical concepts and discussions leading to recording, and understanding the climate goals of prominent Finnish companies via a data driven content analysis. The study started with a theory driven approach, to collect understanding and knowledge and proceeded with a data driven approach to arrive at results linked to theory. The former was used to study the climate goals and pathways of

companies, while the latter was used in tabulating the companies based on the Science Based Target initiatives framework (Carrillo Pineda et al., 2020). This approach made it possible to inspect the data in a more meaningful way, as it provided a framework in grasping principal concepts and themes.



## 6 RESULTS AND FINDINGS

### 6.1 Presentation of Results

The evaluation of sustainability reports has played a crucial role in the analysis of the net zero trajectories of prominent Finnish companies as well as their comprehensive strategy for setting and achieving climate objectives. The comparison has led to the classification of companies based on the framework and criterias outlined in the foundational document of Science Based Targets (Carrillo Pineda et al., 2020; SBT, 2023). These criteria have been utilized to extract information regarding the targets established by the companies as well as to gather additional data on individual companies. Also, company views on using Carbon Markets, both compliance and voluntary markets, have been recorded and analyzed in assessing what role offsetting plays in their climate targets.

The subsequent subsections will delineate the climate objectives of the corporations, with the aim of comprehending their all-encompassing strategies. Additionally, these subsections will provide a broad overview of the pathways employed to establish climate goals, as well as the scope and coverage of said goals. The reporting structures and mechanisms utilized will be discussed, and lastly, the role of offsetting and the compensation market in company climate goals will be revealed.

### 6.2 Classification of Companies

Nine companies were selected as a sample to represent the prominent business organizations in Finland. The selected companies underwent a data- and theory-driven content analysis based on their annual reports, sustainability reports, and news announcements. The analysis utilized a framework adopted from the foundation paper of Science Based Targets (Carrillo Pineda et al., 2020), which served as a benchmark for evaluating the companies' common practices and target-setting methods in achieving net-zero. The results of the analysis were used to assess if the climate goals of companies adhered to the three guiding principles of the framework and, secondly, to classify the companies against the different strategies present in the framework; these have been illustrated in Tables 1 and 2. As stated earlier, the primary factors evaluated encompassed the strength of goal-setting, encompassing both short- and long-term objectives, as well as the identification of reporting structures and governance established in achieving these targets. The terminology and descriptions used by the companies to define their targets have also been recorded. Additionally, the robustness and

inclusivity of corporate targets were instrumental in their classification, as was the establishment of a governance framework to monitor and track progress towards these objectives. In addition to this, some basic information about the company, such as location of headquarters, number of employees, and sector division, was collected, along with some binary data (yes or no questions) that was also recorded and used in the analysis of the results.

Having analyzed the climate targets of prominent Finnish companies, the results show that (Table 1) all companies except Sampo are in line with Principles of SBTi foundation framework (Carrillo Pineda et al., 2020). Adhering to these three principles showcases that these companies have integrated climate targets to show their commitment to a business model that is compatible with a net-zero economy. Having established a range of short-term and long-term goals represents their strong adherence to decarbonizing their operations at a rate consistent with the targets of the Paris Agreement.

Company Name	Principle 1: Consistent with no net accumulation of GHGs in the atmosphere?	Principle 2: Consistent with the attainment of the Paris SDGs?	Principle 3: Business model resilient in a net zero economy
Nordea Bank	Yes	Yes	Yes
Sampo plc	No targets set	No targets set	No targets set
Nokia	Yes	Yes	Yes
Fortum	Yes	Yes	Yes
Neste	Yes	Yes	Yes
UPM-Kymmene	Yes	Yes	Yes
Stora Enos	Yes	Yes	Yes
Kone	Yes	Yes	Yes
Kesko	Yes	Yes	Yes

Table 1 Consistency of company goals with the guiding principles of the SBTi foundation framework (Carrillo Pineda et al., 2020).

The results show that (Table 2), Nordea, Neste, UPM, Stora Enso, and Kone have adopted climate goals and sustainability strategies, which can be recognized as Strategy 5 from the SBTi foundation framework (Carrillo Pineda et al., 2020). The Climate-Positive approach is well-suited for categorizing these companies, given their adherence to the three principles established by SBTi. Specifically, these companies are implementing measures aimed at reducing greenhouse gas (GHG) emissions throughout their value chain and operations while ensuring that their climate objectives align with climate science and are consistent with the Paris Agreement. Furthermore, these companies are actively involved in expediting the global shift towards achieving net zero emissions, extending their efforts beyond their immediate value chain. This is demonstrated in their goals to partially or fully offset emissions that are released into the atmosphere during its transition towards a state of net-zero emissions.

The climate goals and overall sustainability strategies of Nokia and Fortum are categorized under Strategy 4. The classification of these companies under this strategy shows the commitment made to abate value chain emissions at a rate consistent with emission pathways that meet the goals of the Paris Agreement. These companies are planning to reduce their emissions to zero or close to zero in line with climate science from most of their emission sources; however, certain facets of their operations will still yield marginal emissions. Although Nokia and Fortum have their goals in line to reach net zero emissions in the future, these companies have not incorporated offsetting measures into their short-term goals.

Sampo has yet to set climate goals and have them validated in the near future. In studying sustainability and comparing the actions taken by the company, Sampo has been categorized in Strategy 1, where the company is recognized as replacing abatement with carbon credits, which represent emission reductions.

Company Name	<b>Strategy 1</b> Replacing abatement with carbon credits representing emission reductions	<b>Strategy 2</b> Replacing abatement with avoided emissions	<b>Strategy 3</b> Replacing abatement with negative emissions	<b>Strategy 4</b> Abatement of emissions in line with science	<b>Strategy 5</b> Climate positive approach
Nordea Bank					Nordea
Sampo plc	Sampo Plc				
Nokia				Nokia	

Fortum				Fortum	
Neste					Neste
UPM-Kymmene					UPM
Stora Enos					Stora Enso
Kone					Kone
Kesko					Kesko

*Table 2 Presents the tabulation of the assessed companies according to the SBTi foundation framework (Carrillo Pineda et al., 2020).*

### 6.3 Commitment to Net zero: Status and Description

The evaluation of sustainability reports was also utilized to gather data on the terminology used to describe net zero and similar concepts used to encompass climate goals. Analyzing the jargon companies use to describe their progress and status in relation to their climate aims has also been a part of the analysis.

Of the nine companies assessed, five are participants in the UNFCCC's Race to Zero initiative (2021). Though Nordea Bank has not directly pledged to the initiative, it is a member of the Net Zero Banking Alliance, which is affiliated with the Race to Zero initiative. To achieve net zero emissions or carbon neutrality, Nordea Bank, Nokia, Fortum, Neste, UPM, Stora, Kone, and Kesko have either committed to or pledged their climate targets. Sampo is still working on establishing its climate targets, and they hope to do so by 2024.

Nokia, UPM, and Stora have been leaders in recognizing the significance of the net zero transition as well as being the first in their respective industries to make an early commitment to net zero. These companies had already made an early commitment in 2017 and have since worked to establish strong climate targets in their operations. Amidst a global Covid-19 pandemic, Kone, Kesko, Neste, and Nordea made attempts to establish their climate targets between 2020 and 2021. Sampo intends to establish its targets by 2024 and afterwards have the Science Based Target initiative evaluate and validate them (Sampo, 2022).

Net zero Description				
Company Name	What is the current status of the net zero target?	Is there a net zero target established by the company? If yes, how does the company provide a description of it?	Is the company a member of the Race to Zero? (UNFCCC)	Commitment Date
Nordea Bank	Committed to net zero	Net zero	Yes, it is a part of Net Zero Banking Alliance	4th February, 2021
Sampo plc	Setting targets	Net zero	No	Not yet committed
Nokia	Committed to net zero	Net zero	Yes	2017
Fortum	Committed to carbon neutrality	Carbon neutrality	No	March, 2023
Neste	Committed to net zero	Carbon neutral	No	27th October, 2021
UPM-Kymmene	Committed to net zero	Net zero emissions	Yes	2017
Stora Enso	Committed to net zero	Net positive contributor	Yes	December, 2017
Kone	Pledged to carbon neutral	Carbon neutral	No	September 28th, 2020
Kesko	Committed to zero emissions	Zero emissions	Yes	12th May, 2020

Table 3 Shows how companies describe their net zero goals, and their commitment status.

## 6.4 Net zero pathways

### 6.4.1 Scope and Coverage of Targets

It is recommended by SBTi that corporations establish climate objectives that encompass all greenhouse gas emissions rather than solely focusing on carbon dioxide emissions. To attain global climate objectives and restrict the temperature increase to 1.5 C, it is imperative for companies to incorporate abatement measures that focus on scope 1, 2, and 3 emissions across their value chain (SBTi, 2023). This sub-section will delve into the scope and coverage of the nine chosen Finnish companies to understand the boundaries and parameters of their targets. The assessment was achieved through a theory-driven and data-driven content analysis.

The targets set by companies exhibit variations owing to the diversity of sectors in which they function. Nevertheless, it has been observed that the predetermined targets aim to encompass all greenhouse gas emissions throughout their value chain, despite the disparities. All companies, except for Sampo, are actively working towards addressing GHG emissions across scopes 1, 2, and 3. Sampo Group is currently in the process of setting its climate goals. With the exception of Sampo, the remaining companies have established a series of short-term goals that prioritize the reduction of scope 1, 2, and 3 emissions,

and within each scope, the targets have been defined with measurable indicators for the purpose of comparison.

Nordea has categorized its objectives based on the various industries it serves, including real estate, shipping, oil and gas, offshore, and mining. The company has established specific targets and parameters for its environmental objectives. By the year 2030, the company intends to reduce its emissions from the Oil and Gas sector by 55%, using 2019 as its benchmark year. Additionally, the company aims to eliminate 40-50% of its emissions from Residential Real Estate across Scope 1 & 2 by 2030, using 2019 as the baseline year. Notably, the company has already taken steps to reduce its carbon footprint by phasing out from emission-heavy sectors such as Mining in 2021. Nokia has set a target to decrease its greenhouse gas (GHG) emissions by 50% throughout its value chain by the year 2030. Their strategy involves the abatement of emissions from their own operations, which fall under scope 1, as well as the emissions associated with energy from scope 2. Additionally, they have established a variety of targets aimed at their supply chain and transportation in order to reduce CO<sub>2</sub> and other GHG emissions from their scope 3.

The task of establishing and reducing emissions associated with Scope 3 activities has proven to be more challenging compared to the reduction of emissions from Scope 1 and 2 activities, as noted by Carrillo Pineda et al. (2020) and Stabinsky (2021). This has been observed in the experiences of Fortum and Neste, who have encountered difficulties in setting achievable targets and reducing emissions associated with this category. Fortum has successfully demonstrated its commitment to transitioning from fossil-based energy sources to low-carbon energy sources while also reducing greenhouse gas emissions from its Scope 1 and 2 operations. Neste has made a commitment to decrease their utilization phase emissions from their sold products by 50%, which is linked to Scope 3 reduction. Neste's commitment is also evident in their goal to mitigate emissions from their operations by 50% in comparison to their inventory year of 2019.

Companies including Nokia, UPM, Stora Enso, Kone, and Kesko have established rigorous net zero objectives that align with current climate science and have undergone evaluation and verification by SBTi. UPM has made a pledge to decrease their emissions resulting from their activities by 65% in the near future, encompassing Scopes 1 and 2. Additionally, they have implemented a distinctive initiative known as -30 by 30, which involves collaborating with significant stakeholders such as consumers, partners, and suppliers. The program aims to minimize operational redundancies and enhance resource efficiency, thereby reducing Scope 3 emissions. Stora Enso has received approval from SBTi for their targets and has pledged to decrease greenhouse gas emissions from their internal operations by 50% (Scopes 1 and 2) using 2019 as their base year. The organization has implemented comprehensive strategies to mitigate their Scope 3 emissions by 50% throughout their value chain.

Kone has established a comprehensive strategy to address climate change, encompassing measures aimed at mitigating Scope 1, 2, and 3 emissions. The

company's plan entails a 50% reduction in greenhouse gas (GHG) emissions from Scope 1 and 2 operations, based on a 2018 inventory year, by the year 2030. Additionally, Kone aims to reduce GHG emissions from Scope 3, specifically related to the use of products after sales, by 40% within the same time frame. These objectives are consistent with the principles and guidelines of SBTi (Carrillo Pineda et al., 2020). Kesko's objectives, akin to those of Kone, have undergone validation and entail a reduction of emissions originating from the sale of products by 17% from the inventory year of 2020. Furthermore, Kesko has pledged to reduce their emissions by 90% relative to the 2020 baseline, with the aim of accomplishing this goal by 2030.

#### **6.4.2 Internal Abatement Measures**

Upon evaluating the sustainability reports and information published by companies, a significant portion of their objectives were discovered to be focused on mitigating the emissions linked to internal business operations. Various strategies have been implemented by companies to mitigate emissions, depending on the industry. The tabulation of these mitigation efforts into three categories, namely Transportation, Energy, and Resource Efficiency, has been achieved through the utilization of assessment methods that rely on data and theory-driven content analysis. This section has been utilized to further elaborate on the characteristics of these objectives and their contribution towards accomplishing the climate objectives of the companies.

##### **1. Internal Abatement Measures - Energy**

There has been notable emphasis placed on business organizations' shift from utilizing fossil fuel-based energy sources to low-carbon and renewable energy sources (Chen et al., 2022). Therefore, it doesn't come as a surprise to see companies making changes to facilitate such a shift and paving a step-by-step process to accomplish the mitigation of emissions associated with the energy sources utilized in their activities.

The predominant theme that has been discerned pertains to the shift towards renewable energy sources. The evaluated companies share the objective of incorporating strategies that facilitate the curtailment of energy usage while simultaneously distancing themselves from non-renewable energy sources. Companies operate within a stringent framework in this domain, wherein the substitution of fossil fuels with sustainable energy sources is being pursued, with objectives spanning from 70 to 100% utilization of renewable energy. The aforementioned transitions have been integrated into the operations of Nokia and Neste. Nokia has expressed its objective to utilize exclusively renewable electricity in all of its offices and facilities and has additionally become a member of the RE100 initiative.

Similarly, Neste has established goals to achieve complete reliance on renewable energy by the end of 2023. UPM has set a short-term target to increase their renewable fuels by 70% and has also committed to reducing carbon emissions from their energy sources used in production. Kone has achieved an 80% increase in the use of renewable energy in their operations as of 2022 and plans to reach 100% by 2030. Kesko has established a comprehensive set of targets to reduce emissions from their activities, including improving energy efficiency in their stores, offsetting remaining emissions through the reduction of fossil fuel and oil use, and investing in renewable energy technologies. Their goal is to achieve carbon neutrality in their operations by 2025.

The overarching trend observed among these corporations is to curtail the emissions linked to energy usage, which come from a range of activities including production, transportation, and other activities falling under the purview of Scopes 1 and 2. The approach to attaining such a reduction can be attributed to the utilization of sustainable energy resources, low-emission fuels, technological advancements in enhancing energy efficiencies, and transitioning to emissions-free electricity sources.

## **2. Internal Abatement Measures - Transportation**

The regulation of travel and transportation has emerged as an essential aspect of mitigating emissions stemming from a company's internal operations. Among the objectives linked to this category, the most frequently expressed aims were centered on mitigating work-related travel, including the adoption of hybrid workspaces, curbing commuting by car, and transitioning to electric and hybrid vehicles.

The COVID-19 pandemic has expedited the adoption of digital tools and workspaces while also limiting non-essential work-related travel. This trend has persisted as evaluated companies have significantly reduced air travel and maintained their investment in digital platforms and tools that facilitate hybrid work arrangements. In the context of operational transportation and logistics, Nokia, Kone, Kesko, UPM, Stora, Fortum, and Neste have incorporated the increased utilization of sustainable and low-emission fuels into their overarching climate objectives. Furthermore, the mitigation of emissions through the enhancement of operational efficiencies by reconfiguring vehicle fleets towards more sustainable alternatives, optimizing logistical efficiency by substituting packaging materials, and offering electric and hybrid vehicles are measures implemented to minimize emissions whenever feasible.

## **3. Internal Abatement Measures - Resource efficiency**

Apart from implementing measures to reduce energy consumption and transportation, companies also showcased a variety of initiatives such as waste



conservation, recycling, waste management efficiency, and overall resource optimization. These initiatives are based on the principles of circular economy and reflect efforts to minimize emissions and curb environmental impacts from day-to-day operations. A few common initiatives include the transition to digital platforms in an effort to reduce the use of paper, recycling, and reduction of water resources; companies with their own manufacturing units also include plans to treat hazardous water; and lastly, reducing waste produced by integrating waste management into their operations.

### **6.4.3 Overview of Net zero pathways and Climate goals**

Each of the assessed companies has made a commitment or pledge to achieve net zero, carbon neutrality, or similar concepts, and their objectives are tailored to the scale, extent, and industry of their activities. While many companies have set similar timeframes for achieving their climate goals, with short-term targets for 2030 and a long-term goal of achieving net zero by 2050, the pathways to achieving these goals vary in terms of their level of robustness. Companies have to make the difficult decision of whether or not to implement climate goals, select the most effective method for meeting the requirements, and select the ideal pathway and targets in order to maximize their profits and progress towards a sustainable future (André & Valenciano-Salazar, 2022).

Even though the assessed companies have pledged or committed to achieve net zero emissions, there is no one clear path to realize it. To get to a point where their emissions are being abated, companies have had to compile emissions inventories, assess and validate emissions sources, and develop strategies. The analysis of climate pathways shows that there is a common understanding that reaching the aforementioned state will require innumerable tools, regulations, policies, and mixed strategies. This section will delve into the strategies adopted by the assessed companies.

#### **1. Internal Operations Changes**

Organizations have established various objectives to decrease emissions stemming from their internal operations. For instance, Nokia has set a target to curtail carbon emissions from their internal operations by 30% in its immediate goals. The company has effectively mitigated 54% of their greenhouse gas emissions from their facilities and laboratories by augmenting the proportion of renewable energy employed. All nine companies have demonstrated a commitment to addressing emissions from their operations, either through implementation or ongoing efforts. Their strategies can be acknowledged as encompassing a shift towards renewable energy and electricity, the utilization of low-carbon fuels, the implementation of policies to regulate resources more effectively, and technological changes that make abatement easier.

To adhere to worldwide climate objectives, companies have identified emissions sources that are deemed unsustainable. In acknowledgement of this premise, Fortum and UPM have pledged to discontinue their coal and peat activities. Fortum has established objectives to discontinue its coal operations by 2027, whereas UPM has pledged to achieve the same goal by 2030.

## **2. The Role of Renewables**

The transition towards utilizing sustainable energy sources has garnered significant interest, particularly among companies operating within the energy sector. Fortum and UPM both provide to their consumers power that is CO<sub>2</sub> emissions-free as it is sourced from hydro, nuclear, solar, and wind technologies. In addition to providing these energy sources to their consumers, the companies also purchase low-emission energy for their on-site production. In their climate goals, these companies aim to increase the production of renewable energy in their portfolios while simultaneously working on decarbonizing their operations through resource efficiency and technological advancements.

## **3. Emissions abatement through Investments and Technology**

The achievement of net zero emissions requires a combination of technological modifications and the implementation of innovative technologies aimed at reducing emissions (IPCC, 2018). An illustration of the latter is the Reef Shark chipset and liquid-cooled 5G base station developed by Nokia, which are utilized in AirScale radio products to regulate energy consumption and mitigate emissions. Furthermore, Nokia's energy efficiency services, such as Nokia AVA (Automation, Virtualized and Analytics), have been employed to regulate energy consumption in infrastructures through the use of artificial intelligence. Kesko has acknowledged the necessity of allocating resources toward sustainable technologies. The organization has demonstrated its commitment by actively investing in low-carbon transportation and facilitating its integration through the provision of necessary infrastructure, including charging stations. Additionally, Kesko Group has implemented technology to monitor the energy efficiency of its facilities. UPM and Fortum have invested in Combined Heat and Power plants as a means of mitigating their internal emissions and edging closer to their climate objectives. Both of these companies are focusing on building the infrastructure required for the production of renewable energy.

UPM and Stora Enso have demonstrated their dedication to forest investment as a means of carbon storage in response to changing climate conditions, biodiversity conservation, and the utilization of forest-derived products due to their renewable and circular attributes, as outlined in their climate targets. Both UPM and Stora prioritize investing resources in maintaining healthy forests, recognizing their crucial role as dependable carbon sinks in addressing global climate challenges. The companies emphasize the preservation of a healthy forest

as it provides a means for the sustainable extraction of forest-based products, primarily wood-based products, which serve as a source of carbon storage. Additionally, these wood-based products possess a circular nature as they can be recycled and reused.

#### **4. Abatement of Emissions through Products and Services**

In addition to mitigating emissions within a company's operations, the provision of sustainable products and services that are associated with low emissions has been recognized as a viable means of achieving climate objectives. In this context, companies have implemented sustainable practices by utilizing renewable resources, optimizing energy efficiency, promoting recycling, and adopting circular economy principles in the provision of their goods and services.

UPM provides a range of sustainable products, including BioVerno fuel, which is a low-carbon fuel source, and BioVerno, a product designed for the chemical industry with a low carbon footprint. Stora's climate vision for 2030 entails a commitment to offer consumer products that are entirely recyclable. Additionally, the company aims to replace low-impact materials in their current product portfolio wherever feasible. The primary objective is to assist consumers in reducing their carbon emissions by substituting fossil-based products with renewable alternatives. Stora's 2030 climate objective involves the reduction of up to 16.2 million tonnes of carbon dioxide emissions and the sequestration of over 2.5 million tonnes of CO<sub>2</sub> through the implementation of their proposed approach. Kone has set a comparable objective of decreasing their emissions associated with their products throughout their service life by 40%. This goal is planned to be accomplished by prioritizing energy efficiency and promoting circularity in their products post-consumption. The climate objectives of Kesko place significant emphasis on the utilization of sustainable products throughout all of their operations, including food markets, real estate, and automobiles. The company is utilizing policies to carry out these objectives. For instance, Kesko food markets is set to introduce sustainable packing options across its product line and expand its range of plant-based products. In addition, the company has incorporated the use of renewable resources into its real estate operations. Furthermore, Kesko has adopted the use of electric vehicles and low-carbon fuels and established charging stations in their automobile operations.

#### **5. Circular Economy**

The climate goals of the evaluated companies have emphasized the principles of the circular economy as part of their efforts to reduce resource usage. The measures implemented entail reducing wastage of resources and promoting recycling initiatives to facilitate the reuse of materials, thereby facilitating the reduction of emissions. The prevailing notion regarding the application of

circular economy is to enhance the efficacy of resources within organizational processes and to disseminate knowledge among stakeholders in order to optimize the utilization of this approach.

Some of the initiatives adopted by companies that reflect the use of circular economy can be illustrated by briefly describing targets. Kesko, for instance, has established objectives to repurpose all plastic waste for internal operations while concurrently implementing stringent policies concerning the utilization of wood-based products to ensure their reusability. Additionally, the company has set a goal to curtail food waste by 50% within its short-term targets. Kone's aim of achieving zero landfill waste from their production can be attributed to their practice of recycling their products after their service life. Neste has established a quantifiable objective to mitigate a minimum of 20 million tonnes of greenhouse gas emissions resulting from the utilization of Neste's products by consumers through the implementation of renewable and circular solutions. However, the specifications of this target have not been investigated in this study. Nokia has pledged to achieve a circularity rate of 95% in the waste produced by their various facilities, encompassing manufacturing, offices, and Research and Development. Stora has placed significant emphasis on the restructuring of their operations to offer consumers products that are entirely recyclable. To achieve this objective, the company plans to eliminate the use of fossil-based products in their operations and transition towards a circular bioeconomy.

## **6. All Stakeholders on board**

The assessment of corporate reports has emphasized the challenges encountered in attaining comprehensive climate goals, particularly with regard to the emissions linked to Scope 3. In contrast to indirect emissions across the value chain, policies and regulations aimed at mitigating direct emissions from a company's operations can be more readily quantified and controlled. This paper used content analysis to comprehend the targets linked to this category. The analysis placed significant emphasis on the ongoing exchange of effort between suppliers, distributors, consumers, investors, employees, and all other stakeholders. This analysis places a greater emphasis on an organization's relationship with its suppliers relative to other stakeholders, owing to the number of target goals associated with them. A few notable initiatives have been highlighted and discussed below.

A recurring trend observed in supplier-target relationships pertains to the implementation of policies mandating suppliers to adhere to global climate goals and establish benchmarks aimed at mitigating emissions from their operations. UPM's interim 2030 goals include a 30% reduction in emissions from their supply chain, using a 2018 baseline as a reference point. Nordea has implemented stringent policies and objectives to address the issue at hand. The company has identified that a significant proportion of their emissions, approximately 99.9%,

are attributed to Scope 3. As a result, Nordea is collaborating with their customers to facilitate the transition towards setting climate goals that align with climate science and widely available climate standards. The overarching aim of this initiative is to ensure that 90% of Nordea's customers in climate-vulnerable industries have transition plans in place by 2025. Additionally, Nordea is committed to ensuring that at least 70% of their suppliers have climate goals that align with the Paris Agreement by 2023. Nokia has taken a proactive approach in collaborating with their suppliers to mitigate emissions from their assembly lines. As of 2019, they have successfully reduced emissions by 39% in comparison to their benchmark. Furthermore, they have set a goal to achieve complete elimination of emissions from their assembly line suppliers by 2030. Neste and Kesko have implemented stringent policies to ensure the compliance of their suppliers with science-based climate targets. While Neste mandates full adherence to its policies by all suppliers, Kesko has set a target of achieving 67% supplier compliance with science-based goals by 2026. Neste and Fortum have established a series of collaborations aimed at reducing carbon emissions in their operations and products. One such partnership involves Neste's provision of sustainable fuels to AirFrance for a period of eight years, while Fortum has collaborated with Microsoft to offer sustainable waste heat resources.

## **6.5 Sustainability Governance and Reporting Mechanism**

The evaluation of company climate objectives has included an examination and analysis of the degree of transparency exhibited in both sustainability reporting and sustainability governance frameworks. The SBTi foundation framework, as outlined by Carrillo Pineda et al. (2020), evaluates various aspects of emissions coverage, climate target pathways, abatement measures, and timeframe. Additionally, the framework places significant emphasis on establishing transparency and accountability measures to ensure overall robustness. Principle 3 of the SBTi framework (Carrillo Pineda et al., 2020) highlights the importance of considering the long-term profitability and feasibility of a business in a net-zero economy. This can be interpreted as the need for reporting structures, use of standards, accountability hierarchy, and integration of Environmental Management Systems (EMS), among other factors.

The significance of a reporting structure and mechanism for corporations has been emphasized by the European Commission (2022). The Corporate Sustainability Due Diligence Directive (CSDDD) is a mandatory mechanism that requires companies of a certain size to adhere to non-financial reporting standards and regulations that address global climate objectives, human rights, and long-term sustainability within an organisation and its value chain (Hobbs, 2023). According to Hobbs (2023), the prioritisation of due diligence in long-term goal setting necessitates the implementation of initiatives like CSDDD.

This section uses a content analysis approach that is both theory-driven and data-driven to examine reporting mechanisms and standards, reporting hierarchy and framework, and the utilisation of Environmental Management System. The objective is to gain a deeper understanding of these aspects in relation to the climate pathway and net zero goals of the selected companies.

### **1. Role of Board of Directors in Climate Goals and Overall Sustainability**

The findings of the analysis indicate that the governance and accountability framework was structured in such a way that the Board of Directors held the primary responsibility for the climate objectives and sustainability-related aspects of the company. The Board of Directors of companies not only establishes overarching climate goals and objectives but also assumes the duty of scrutinizing and approving these targets, relying on reports related to governance, risk, strategy, and performance resulting from business operations. While the Board of Directors holds the ultimate responsibility and accountability for reviewing and establishing targets, they are frequently aided by senior management, the CEO, the CFO, and sustainability teams. Based on the assessment of company sustainability reports, the Board undergoes periodic training sessions to address various aspects, thereby ensuring increased vigilance. Frequently, these trainings are conducted by specialized teams and delivered in the form of reviews and reports. The sustainability agenda and framework undergo an annual review and are subsequently presented to diverse stakeholders. However, in the majority of instances, the targets are subject to quarterly monitoring.

### **2. Responsibility chain and Reporting Hierarchies**

The responsibility of directing the sustainability path of the company lies with the Board of Directors and senior management. However, the integration of these objectives and goals into the company's overall operations is the responsibility of multiple tiers of teams and managers. In assessing how climate goals are implemented to reflect in a company's actions, it was noticed that there are several ways this has been structured. One approach involved integrating these goals throughout all levels of operations and assigning ownership to each team for achieving specific climate goals. At the group and team management levels, the responsibility was delegated to identify, analyse, and manage risks relevant to their operations in accordance with the overall policies and framework established by the Board of Directors and senior management.

An additional mode of governance involved the formation of sustainability teams that collaborated with various departments within the organization to attain established goals. These teams provide periodic updates to members of the Board. Though both of these structures have dedicated sustainability teams in

place, there was a difference in how reporting's were carried out, and how responsibility and accountability were divided to reflect the working of established targets.

In general, corporations' climate-related objectives and overall sustainability were overseen by a confluence of committees, management teams, and specialized sustainability teams that provided reports to senior management and the Board.

### **3. Reporting Standards and use of Environmental Management Systems and External Assurance**

The requirement for companies to disclose their non-financial statements has been necessitated by initiatives such as the Non-Financial Reporting Directive (NFRD) and the Corporate Sustainability Due Diligence Directive (CSDDD) (European Commission, 2022). These regulations have made it mandatory for large companies to comply with them in order to address global climate objectives, human rights, and long-term sustainability within their organization and value chain. (Hobbs, 2023). Organizations have employed diverse reporting and disclosure frameworks to furnish data regarding their comprehensive economic, environmental, and social performance. The Task Force on Climate-related Financial Disclosures and the Global Reporting Initiatives Sustainability Standard are frequently utilized reporting standards, while the ISO 14001 standard is the most commonly employed Environmental Management System. The utilization of external auditors was employed to furnish confidence regarding the data presented in the sustainability report, and to enhance the reliability of the reporting and sustainability achievements. With the exception of Sampo, whose reports were not externally assured, all other companies have utilized assurance and audit services to evaluate the dependability of their reports.

Company Name	Overall Responsibility	Reporting Standard	EMS	External Assurance and Auditors	Climate goals in line with UN SDG's
Nordea Bank	Board of Directors	TFCD & GRI Sustainability Reporting Standard	ISO 14001	PricewaterhouseCoopers Oy, and Jukka Paunonen	4,5,6,7,9,10,12,13,14,15,16,17
Sampo plc	Board of Directors and Audit Committee	TFCD & GRI Sustainability Reporting Standard	ISO 14001	Sustainability is not subject to external assurance	3,5,8,12,13
Nokia	Board of Directors	GRI Sustainability Reporting, SASB, UN Global Compact Reporting	ISO 14001	Deloitte Oy	All
Fortum	Board of Directors	EU Taxonomy Regulation, Finnish Accounting Act, GRI Sustainability Reporting, UN Global Compact Reporting	ISO 14001	Deloitte Oy	5,6,7,8,9,11,12,13,15,17
Neste	Board of Directors	Finnish Accounting Act, EU Taxonomy Regulation, GRI Sustainability Reporting, SASB Oil & Gas Refining and Marketing Standards	ISO 14001	KPMG Oy Ab	7,8,9,10,11,12,13,15,17
UPM-Kymmene	Board of Directors	GRI Sustainability Reporting, TFCD, AA 1000 Accountability Principles Standard	ISO 14001, ISO 9001, ISO 45001, EMAS	PricewaterhouseCoopers Oy	6,7,8,12,13,15
Stora Enso	Board of Directors	ESIA, GRI Sustainability Reporting, GHG Protocol	ISO 14001	PricewaterhouseCoopers Oy	12,13,15
Kone	Board of Directors and Executive Board	TFCD & GRI Sustainability Reporting Standard	ISO 14001, QMS, OHSMS	Sustainability reporting is subject to limited assurance by an independent third-party auditor	3,4,5,8,9,11,12,16
Kesko	Board of Directors	TFCD, GRI Sustainability Reporting Standard, GHG Protocol	ISO 14001, WWF Green Office environmental management system	PricewaterhouseCoopers Oy	5,8,12,13,15

Table 4 Furnishes a thorough documentation of the reporting norms, EMS standards, and SDG's targeted by the companies in their sustainability goals.

## 6.6 Role of Offsetting

This section provides an analysis of the measures implemented by companies to mitigate their emissions impact subsequent to abatement measures. These measures include participation in either the compliance or voluntary carbon markets.

According to the SBTi foundation framework (Carrillo Pineda et al. 2020), there are two distinct functions of offsetting measures in the path to net zero. The first involves utilizing offsetting programs during the process of transitioning to net-zero, while the second involves employing offsetting measures to eliminate residual emissions from the value chain at net-zero. The framework places significant emphasis on prioritizing abatement measures based on science-based targets and places great importance on reducing emissions from both internal operations and the value chain, rather than relying on compensation initiatives.



The evaluation reveals different preferences that companies have adopted in selecting compensation mechanisms. These include procuring credits, investing in voluntary compensation programs and initiatives, participating in the EU Emissions Trading System, and developing their own range of products and services that help in the reduction of emissions.

### **1. Motivations and extent of Offsetting**

The assessed companies acknowledge the necessity of establishing climate objectives that align with climate science and have implemented various measures to accomplish this goal. Nevertheless, companies acknowledge the necessity of compensating greenhouse gas emissions resulting from specific aspects of their operations, where difficulties and challenges persist in the progress of their mitigation efforts.

Nordea intends to achieve complete offsetting of its residual emissions from internal operations. In the short term, their objective is to attain a net positive position, while in the long term, they are striving to establish a carbon removal portfolio that adheres to the most effective methods for achieving net zero. Sampo is the only company that has employed the practice of voluntary carbon offsetting to counterbalance more than 90% of its internal emissions by 2020. However, there is a lack of disclosure regarding the company's actions concerning this matter for the years 2021 and 2022. Fortum has established objectives to achieve carbon neutrality by reducing emissions from its operations and value chain. Furthermore, the company acknowledges the potential benefits of investing in environmentally friendly technologies, as shown by its active involvement in the EU Emissions Trading System. Fortum regards this market mechanism as the primary means to promote decarbonization in the energy sector in a manner that is both efficient and cost-effective. Over the course of time, Fortum has advocated for the enlargement of the trading system and emphasized the necessity for a worldwide mechanism for carbon pricing. In addition to this, in 2022, the company used voluntary offsetting initiatives to compensate for their emissions from air travel.

Neste endeavors to counterbalance any remaining emissions resulting from their operations subsequent to their mitigation and abatement efforts. Moreover, the company is a participant in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which seeks to mitigate the impact of aviation on climate change. UPM is a participant in the European Union Emissions Trading System (EU ETS). In addition to its involvement in the cap-and-trade mechanism, the company has incorporated carbon offsetting into its short-term objectives through participation in voluntary markets. The primary incentive for UPM's utilization of voluntary carbon mechanisms in the near future is to support their consumers' needs.

Stora Enso follows a comparable trajectory to UPM, as it actively participates in the European Union Emissions Trading System and employs voluntary offsetting mechanisms to counterbalance emissions after implementing abatement measures. Kone's main motivation to compensate for their residual emissions is to achieve a positive climate effect, and the extent of their compensation is limited to direct and indirect maintenance activities. Kesko has incorporated the requirement for offsetting via voluntary markets into their interim objective for 2030, which is limited to residual emissions from internal activities after mitigation measures. However, in the long run, the company will strive to attain net zero emissions from their operations and eliminate the necessity for offsets.

## **2. Offsetting Projects and Initiatives**

The primary focus of companies' offsetting projects centers on renewable energy, forest and biodiversity, and reforestation initiatives. These compensation programs are often certified, as emphasized and highlighted by the companies. A few examples of these projects have been discussed below:

Although Nordea has not disclosed specific information regarding their compensation initiatives, they have mentioned their involvement in renewable energy projects. Sampo has made investments in renewable energy projects, specifically those related to wind power, as well as initiatives focused on forest conservation. The Verified Carbon Standard (VCS) and the Gold Standard, two widely recognized standards, have certified these projects. Neste, Stora, and Kone have formed a partnership with South Pole, an organization whose compensation programs adhere to VCS and gold standard guidelines. These companies have made investments in various initiatives, including biodiversity conservation, forest conservation, renewable energy generation, and community-based projects.

Furthermore, Nokia, Neste, and Stora have implemented carbon in-setting projects aimed at mitigating emissions within their respective value chains. Carbon in-setting is a strategy for reducing emissions in which a company's product or service assists consumers in decreasing their emissions impact in comparison to utilizing a typical product. Nokia has implemented a Sustainable Aviation Fuel (SAF) initiative aimed at directly reducing carbon emissions within the transportation system. Neste is collaborating with CORSIA and several other companies to enhance the adoption of Sustainable Aviation Fuel (SAF), owing to its potential to mitigate the environmental impact of emissions. Stora Enso provides products that have a minimal carbon footprint and presents compensation options to its customers through the CarbonZero initiative, which collaborates with an external provider to fully offset any remaining emissions.

## 7 CONCLUSION AND RECOMMENDATIONS

Regardless of the geographical parameters, companies, national and global, are committing to climate goals, as emphasized by international agreements such as the Paris Agreement. Adopting climate goals can improve a company's reputation, public recognition, and social and environmental legitimacy. The climate goals of companies can vary depending on the industry and sector, and the goals and aims towards achieving net zero for a particular company could contradict the aims and goals of another. Thus, climate targets need to be cautiously constructed, and it is important to weigh the pros and cons of each strategy as well as their interconnection and potential effects on economic growth, social equity, and environmental quality. In order to reach a net-zero state by 2050, there is a need for a comprehensive transition towards sustainable technologies that reduce carbon emissions. This transition will require the collaboration of multiple stakeholders, including policymakers, financial institutions, academia, and other supporting regimes. The development of regulatory frameworks and incentives that promote the adoption of sustainable technologies will be critical to achieving this transition.

The evaluation of sustainability reports has played a crucial role in analyzing the net zero trajectories and comprehensive strategies of prominent Finnish companies in setting and achieving climate objectives. By utilizing the framework and criteria outlined in the Science Based Targets (SBTi) foundations framework, companies were classified based on their adherence to the principles and strategies of the framework. This classification was based on the strength of goal-setting, reporting structures, governance, and inclusivity of targets.

It can be concluded that Finnish companies' climate goals and sustainability strategies highlighted their strong dedication to decarbonization and alignment with the principles and strategies outlined in the SBTi foundation framework. These companies demonstrated a comprehensive approach to addressing climate change by actively contributing to the global transition towards a net-zero economy. Prominent Finnish companies have made commitments or pledges to achieve net zero emissions, or carbon neutrality, and have set both short-term targets to be achieved by 2030 and a long-term goal of achieving net zero by 2050. However, the pathways to achieving these goals vary in terms of their level of robustness and specific strategies. The set targets encompass all greenhouse gas emissions across their value chain, and they have implemented various internal abatement measures in the areas of energy, transportation, and resource efficiency. The companies are taking different pathways to achieve their goals, focusing on renewable energy, emissions reduction in their operations, and technological advancements. With the exception of Sampo, the measures taken by the rest of the prominent Finnish companies are aligned with the Paris

Agreement and in line with climate science. All the companies have various metrics in place to measure their sustainability performance and have adhered to reporting standards and regulatory disclosures.

As a part of the conclusive note, it is recommended that companies provide more specific information that can be used to evaluate their short-term and interim targets and provide greater transparency in discerning the steps that will be taken to achieve their climate targets. It is also recommended that companies integrate a framework to get their climate targets assessed on a regular basis by external assurance authorities who not only evaluate financial reporting but also sustainability governance. It is recommended that these companies continue to expand efforts by getting their climate goals assessed and evaluated on a regular basis by organizations such as Science Based Target initiatives, which would give them the assurance of having their goals in line with the latest climate science.

The assessed companies have incorporated abatement of emissions in their value chain as the primary means of achieving their climate goals; however, they also use offsetting measures to a certain extent. Though the motivations for using compensation vary, it is recommended that companies show greater transparency in the extent of emissions being compensated through voluntary or compliance carbon offsetting. There is a need for up-close disclosure and reporting with respect to the offsetting measures used by companies. Reporting standards should be established that provide financial information, information about the programs and initiatives taken part in, information pertinent to the extent of offsetting, and justification for using offsetting should be more transparently recorded in sustainability reports.

The pressure for companies to set clearer climate targets and build pathways is regulated on a broader scale by the legislative policies and norms placed by national governments and the EU. As a means to increase both the quality and quantity of targets set by companies, there is a need for legislative policies from both the Finnish government and the European Union. Over the long term, it is crucial to develop policy reform and approaches to more explicitly monitor the climate goals adopted by companies, as policy-driven change is effective in pressuring companies with a risk and reward strategy (Broekhoff, 2022). By complying with climate change policies, companies have the benefit of certification, which serves as encouragement to build trust and confidence with both internal and external stakeholders (André & Valenciano-Salazar, 2022). On the other hand, companies' risk being exposed to monetary, regulatory, reputational, and operational risks if they fail to comply with national and broader EU policies and directives.

Policymakers play a crucial role in implementing legislation and regulations for companies to set and achieve climate goals. The implementation of cost-effective

technologies is crucial to enabling this transition towards sustainability, and policymakers play a central role in facilitating the necessary frameworks and structures to support a green transition. In order to achieve the necessary progress, policymakers must prioritize the development of supportive regulations and incentives for the adoption of sustainable technology and frameworks. This may include initiatives such as regulatory reporting for businesses, subsidies for research and development, and general frameworks that promote sustainable practices, in addition to promoting public awareness and engagement in sustainable practices.

To effectively mitigate the adverse effects of climate change and fulfill the goals of the Paris Agreement, governments must enact policy and regulatory changes across a wide range of industries, including banking and financial institutions, real estate, food and agriculture, transportation, and manufacturing sectors (Chen et al., 2022). In light of this context, it was recommended that, in addition to the policies and legislation accorded by the EU, the Finnish government continue to implement policy-driven change in the space of companies setting sustainability and climate-related goals. Legislative policies should address the need for standardization in regulatory disclosure mechanisms and reporting frameworks used by companies in goal setting and achievement. It is suggested that the national government take action to adapt to comprehensive net zero standards & prerequisites and establish a national framework for businesses as an aid to facilitate and expedite a fair transition toward achieving global climate objectives (Broekhoff, 2022). Furthermore, there is a need for tighter regulations from the national government that allow scrutiny of climate goals to ensure that inaccurate information and assertions are not made by companies.

In exploring and comparing the climate action and targets of prominent Finnish companies, this study has adapted a broad perspective. In drawing the necessary comparison, a variety of factors have been considered, including the timeline of targets, the usage of terms used for referring to net zero, understanding the short-term and long-term goals set by the companies, the barriers to these goals, the specifications of the goals, the reporting structure and governance, the scope coverage of targets, and a list of offsetting related aspects. Collecting information and data for these facets included looking into the annual reports of companies as well as relevant information provided on the company website with regards to climate goals, sustainability issues, and circularity. However, there are a plethora of other aspects that have not been covered in this study in understanding the net zero pathways of these companies. In exploring the actions of companies, it was equally important to comprehend how these companies have integrated their targets into the operations and working of the organization; this includes how employees are being trained, the dialogue and information that is facilitated with suppliers, distributors, business partners, and also the end consumers and customers who play a big role. Each of these aspects has great depth and can be taken up as an individual study in itself.

Another topical aspect that was identified was the integration of circularity in business operations. The recorded companies have dedicated umpteen resources to imbuing circularity in their operations and every-day business activities. A study can be conducted to assess the advantages and disadvantages while evaluating the effectiveness of such measures. The continuous efforts being taken by these companies in their operations today and the wide array of efforts being made to reduce resource wastage and change consumption behavior within the prominent companies would be of much relevance within the smaller companies where it is not common practice as they lack a wide array of resources in making changes as compared to the bigger companies.

This thesis documented the prevalent climate pathways and implementation of offsetting among prominent Finnish companies in their sustainability framework and climate target setting. Nonetheless, the present study does not examine the exact scope of their objectives. Therefore, it is suggested that additional research is warranted to determine the impact of the outcomes in both the immediate and distant future, as well as the efficacy of their measures in mitigating emissions stemming from their operations. Despite the extensive information companies provide in their annual and sustainability reports, there is not enough data to conduct a thorough analysis of the effectiveness of climate targets. To address this limitation, it is necessary to engage in structured or semi-structured interviews with key internal stakeholders of the company.

In conclusion, the key element in achieving a net zero state would require a concerted effort among policymakers, politicians, business entities, Non-Governmental Organizations, financial institutions, academia, and other supporting regimes. This would require collaborative action from multiple stakeholders to enable the development and adoption of cost-effective technologies, supporting frameworks, and resilient policies that support sustainable practices.

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## APPENDICES

### Appendix 1: List of companies and information pertinent to data collection.

Information about the company		
No.	Company Name	Link the sustainability report, annual report or announcement.
1	Nordea Bank	<a href="https://www.nordea.com/en/press/2021-02-04/nordea-sets-target-to-become-a-net-zero-emissions-bank-by-2050">https://www.nordea.com/en/press/2021-02-04/nordea-sets-target-to-become-a-net-zero-emissions-bank-by-2050</a> ; <a href="https://www.nordea.com/en/sustainability/our-sustainability-targets">https://www.nordea.com/en/sustainability/our-sustainability-targets</a>
2	Sampo plc	<a href="https://www.sampo.com/sustainability/climate-and-environment/metrics-and-targets/own-operations/">https://www.sampo.com/sustainability/climate-and-environment/metrics-and-targets/own-operations/</a>
3	Nokia	<a href="https://www.nokia.com/about-us/sustainability/environment/#remote-environmental-monitoring-system">https://www.nokia.com/about-us/sustainability/environment/#remote-environmental-monitoring-system</a>
4	Fortum	<a href="https://www.fortum.com/sustainability">https://www.fortum.com/sustainability</a>
5	Neste	<a href="https://www.neste.com/sustainability">https://www.neste.com/sustainability</a>
6	UPM-Kymmene	<a href="https://www.upm.com/responsibility/climate-actions/">https://www.upm.com/responsibility/climate-actions/</a>
7	Stora Enso	<a href="https://www.storaenso.com/en/sustainability">https://www.storaenso.com/en/sustainability</a>
8	Kone	<a href="https://www.kone.com/en/sustainability/">https://www.kone.com/en/sustainability/</a>
9	Kesko	<a href="https://www.kesko.fi/en/company/responsibility/sustainability-strategy/">https://www.kesko.fi/en/company/responsibility/sustainability-strategy/</a>

## Appendix 2: Framework used to collect data

Information about the company							
Company Name	Organization Type	Headquarters	Link the PR, report or announcement. (Add additional links on a new line)	Country	No. of employees	Sector	Annual revenue

Net zero Information					
What is the current status of the net zero target?	Does the company have a net zero target? If so, how does the company describe it?	Carbon neutrality, Climate neutrality, Net -zero	Is the company a member of the Race to Zero?	Commitment Date	Net-Zero Year time frame

Information on Short term targets							
Does the entity have near term targets	Short term Target status	Short term Target goals	Short term Target Year	Short target baseline year	Short term target other	Short target text	List the intermediate targets if they exist.

Information on Long term targets								
Does the entity have long term targets	Long term Target status	Long term Target goals	Long term Target Year	Long target baseline year	Long term target other	Long term target text	List the long term targets if they exist.	End target percentage reduction

Scope and Coverage of targets					
Scope of climate impacts (CO <sub>2</sub> , all GHG's, GHG's and other climate impacts)	Coverage - Scope 1?	Coverage - Scope 2?	Coverage - Scope 3?	Scope of activities Operations value chain, products, other s)	Inventory year

Reporting Mechanism			
Governance - Is there a mechanism for reporting on progress regularly?	Governance - Is management accountable to the board or external parties	Governance - Has the company published NFR?	Governance notes

Information related to Offsetting							
Do the targets involve the offsetting or compensation?	What extent of the emissions are offset?	Under what circumstances is the company offsetting their emissions?	Voluntary Carbon Markets	EU ETS	Carbon offset service providers?	Motivations for compensating	Reasons for compensating

### Appendix 3: The recommendations from SBTi (Carrillo Pineda et al., 2020) used to build data collection framework.

#### Initial recommendations for corporate net-zero target setting

On the basis of the analysis conducted in this paper, the following initial recommendations are provided for companies seeking to set and implement robust net-zero targets. These recommendations will be followed by development of more detailed guidance and criteria that the SBTi will develop using an inclusive and transparent multi-stakeholder process:

1. **Boundary:** A company's net-zero target should cover all material sources of GHG emissions within its value chain.
2. **Transparency:** Companies should be transparent about the sources of emissions included and excluded from the target boundary, the timeframe for achieving net-zero emissions, the amount of abatement and neutralization planned in reaching net-zero emissions, and any interim targets or milestones.
3. **Abatement:** Companies must aim to eliminate sources of emissions within its value-chain at a pace and scale consistent with mitigation pathways that limit warming to 1.5°C with no or limited overshoot. During a company's transition to net zero, compensation and neutralization measures may supplement, but not substitute, reducing value chain emissions in line with science. At the time that net zero is reached, emissions that are not feasible for society to abate may be neutralized with equivalent measure of CO<sub>2</sub> removals.
4. **Timeframe:** Companies should reach net-zero GHG emissions by no later than 2050. While earlier target years are encouraged, a more ambitious timeframe should not come at the expense of the level of abatement in the target.
5. **Accountability:** Long-term net-zero targets should be supported by interim science-based emission reduction targets to drive action within timeframes that are aligned with corporate planning and investment cycles and to ensure emission reductions that are consistent with Paris-aligned mitigation pathways.
6. **Neutralization:** Reaching net-zero emissions requires neutralizing a company's residual GHG emissions with an equivalent amount of carbon removals. An effective neutralization strategy involves removing carbon from the atmosphere and storing it for a long-enough period to fully neutralize the impact of any GHG that continues to be released into the atmosphere.
7. **Compensation:** While reaching a balance between emissions and removals is the end goal of a net-zero journey, companies should consider undertaking efforts to compensate unabated emissions in the transition to net-zero as a way to contribute to the global transition to net-zero.
8. **Mitigation hierarchy:** Companies should follow a mitigation hierarchy that prioritizes eliminating sources of emissions within the value chain of the company over compensation or neutralization measures. Land-based climate strategies should prioritize interventions that help preserve and enhance existing terrestrial carbon stocks, within and beyond the value chain of the company.
9. **Environmental and social safeguards:** Mitigation strategies should adhere to robust social and environmental principles, ensuring amongst others, protection and/or restoration of naturally occurring ecosystems, robust social safeguards, and protection of biodiversity, amongst others.
10. **Robustness:** Compensation and neutralization measures should: (a) ensure additionality, (b) have measures to assure permanence of the mitigation outcomes, (c) address leakage and (d) avoid double-counting.



### Appendix 3: Content analysis on Role of Offsetting

Company No.	Phrase	Concept	Theme
Nordea	Carbon offsets for emissions from internal operations. Despite our best efforts to limit our internal carbon footprint, some emissions still remain difficult to reduce. For these, we purchase carbon offsets to reduce equivalent emissions elsewhere.	Extent of offsetting in operations	Extent of compensation
Nordea	Offsetting to achieve net positive carbon contributions by 2030, after abatement in value chain.	What is the goal of the offsetting efforts in relation to achieving climate goals, taking into account the abatement efforts?	Extent of compensation
Nordea	Nordea purchases carbon offsets to reduce equivalent emissions elsewhere for some emissions that remain difficult to reduce despite its best efforts to limit its internal carbon footprint	What is the goal of the offsetting efforts in relation to achieving climate goals, taking into account the abatement efforts?	Extent of compensation
Nordea	Overall, Nordea purchases carbon offsets to reduce equivalent emissions elsewhere for some of its difficult-to-reduce internal carbon footprint and fully offsets residual emissions from its internal operations.	To what extent has the company included offsetting in their operations?	Extent of compensation
Sampo	Sampo Group also offsets its remaining greenhouse gas emissions through certified carbon offset projects	In 2020, how much of Sampo Group's total greenhouse gas emissions were offset through certified carbon offset projects?	Extent of compensation
Sampo	In 2020, Sampo Group's total greenhouse gas emissions were 16,413.2 tCO <sub>2</sub> e, and the company offset 15,000 tCO <sub>2</sub> e through certified carbon offset projects.	Sampo Group also offsets its remaining greenhouse gas emissions through certified carbon offset projects	Extent of compensation

Fortum	It is mentioned that Fortum has set a target to be carbon neutral in its own operations by 2035. The company aims to achieve this target by reducing its emissions and compensating for the remaining emissions through verified emission reduction projects.	What is Fortum's target and strategy for achieving carbon neutrality in its own operations by 2035?	Extent of compensation
Fortum	Emissions from air travel; Scope 3 - Emissions from air travel; Certified Emissions Reduction (CER) from World Bank's Prototype Carbon Fund (PCF)	What type of emissions are included in Fortum's Scope 3 category, and how does the company offset these emissions specifically related to air travel?	Extent of compensation
Neste	Any residual production emissions that cannot be mitigated will be compensated through credible methods.	What methods does Sampo Group use to compensate for residual production emissions that cannot be mitigated?	Extent of compensation
UPM	We support our customers in offsetting carbon emissions of paper or the paper end-product.	How does Sampo Group support its customers in offsetting the carbon emissions of paper or the paper end-product?	Extent of compensation
Stora	The remaining emissions are offset by using the CarbonZero service by Stora Enso, in collaboration with compensation partner South Pole.	Who collaborates with Stora Enso to provide the CarbonZero service for offsetting the remaining emissions of Sampo Group?	Extent of compensation
Kone	We compensate for the remainder of the emissions including CO2 emissions caused by direct and indirect maintenance activities for spare parts, maintenance visits and facilities.	What emissions does Sampo Group compensate for, including CO2 emissions, related to direct and indirect maintenance activities such as spare parts, maintenance visits, and facilities?	Extent of compensation
Kesko	During 2025–2030, we will offset the emissions generated. We will continue to take measures to reduce emissions towards zero by the end of 2030, after which we will have no need for offsets.	Until when does Sampo Group plan to offset the emissions it generates? What is the company's target regarding emissions reduction by the end of 2030?	Extent of compensation