Science-Based Targets for a Low-Carbon Economy

– Drivers and Barriers for Global Companies

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Abstract

This thesis addresses the Science-Based Targets initiative (SBTi) in the context of two case studies on *HEXPOL AB* and *Nolato AB*. Findings suggest that companies with an advanced approach to sustainability usually have already implemented the SBTi. Therefore, for these companies, implementation of this initiative does not result in major internal or external changes. The interviews suggest that implementing these targets has brought additional benefits for them including improved communication and greater validation of their approach to carbon management. The paper recommends that both *HEXPOL AB* and *Nolato AB* take steps to prepare before they commit to the initiative. Each company should decide which type of adopter they want to be, based on the Bell Curve that explains a technology adoption lifecycle. Such decision can contribute to the future pathway of activities and other decisions related to CO_2 reduction. Companies location and ability to purchase renewable energy can significantly contribute to the carbon dioxide emissions reduction. As for other findings, the paper expects to see more disclosure and work around the Scope 3 emissions. In addition, more uptake of the SBTi by the companies is projected in the future, contributing to the successful transition to a low-carbon economy and climate change mitigation.

Keywords: CDP, corporate climate action, drivers and barriers, science-based targets, low-carbon economy

Executive Summary

Background and Problem Definition
This thesis analyses the Science-Based Targets initiative (SBTi) for a low-carbon economy. Since the establishment of Carbon Disclosure Project (CDP), an investor-led organisation promoting disclosure of corporate carbon emissions, many companies have joined the initiative and are now annually reporting data to CDP. However, despite the effort of this initiative to address climate change, the effect is probably modest as most of the time companies set carbon reduction targets based on the likelihood of reaching them rather than on scientific basis. CDP aims to increase disclosure, and it does not set targets. It is also not clear if such voluntary corporate climate action is ambitious enough.

In 2015, the Science-Based Targets initiative was set up as one of the consequences of the Paris Agreement 2015 to combat climate change. The SBTi is a collaboration among Carbon Disclosure Project (CDP), World Resources Institute (WRI), World Wide Fund for Nature (WWF), and the United Nations Global Compact (UNGC) as well as the We Mean Business Coalition initiative. The SBTi aims to limit total global average temperature rise to 2°C, going in line with science. This initiative aims to assist companies in setting targets based on science, to address climate change and escalate the transition to a low-carbon economy. Such targets go in line with science and are very ambitious. As for the end of May 2017, a total of 266 companies have committed to the SBTi, out of which 46 companies have their targets approved, and the number is rising steadily.

Aim and Research Questions
The aim of this research is: 1) to investigate drivers and barriers in companies that already have implemented the SBTi, 2) to gather observations from organisations that have an interest in CDP and SBT (consultancies, investors); and 3) to use the knowledge to contribute to the two case studies, *HEXPOL AB* and *Nolato AB* (further as *HEXPOL* and *Nolato*) in analysing the SBTi application in practice. This thesis seeks to ask two research questions:

- *RQ1:* How is the initiative perceived and what are the main drivers and barriers for companies to implement SBTi?

- *RQ2:* How can SBTi be applied in practice – case studies at *HEXPOL* and *Nolato?*

Research Design and Methodology
To answer these research questions, this thesis seeks to employ various methods of the research and analysis. The author collected data from a number of sources such as interviews, reports, grey and academic literature related to the topic. To answer RQ1, the author conducted expert interviews with representatives from companies that have approved targets in place and have experience in reporting to CDP. The interviews were coded, to identify drivers and barriers to implement the SBTi. These findings were compared to the drivers and barriers mentioned by the SBTi to see if there are any differences or similarities. Finally, those findings were then applied to two case studies, *HEXPOL* and *Nolato* to answer RQ2.

To answer RQ2, the author also conducted a literature review on the SBTi, including both academic articles and grey literature. The author explored the science behind the initiative to get an in-depth perspective. Additional interviews were conducted by the author with the organisations and investors related to the science-based targets to understand its global role. The author also analysed two companies to understand their sustainability performance. In

order to answer the RQ2, the author applied the data collected from RQ1 and RQ2 to *HEXPOL* and *Nolato*.

Findings for RQ1:
The analysis to answer the RQ1 found that there are both, barriers and drivers to implementing the SBTi. It is important to highlight that there is no literature on this topic. Therefore, this research is explorative in nature. A total of seven barriers were identified by the author as the result of the interviews. Barriers mentioned include a future change in the methodologies that can affect current achievements; internal communication within a company to set targets; setting longer-term target in comparison to the previous ones; prediction of the market development that can affect a contain sector; reducing Scope 3 emissions; technological innovation that can affect a certain sector; and time for improvement. Some companies stated that they did not face any barriers to implement the initiative. Companies that faced barriers have identified and then successfully addressed those barriers. For an effective implementation of the SBTi and better sustainability performance, it is essential for companies to be aware of possible barriers in advance.

As for drivers, a total of nine drivers were identified by the author, with some drivers being repeated. Drivers include easier communication of the carbon reduction targets and improvement; cost and consumption reduction as a result of the SBT; enhanced customer relations; good internal and external governance of a company; enriched investor relations; new business opportunities in a sector/business; development and application of new business models without CO_2; higher CDP ratings; replication; improved report utilities; strengthen a company's reputation; better transparency; and validation. Companies that have already implemented the SBTi can be seen as innovators that want to reliably and responsibly communicate their CO_2 emissions reduction ambitions. These companies want to ensure there is a logical internal follow-up of their achievements. In comparison to the four drivers mentioned by the SBTi, companies-innovators mentioned more drivers for the SBTi implementation. It is important that companies understand these drivers to ensure a successful transition to a low-carbon economy.

Findings for RQ2:
As for the RQ2, the way the companies-innovators have implemented the SBTi was assessed and then applied to two case studies. *HEXPOL AB* and *NOLATO AB* current CO2 reduction activities were broken down by Scope 1, 2 and 3 into areas such as transport, suppliers, use of fossil fuels, products, fossil-free electricity and increased energy efficiency. The CO2 reduction potential of the current and planned activities was evaluated and the possibilities for more actions were identified for each of the specified areas. This analysis has shown that both companies have further opportunities to reduce carbon emissions.

These two companies do not aim to implement the SBTi and internal carbon tax in the next few years, yet they both have opportunities to pursue emission reductions in Scope 1, 2 and 3. Such reductions can be achieved by having a long-term perspective and introducing a life-cycle thinking along with practical measures to achieve them. These actions may result in a change of company's business model or operations. Such actions can ensure that companies are ready for the SBTi implementation and choose one of the adopter's types, based on the Rogers Bell Curve. The author proposed a number of recommendations to *HEXPOL* and *Nolato* to prepare themselves for the low-carbon economy.

Recommendations
From the interviews and preparatory work, the author distilled six key aspects that can help companies implement SBTi. Recommendations for the two studied companies are based on

these six aspects that were mentioned by the nine leading companies with approved targets. These aspects include 1) CO2 reduction target; 2) the type of methodology used; 3) concrete actions to reduce carbon emissions; 4) internal changes to processes or ambitions as a result of the SBTi implementation; 5) perceived benefits of the SBTi; 6) companies attitude to the SBTi. These six aspects were applied to *HEXPOL* and *NOLATO* to advise them whether to implement science-based targets and/or the SBTi in the future. Recommendations include a list of actions companies could follow to strengthen their current activities and initiatives to reduce carbon emissions. In addition, based on the Rogers Bell Curve, the categories of adopters, two companies are recommended to decide what type of adopter they want to be and take relevant actions to achieve that goal.

The recommendations to *HEXPOL AB* and *Nolato AB* include:

- Establish a life-cycle perspective on carbon dioxide emissions, including raw materials, transport and use of products;
- Go through existing carbon reduction activities and introduce a unified set of actions for all sites to implement (if relevant);
- Continue implementation of ISO 50001;
- Decide if targets will be group-wide, geography-wide or site-wide. Introduce more ambitious targets if necessary;
- Based on the choice of targets, decide if some sites are allowed to expand (e.g. size, production, activities);
- Introduce consistent data collection for Scope 3;
- Consider introduction of an internal carbon tax as a tool to reduce CO_2 emissions;
- In case finance and resources permit, go through the 'exercise' of setting science-based targets (e.g. the SBTi), to understand risks and opportunities of the low-carbon economy.

It is important to make science-based targets part of company's business model to successfully transition to a low-carbon economy. The author hopes that this research will trigger discussions around the SBTi and support more companies to set science-based targets either by themselves or with the help of the initiative.

Other Findings
First, companies interviewed were already engaged in science-based targets before the SBTi was set up. Second, the SBT initiative drives companies to rethink and change their business model encouraging lower carbon emissions. Third, more quality data and more disclosure are needed by companies to set credible targets. Interviews suggest larger uptake of the initiative in the future. These findings can contribute to the future research and provide a comprehensive understanding around corporate climate action.

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Abbreviations

2°C	2° Celsius
BNEF	Bloomberg New Energy Finance
CERES	Centre for Education and Research in Environmental Strategies
CDP	Carbon Disclosure Project
CO_2 emissions	Carbon Dioxide Emissions
EU	European Union
EU ETS	European Union Emissions Trading System
GHG	Greenhouse Gases
GRI	Global Reporting Initiative
IPCC	Intergovernmental Panel on Climate Change
NGO	Non-governmental Organisation
SBT	Science-Based Target
SBTi	Science-Based Targets initiative
SDGs	Sustainable Development Goals
TCFD	Task Force on Climate-related Financial Disclosures
UN	United Nations
UNEP	United Nations Environment Programme
WRI	World Resource Institute

1 Introduction

This chapter first presents background information on the research, on Science Based Targets (SBT), problem definition, limitations and scope. Second, it gives an overview of the methodology and presents the aim of the research along with the research questions. Finally, it explains ethical considerations and intended audience of this paper.

1.1 Background

Climate change is a change in average weather conditions, more specifically, in the statistical distribution of weather patterns over a long time (Solomon, Qin, et al., 2007). Climate change is caused by a number of factors but not limited to certain human activities, plate tectonics, variations in solar radiations on Earth, and biotic processes. The term 'Climate Change' is often referred to global warming (anthropogenic climate change) which is caused by human activities different to changes in climate that may have been caused by natural processes. The Earth's global average temperature continues to increase, because of the CO_2 emitted naturally and manmade emissions over the years (IPCC, 2014). Climate Change effects are not limited to the sea level rise, global temperature rise, and shrinking ice sheets. As it is impossible to address Earth's natural processes, it became clear that it is necessary to revise human activities to address climate change successfully.

Anyone who believes in climate change, from individuals to nations, can help address it through their activities. For example, different actors can set targets to minimise their carbon emissions, use recyclable materials, use energy efficient technology and many other activities. It also depends on the area of mitigation. The carbon emissions in the atmosphere are the primary manmade activity that possibly can be mitigated, or at least reduced. Besides nations, companies need to play a significant role in addressing climate change by reducing their carbon emissions. For decades, many companies have been setting targets to improve and communicate their environmental performance. However, carbon emissions targets set by the companies were not based on science but rather on the company's feasibility to achieve them. Based on the UN climate report, manmade emissions are projected to increase the global temperature from 3.7°C to 4.8°C compared to the average pre-industrial temperatures (IPCC, 2017). Scientific evidence suggests that minimising the temperature rise to 2°C would minimise environmental impact on the planet.

In 2015, the Paris Agreement was set, an agreement within the UNFCCC dealing with GHG mitigation, finance and adaptation starting in 2020. Based on this agreement, every country plans, regulates, and reports on its contribution to global warming mitigation. The Paris Agreement stated to hold "the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels" (UNFCCC Secretariat, 2015 p.22). This agreement is incorporated into countries' national plans and targets. Yet, the question remains, how can the remaining carbon budget be distributed among the nations. Besides nations, companies are one of the reasons for manmade emissions, should incorporate science into its operations to set benchmarks for their environmental actions and control greenhouse gas (GHG) emissions (Putt del Pino et al., 2016; Rankin et al., 2011).

Recently, a number of voluntary and mandatory carbon disclosure and reduction schemes appeared on the market. In addition, regulatory changes around energy efficiency appeared on the national level. Companies started to set more aggressive targets; whiles investors became more involved in identifying and mapping climate risks and opportunities. The studies by Clarkson et al. (2008) and Mitchell et al. (2006) suggest that companies that disclose their carbon emissions that are based on environmental improvement contribute to the pertinent

decision-making. However, some scientists are concerned about the credibility of the voluntary carbon disclosure because some companies may take advantage to influence the stakeholder's decisions, or in other words, to 'green-wash' people's minds instead of contributing to the environment (Andrew and Cortese, 2010; Neu et al., 1998). A poor data quality and a number of methodologies that produce different numbers can also be reasons for concern. For the purpose of this research, the author concentrates on the CDP voluntary scheme as the leader in the area.

Based in the United Kingdom, operating since the year 2000, CDP as a non-profit initiative is one of the voluntary schemes that encourages companies to disclose carbon emissions, working with on behalf of the institutional investors together with companies. CDP aims to bypass national interests such as strict national limits on GHG emissions and focus on individual companies instead of nations (CDP, 2017). It collects information on carbon emissions by surveying companies risks and strategies in relation to carbon emissions and management. The CDP grades companies based on their disclosure level. High scores imply an internal understanding of climate change-related issues concerning the business. Reporting emissions to CDP shows that companies are aware of their impact and are setting ground to reduce emissions, address risks and opportunities.

According to Kolk, Levy and Pinkse (2008), CDP is a political project because of continuous institutionalisation of carbon disclosure by standardising the reporting emissions. In 2014, around 2,000 companies reported their emissions to CDP (CDP, 2014). The quality of the reports submitted to CDP by companies varies due to the scoring nature of the system. Multiple reasons can affect the quality of the report. Companies are regularly scored on whether they have answered the question, rather than on the quality of the answer, perhaps due to insufficient motivation to provide relevant information to CDP (Matisoff, Noonan and O'Brien, 2013). According to Kolk, Levy and Pinkse (2008), CDP lacks external verification, and a small amount of data collected is audited.

Several studies suggest that improved disclosure does not always relate to the improved environmental performance of the company (Matisoff, Noonan and O'Brien, 2013; Delmas and Blass, 2010). There are no studies available on measuring positive impact on corporate climate change policies, goals and performance due to the complexity and changes in the CDP survey. Matisoff, Noonan and O'Brien (2013) stated that voluntary disclosure scheme might allow less consistency and standardisation, challenging comparability among companies over time. The challenges faced by CDP are similar to the ones confronted in environmental/sustainability reporting. Yet, the efforts of CDP to improve comparability and standardise reporting emissions cannot be denied. According to Matisoff, Noonan and O'Brien (2013), CDP has facilitated standards for carbon accounting methodology. The NGO has improved its surveys since the year 2000 by adapting to the companies, putting forward the right questions to get relevant and useful information that addresses climate change, facilitating transparency. In addition, the initiative provides useful information to the investors for their decision-making (Luo and Tang, 2014; Kolk, Levy and Pinkse, 2008).

1.2 Problem Definition

Since the establishment of CDP, more and more companies have responded and are now annually reporting their GHG emissions to CDP. Because of the institutionalisation and commensuration of carbon disclosure, this trend contributes to the corporate climate action (Kolk, Levy and Pinkse, 2008). However, despite the initiatives to address climate change, the effect is probably modest as most of the time carbon reductions targets are of their own choice and are not based on science. It is also not clear if such voluntary corporate climate action is ambitious enough.

In 2015, the Science-Based Target initiative (SBTi) was set up as one of the consequences of the Paris Agreement 2015 to combat climate change. The SBTi is a collaboration among Carbon Disclosure Project (CDP), World Resources Institute (WRI), World Wide Fund for Nature (WWF), and the United Nations Global Compact (UNGC) as well as the We Mean Business Coalition initiative. The SBTi aims to limit total global average temperature rise to 2°C going in line with science. Since 2015, as for the end of May 2017, a total of 266 companies have committed to the SBTi, out of which 46 companies have their targets approved, and the number is rising steadily. A more comprehensive presentation of the initiative can be found in Chapter 3.

The purpose of this paper is to analyse whether the SBTi is the next step to address climate change by companies, or it is another tool to influence investors' decision-making, or perhaps both. For the purpose of the research, the author analyses the practical implementation of the SBTi on two companies that have several years of experience reporting to CDP, but have not yet demonstrated a commitment to the SBTi. This research reveals a practical application of the SBTi for further corporate climate action.

1.3 Aim and Research Questions

The aim of this research is: 1) to investigate drivers and barriers in companies that already have implemented SBTs, 2) to gather views from organisations that have an interest in CDP and SBTi (consultancies, investors); and 3) to use the knowledge to contribute to the two case studies, *HEXPOL AB* and *Nolato AB* (further referred to as *HEXPOL* and *Nolato*) in analysing the SBTi application in practice. Both companies already have experience reporting to CDP, and this research assesses whether the SBTi is the next step that these companies can pursue to contribute to a low carbon economy. For this purpose, the study examines what the drivers and barriers for companies to commit to the SBTi are. It also applies the practical application of the SBTi from those companies to *HEXPOL* and *Nolato*. To further guide the research, the author assigned both RQs with a set of sub-questions.

Table 1-1. Style 'Research Questions'

RQ1:	More than 50 companies have adopted SBTs and have had their targets approved by the SBTi. How is the initiative perceived and what are the main drivers and barriers for companies to implement SBTi?
Sub-questions:	- How did companies, with approved climate targets, implement the SBTi and what can be learnt from the implementation process?
RQ2:	How can the SBTi be applied in practice – case studies at *HEXPOL* and *Nolato*?
Sub-questions:	- What are the main drivers and barriers for the case studies? - Both companies have already implemented targets for energy efficiency and carbon dioxide emissions. What changes would implementation of SBTi bring to the companies (e.g. tighter targets, long-term perspective, practical measures, change in business model)?

Source: Author (2017)

1.4 Overview of Methodology

To answer the research questions, the author collected data from a number of sources such as interviews and grey and academic literature. To answer RQ1, the author conducted expert interviews with representatives from companies that have approved targets in place according to the SBTi and have experience in reporting to CDP. The interviews were coded, aiming to identify drivers and barriers to implement the SBTi. These findings were compared to the drivers and barriers mentioned by SBTi to identify difference and similarities and then applied to the case studies. Also, the author interviewed organisations with interest in SBTi.

As for the RQ2, a literature review was conducted on SBTi, including both academic articles and grey literature. In order to answer the RQ2 and its sub-questions, the data collected through the literature review is applied to *HEXPOL* and *Nolato*. The author investigated the current performance, initiatives, and ongoing actions to minimise their carbon emissions. This step was conducted to analyse how SBTi could be applied in practice to the case studies.

1.5 Limitations and Scope

For this paper, the scope is narrowed to the group of companies that have already implemented the SBTi and have experience reporting to CDP. Companies that do not have had their targets approved were not considered. The SBTi is a relatively new area of research, whereas the majority of the companies committed to the SBTi are still in the process of setting their targets. Therefore, this research is to be recognised as explanatory. Companies that implement the SBTi are predominantly global and address GHG scopes based on their operations. Consequently, the geographical scope is not a limitation of this study.

To get more in-depth information on the SBTi implementation, the author contacted all forty-six companies. The study was to some extent limited by the possibility to get direct contact with persons that are responsible for the implementation of the SBTi. Some companies allowed to send messages only through an official web page form, which slowed down the process. A total of twelve companies replied expressing their interest and enthusiasm to contribute to this research. The informants replied, are directly engaged with SBTi and are experts in relation to the SBTi implementation. Some informants preferred to answer interview questions in writing because of the convenience and time availability, therefore evading the perception of the answers in person or/and telephone interviews. However, they did not reply back after three reminders, and therefore the author did not consider them. This research is limited by findings generalisation acquired from in-person, telephone and written interviews.

One of the aims of this paper was to analyse SBTi implementation to the case studies and to provide guidance whether or not the initiative could be the next step in their transition to a low-carbon economy. The scope was based on 1) the participating companies interest to get a deeper understanding of SBTi and the implementation process, and 2) the possibility of the researcher to get access to relevant and detailed background data. Therefore, with the supervisors' advice, *HEXPOL* and *Nolato* were selected. Both companies are based in Sweden and are operating worldwide. The companies have been reporting to CDP for 6 and 2 years, respectively, but have not yet implemented SBTi. Both, *HEXPOL* and *Nolato* get a decent score in the CDP grading system. However, currently, they do not have the ambition to get higher scores by collecting additional climate-change information. Data that is already available for the annual sustainability report is also used for the CDP reports (Brorson, 2017).

1.6 Ethical Considerations

Ethical considerations were taken into account for the purpose of this research. Kvale and Brinkman (2009 p.167) stated that there are some ethical considerations such as 'confidentiality, informed consent, and the effects of the researchers' that affect the interview process and conclusions. Throughout the interviews, the author ensured both confidentiality and informed approval. The purpose of the data gathering and its usage was clarified at the beginning of the interviews. The data acquired during the interviews were sent to the representative interviewees for confirmation and validation, before the publication of this paper.

The author collected primary data through interviews with the experts from representative companies that have their SBTi targets approved. Organisations that are engaged in science-based targets were also contacted by the author to get a broader perspective on the initiative. Some of the informants preferred to answer questions by writing either due to their busy schedule or ability to express their thoughts better. In cases where interviewees agreed for the phone interview and allowed to make audio records of the interviews, these were used for academic purposes and not shared with other parties. In occasions where informants did not agree their interviews to be recorded, the author took minutes manually to ensure the content of the interviews. In cases where the author did not have time to ask the consent for audio recordings, the interviews were manually recorded to ensure the content of the interviews.

1.7 Intended Audience

This thesis is written for the completion of the Master of Science Programme in Environmental Management and Policy held at the International Institute for Industrial Environmental Economics (IIIEE), Lund University. It is open for staff and student access.

As mentioned before, this paper is an exploratory work, setting grounds for scholars to conduct further research in relation to the SBTi. This research may be useful for companies aiming to implement SBTi, based on the relevant documentation related to SBTi and suggestions made by the author for the case studies of *HEXPOL* and *Nolato*. This research may also be valuable for corporate stakeholders, investors, and national policymakers concerned about the quality of voluntary GHG disclosure. In addition, it may contribute to scientists to understand institutionalisation of the corporate climate action initiatives, bringing companies needs along with the science. Moreover, this research may benefit re-evaluation of the importance of corporations to address climate change and reinforce new trends in setting targets.

1.8 Disposition

This paper is organised as follows; Chapter 2 presents a research design used to conduct this thesis and methods for data collection. It focuses on data analysis such as literature analysis, expert interviews and qualitative content analysis.

Chapter 3 provides an in-depth literature analysis on the Science-Based Targets initiative and its evolution since Paris Agreement 2015. It highlights the SBTi's position in the world and assesses the initiative from the technology adoption lifecycle perspective.

In chapter 4, the key findings from interviews are presented. It is structured in multiple parts. First, findings from companies with approved science-based targets are introduced. Subsequently, the chapter demonstrates findings from the interviews with organisations connected to science-based targets.

Chapter 5 introduces two case studies, *HEXPOL* and *Nolato* separately. It is structured in multiple parts. First, *HEXPOL* is presented, focusing on its sustainability initiatives and targets, followed by its areas of energy; carbon dioxide emissions; and transport, product and suppliers. Subsequently, the same introduction of the company is done for *Nolato*.

In Chapter 6, the findings are critically interpreted against two research questions (RQs). First, the barriers and drivers are analysed (RQ1), followed by an assessment of benefits for the two case studies to implement the SBTi (RQ2). Then, the data collected from the interviews is applied to *HEXPOL* and *Nolato* to understand its application and necessary achievements needed to implement the SBTi. It is followed by a brief discussion of other findings identified throughout the research. Finally, reflections on the research, recommendations to the two case studies and future research are presented.

The thesis is conducted in chapter 7 that summarises the findings of this research and gives rationale how they can support companies that want to do a *'fair share'* addressing climate change and transition to a low-carbon economy.

2 Research Design/Methodology

This chapter presents the method to address the research questions. First, it presents main assumptions and research method and then it introduces two procedures for data collection and analysis.

2.1 Research Design and Assumptions

The Research Questions presented in Chapter 1 include different objectives in relation to the SBTi. These objectives include: first, the identification of the drivers and barriers for companies to implement the SBTi as well as actions to achieve the target; second, the analysis of the SBTi applied in practice on the who Swedish companies, *HEXPOL* and *Nolato*. In order to realise these objectives, the author investigates these RQs with the complementary methods presented in Table 2-1. This research is exploratory and primarily inductive because the SBTi is relatively new and lacks literature consideration.

Table 2-1. RQs and methods

#	*RQs*	*Methods*
1	More than 50 companies have adopted SBTs and have had their targets approved by the SBTi. How is the initiative perceived and what are the main drivers and barriers for companies to implement SBTi? - How did companies, with approved climate targets, implement the SBTi and what can be learnt from the implementation process?	Literature analysis. Content analysis – interviews with experts from companies with approved targets; case studies presented by the SBTi. Interviews with organisations that have an interest in SBTi.
2	How can SBTi be applied in practice – case studies at *HEXPOL* and *Nolato?* - What are the main drivers and barriers for the case studies? - Both companies have already implemented targets for energy efficiency and carbon dioxide emissions. What changes would implementation of the SBTi bring to the companies (e.g. tighter targets, long-term perspective, practical measures, change in business model)?	Content analysis – sustainability reports and emissions disclosure from the two case studies.

Source: Author (2017)

For the RQ1, the qualitative research method is based on several assumptions. The first assumption is that pioneering companies have drivers and barriers to implement the SBTi. The second assumption in relation to this RQ is that there are more drivers than barriers to commit to the initiative. The final assumption is that the companies that have their targets approved are willing to improve and have developed a set of actions to achieve the goal.

As for the RQ2, the two case studies of Swedish companies were taken to demonstrate how the SBTi would look like for *HEXPOL* and *Nolato*. The author assumed that it is challenging for the companies in certain industry/sector to minimise their emissions in comparison to others.

2.2 Methods for Data Collections and Analysis

As mentioned before, two research methods have been used to answer two research questions. RQ1 is answered based on the interviews; whiles RQ2 relies on the case studies and the data acquired from both, the interviews and RQ1.

2.2.1 Literature Analysis

The literature review method is based on a comprehensive research focusing on academic articles, grey literature and websites. The objective of this method is to understand the Science Based Target initiative's target setting process, and its possible drivers and barriers. Despite the lack of academic literature available on the SBTi itself, the author acknowledges the existing debate on the three basis; the initiative is based on the IPCC, the 2°C target and the GHG Protocol. Consequently, for the purpose of this thesis, academic literature on these three basis is assessed. The initiative is also compared to the ALARP principle, to provide more understanding of the initiative. In addition, this initiative analysed from the Technology Adoption Lifecycle reinforcing the fact that the SBTi is a 'young' initiative, therefore primarily advanced companies have their targets approved at this stage. Ultimately, there is a time for improvement, and have more companies to commit.

2.2.2 Interviews with Companies

The companies' interviews demonstrate the primary method for data collection to answer RQ1. Between May 20 and August 20, 2017, 46 companies, which have approved targets, were contacted by e-mail or via phone. Interviewees are all experts in the area of science-based targets. As a result of contacting companies via emails or phone, the companies were selected based on their interest to participate in the research. Ultimately, the author conducted nine interviews between May 22 and August 28, 2017, through phone and Skype. The length of conversations varied from 15 minutes to 90 minutes, depending on the availability of the interviewee. A list of interviewees contributed to this study is presented in Table 2-2.

Table 2-2. Companies and Respective Interviewees

#	Company Name	Company Type	Date	Informant	Occupation
1	Advanced Micro Devices, Inc	Semiconductors and Semiconductors Equipment	Jun 2016	Justin Murrill	Head of Corporate Responsibility
2	Dong Energy	Electric Utilities	Jun 2017	Svend Brun Hansen - Environmental Advisor Sabine Lohse - Investor Relations Officer	
3	Eneco	Oil and Gas	Mar 2017	Gerben Meijer	Sustainability Manager
4	Enel SpA	Electric Utilities	Dec 2015	Federica Todaro	Investor Relations
5	International Post Corporation (IPC)	Air Freight and Logistics	Feb 2016	Pieter Reitsma	Manager Sustainability

6	PostNord AB	Air Freight and Logistics	Apr 2016	Søren Boas	Senior Advisor Sustainability
7	Sopra Steria Group	Software and Services	Jun 2017	Siva Niranjan	Head of Environmental Sustainability
8	Swisscom	Telecommunication	Sep 2016	Pascal Salina	Corporate Responsibility Manager
9	Verbund AG	Electric Utilities	Oct 2016	Anonymous	n/a

Source: Author (2017); SBTi (2017e)

The majority of the companies' websites have an embedded system for contact without direct contacts with the departments. A total of nine companies contacted through such system all replied with a standard answer that they are receiving a large number of such requests from university students and researchers. Therefore, those companies took a policy to decline participation in such activities as a whole. Those companies also emphasised the availability of the information on the respective company's website. However, information available on the website of those companies were either not enough or not relevant for this research. Consequently, the author did not consider those companies.

Subsequently, for those companies that have replied, semi-structured interviews were organised, with the companies' experts on the SBTi, to acquire primary data. The author chose semi-structured interview format due to its flexibility around the topic and possibility to adapt questions to interviewee's knowledge and explore topics of particular importance throughout the interview process. The interview guide contains 20 questions relevant for the RQ1. To answer RQ2, the author applies those findings to the main question and sub-questions. For the interview guide, please refer to Appendix I. The interview guide was reviewed by the thesis supervisor and a fellow student at the IIIEE. Recommendations from these reviews were integrated into the final version used for the interviews.

Prior to the interviews, the author took consent from the interviewees to make audio recordings. Otherwise, handwritten notes were taken during the interviews. At times when the interviews have already started, the author relied only on the handwritten notes. After the author analysed the information, it was sent to the interviewees to incorporate further comments and ensure the accuracy of the data. The study focuses on the explicit content of the interviewee's answers. The analysis excludes information such as power relations or external pressure.

2.2.3 Interviews with Organisations

To get a broader understanding of the initiative and target trend on the global market, the author conducted interviews with organisations that, in various ways, have an interest in science-based targets. Between July 14 and August 7, 2017, four organisations that deal with science-based targets either from the investor or consultancy side were contacted via e-mail or phone. Interviewees are all experts in the area of science-based targets. As a result of contacting organisations, they were selected based on their expertise and availability to conduct an interview. Ultimately, the author conducted four interviews between July 20 and August 9, 2017, through phone and Skype. The length of conversations varied from 30

minutes to 60 minutes, depending on the availability of the interviewee. A list of respondents contributed to this study is presented in Table 2-3.

Table 2-3. Expert Interviewees

#	Organisation	Type	Informant	Occupation
1	Ecofys	Consultancy in renewable energy, energy & carbon efficiency, energy systems & markets and energy & climate policy	Giel Linthorst	Programme Leader Science-based Targets
2	ISS-Ethix	Institutional Shareholder Services in corporate governance and responsible investment solutions	Maximilian Horster	Managing Director, ISS-Ethix Climate Solutions
3	Sustainalytics	Independent ESG and corporate governance research, ratings and analysis firm supporting investors around the world with the development and implementation of responsible investment strategies	Sheila Oviedo	Associate Director, ESG Rating Product & Global Compact Compliance Service
4	Trucost	Consultancy providing sustainability data, tools and insights for companies, financial institutions, regulators and thought leaders	Burks Beth	Senior Research Analyst in Corporate Advisory

Source: Author 2017, adapted from Ecofys (2017); ISS-Ethix (2017); Sustainalytics (2017); Trucost (2017)

Semi-structured interviews were organised with the experts in the organisations on the science-based targets and/or investor perspective, to acquire primary data. The author chose semi-structured interview format due to its flexibility around the topic and possibility to adapt questions to interviewee's knowledge and explore topics of particular importance throughout the interview process. The interview guide contains 16 questions relevant for the RQ1 and RQ2. For the interview guide, please refer to Appendix II. The interview guide was reviewed by a fellow student at the IIIEE. Recommendations from these reviews were integrated into the final version used for the interviews.

Before the interviews, the author took consent from the interviewees to make audio recordings. If case consent was not provided, the author took handwritten notes during the interviews. At times when the interviews have already started, the author relied only on her handwritten notes. After the author analysed the information, it was sent to the interviewees to incorporate further comments and ensure the accuracy of the data. The study focuses on

the explicit content of the interviewee's answers. The analysis excludes information such as power relations or external pressure.

2.2.4 Content Analysis

The data collected from interviews and literature analysis was analysed by the author and applied to *HEXPOL* and *Nolato*, as a guiding example for Swedish industrial companies, engaged in polymer sector, to consider the SBTi implementation. To acquire quality information, the author distilled six key aspects that can help companies implement the SBTi. In order to answer RQ2, it was necessary to understand what current sustainability practices, *HEXPOL* and *Nolato* are involved in. In other words, it was essential to understand their 'climate baseline'. To be able to analyse the baseline, the researcher was given access to all relevant sustainability data 2014 – 2016. After analysing the companies' current sustainability status, and actions are taken to reduce their carbon emissions, data was assessed and screened against the GHG Protocol's Scope 1, 2 and 3 perspectives (for further information see pp.57-63). The information collected from the interviews and literature analysis was applied to the case studies to identify trends and practices and to understand further what achievements would be needed for *HEXPOL* and *Nolato* to implement the SBTi. More importantly, the practical application sets the initiative in the global perspective, reinforcing its importance and providing a reason for more companies to commit in the future.

2.3 Overview

This chapter provided a comprehensive review of the methodology used in this paper. The author presented assumptions taken into account for this research and methods corresponding to the research questions. Then, the methods for data collection and analysis were presented, including analysis of companies' and expert interviews. Finally, content analysis was discussed regarding two case studies, *HEXPOL* and *Nolato*. The literature analysis of this thesis is presented in next chapter providing two perspectives (companies and experts) on the science-based targets that the author applies to the case studies in Chapter 5.

3 Literature Analysis

This chapter presents an overview of the Science Based Target initiative (SBTi) including the benefits of such commitment, the target setting process and the introduction to the existing methodologies. In addition, the author analyses limitations of the initiative based on the three basis: the IPCC, the 2°C target and the GHG Protocol.

3.1 The SBTi

The Science Based Target initiative (SBTi) has emerged as a consequence of the Paris Agreement, with a goal to keep global temperature rise below 2°C. It is based on the IPCC report's long-term emission scenarios and has also incorporated the GHG Protocol to address emission origin. As mentioned before, it is a collaboration of four non-governmental organisations (NGOs): CDP, World Resource Institute (WRI), the World Wide Fund for Nature (WWF), and United Nations Global Compact (UNGC), along with one of the We Mean Business communities. CDP takes the lead in the target setting process due to its the technical support. A brief description of the partners can be seen in Table 3-1.

Table 3-1. 'About The Partners'

Name	*Description*
	CDP is an international not-for-profit organization providing the only global system for companies and cities to measure, disclose, manage, and share vital environmental information. These insights enable investors, companies, and governments to mitigate risks from the use of energy and natural resources, and to identify opportunities from taking a responsible approach to the environment. (**www.cdp.net**)
	The UN Global Compact is a strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption. By doing so, business, as a primary driver of globalization, can help ensure that markets, commerce, technology and finance advance in ways that benefit economies and societies everywhere. (**www.unglobalcompact.org**)
	WRI focuses on the intersection of the environment and socio-economic development. We go beyond research to put ideas into action, working globally with governments, business, and civil society to build transformative solutions that protect the earth and improve people's lives. (**www.wri.org**)
	WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption. **(wwf.panda.org)**

Source: Adapted from SBTi (2017a)

3.1.1 Overview

The SBTi is one of the initiatives aiming to minimise carbon emissions within corporations. The initiative outlines and promotes best methods for companies to set science-based targets to address climate change. It offers guidance, resources and verification of the targets. The SBTi (2017c, p.9) defines targets to reduce GHG emissions science-based if targets "…are in line with the level of decarbonization required to keep global temperature increase within 2°C of pre-industrial levels". In addition, the SBTi covers three emission scopes based on the GHG Protocol, and corporations can choose to address in their target setting process. Therefore, the SBTi builds on the IPCC, the 2°C target and the GHG Protocol.

The SBTi has set four objectives to achieve, they are shown in Table 3-2. However, the SBTi does not present a concrete set of actions to achieve them. Neither does the initiative provides updated information on their achievements in relation to these objectives since 2015.

Table 3-2. Objectives of the Science Based Target initiative

#	*Objective*
1	By 2020, at least 300 high-impact companies, representing at least 2 GT of emissions, will have science-based emission reduction targets in place.
2	By 2018, at least 300 high-impact companies, representing at least 2 GT of emissions, will have committed to adopt science-based GHG emission reduction targets and more than 100 of these companies will have approved science-based targets.
3	Science-based target setting will be embedded in key mechanisms and platforms that lead to the widespread and sustained adoption of GHG emission reduction targets in line with science as a standard business practice in priority regions and sectors.
4	In support of the Paris Agreement, science-based targets from leading companies demonstrate to policy-makers the scale of emission reductions that are achievable to positively influence international climate negotiations and domestic climate policy.

Source: Adapted from SBTi (2017f)

3.1.2 Why commit to 'SBTi'?

Companies have been setting targets to address climate change and environment-related issues for more than a decade. Paris Agreement officially has set a new type of targets that go in line with science based on the IPCC. Aiming to make SBTi a standard business practice by 2020, the initiative empowers companies to take the lead to address GHG emissions. The SBTi deals only with companies, and not with the local governments, cities or educational institutions. According to the SBTi (2017a), setting ambitious targets strengthens investor recognition, reduces political uncertainty, improves profitability along with competitiveness, and increases innovation. The four benefits of setting the targets, promoted by the SBTi can be seen in Figure 3-1.
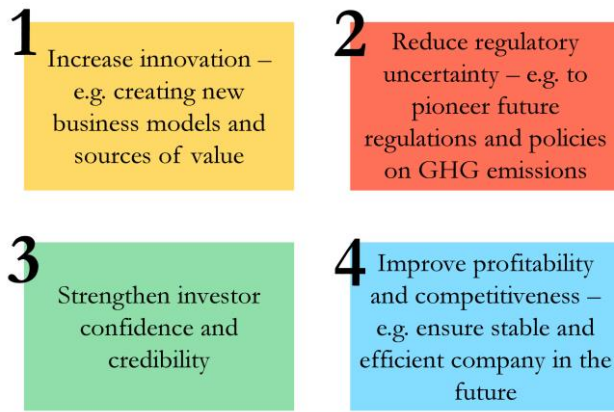
Figure 3-1. Benefits of the SBTi Implementation

Source: Adapted from SBTi (2017a) and SBTi (2017c)

3.2 The Process

The SBTi is voluntary, and the process of target setting is straightforward. It consists of four steps described as a 'Call to Action': committing to set a target, developing a target, submitting a target and finally, announcing a target. The overview of the SBTi 'Call to Action' process is presented in Table 3-3. After a company decides to commit to the initiative, it has to fill out the commitment letter and submit to the initiative. Companies committed to the SBTi then have to set a target for which they can either to select a methodology to set targets, provided by the initiative, or to develop their own methodology. The full list of companies that have approved targets by the SBTi can be found in Appendix III.

Table 3-3. The SBTi's 'Call to Action' process

Step	Company	SBTi
1. Commit to set a science-based target	Fill out the commitment letter and send it to info@sciencebasedtargets.org	SBTi sends a confirmation e-mail together with a welcome pack
2. Develop a target	Review the target setting resources, criteria, recommendations, and other guidance Choose an approach, a methodology and set your target Seek feedback by submitting the target for an unofficial validation (optional)	Unofficial validation (optional) **Results accounted for in official validation**
3. Submit your target for official validation	Read the submission form guidance and fill out the target submission form and send it to info@sciencebasedtargets.org for an official validation If needed, Lead Reviewer asks company for clarifications / missing information using query log If needed, Lead Reviewer asks company for clarifications / missing information using query log **Company may request new targets after making amendments**	**1. Initial screening:** An initial screening is conducted to determine if substantial information is missing and/or the target clearly does not meet one or more criteria **2. Validation team assignment:** SBTi assigns a validation team (includes Lead Reviewer and a member of the Steering Committee) **3. Desk review:** Lead Reviewer performs the desk review to assess the targets against the SBTi crtieria **4. TWG discussion**: Technical Working Group discusses the target and the desk review done by the Lead Reviewer **5. Steering Committee approval:** Steering Committee member signs off on final decision **6. Communicating decisions and feedback**: The decision letter is sent to company from info@sciencebasedtargets.org. If targets are approved, letter includes target wording for publication as agreed with the company **If targets not approved**
4. Announce the target	SBTi communications team works with company to coordinate the publication of targets on SBTi, CDP, and WMB websites and sends the company a welcome pack with information on showcasing the target	**If targets approved**

Source: Adapted by the author from SBTi (2017d)

In order to achieve a desired level of decarbonisation, the SBTi addresses Scopes 1, 2 and 3 based on the Greenhouse Gas Protocol, a common standard for corporate GHG accounting. In total, there are three means for a company to emit carbon and other greenhouse gases that are referred as scopes. The GHG Protocol (2016) refers to Scope 1 as the emissions coming from directly owned or operated by a company. While Scope 2 is referred to the emissions coming from consumption of purchased steam, electricity and other energy sources generated upstream of the company. Scope 3 is defined by the GHG Protocol (2016) as emissions that are a result of the company but are not directly owned or operated by it. This scope includes a number of various emission sources, such as business travel, production of purchased goods, and investments (Carbon Trust, 2017). The map of the GHG emission scopes presented in Figure 3-2. Unlike scope 3, accounting for other indirect GHG emissions, scopes 1 and 2 are compulsory for the companies to report on.
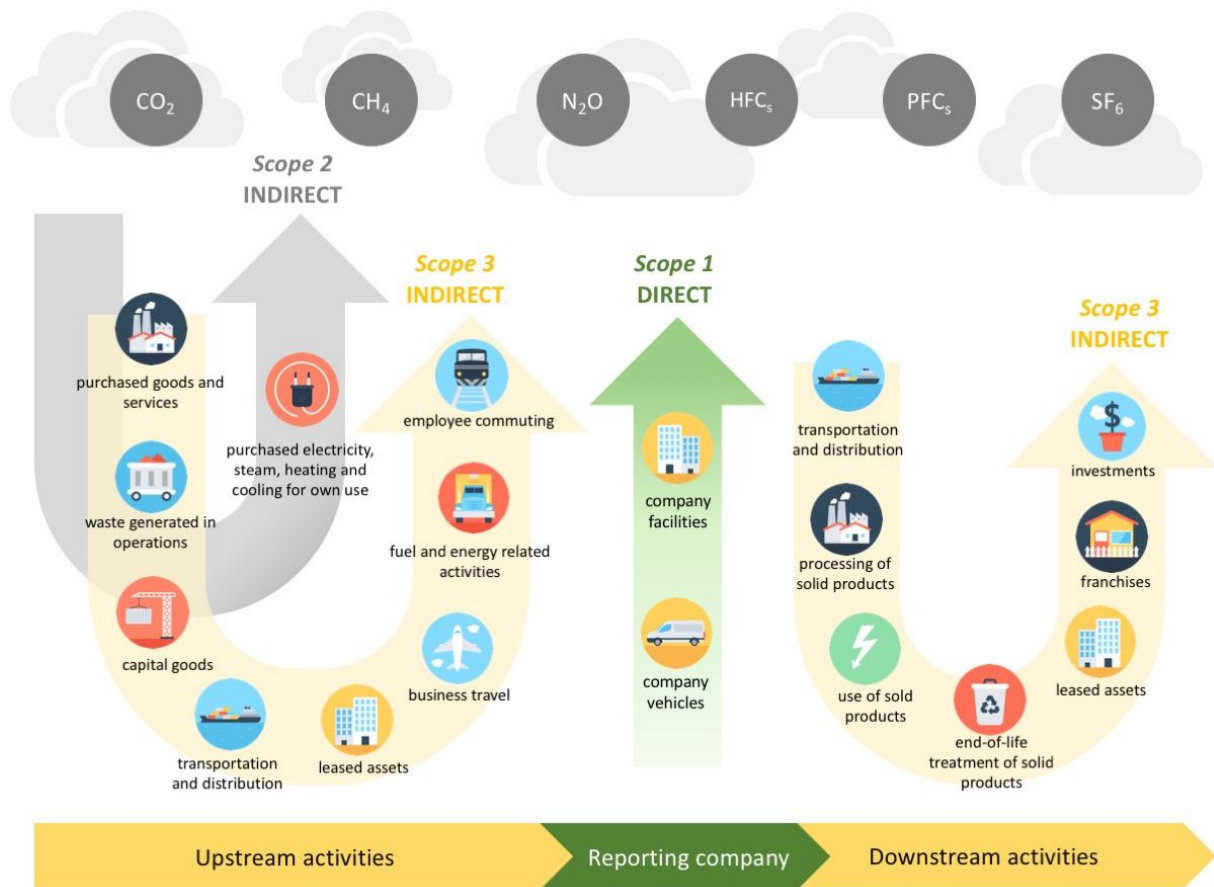
Figure 3-2. GHG Emissions Scopes

Source: Adapted from The GHG Protocol (2016); Icons designed by {Vectors Market} from Flaticon

The SBTi confirms that emissions reduction and measurement varies geographically and by sector. Because of the variation, the UNFCCC and the climate-society use the principle of 'common but differentiated responsibility' (SBTi, 2015; UNFCCC, 1992). In order to calculate corporate emissions and set science-based targets, SBTi also applies the principle of 'common but differentiated responsibility'. As a result, GHG reduction trajectories are formed, they vary among the companies, influenced by a number of aspects including economic concerns, responsibility, and capacity. The methodologies provided by the SBTi to set targets contain three main elements: an underlying emissions scenario of the carbon budget; a level of disaggregation of the carbon budget and; an allocation mechanism. Along with the

methodologies and allocation mechanism, there is a need for company inputs that result in company emissions trajectory. A trajectory produced through calculations depends on the methodology selected.

3.2.1 Existing Methodologies

There are three main approaches: Sector-based approach, Absolute-based approach and Economic-based approach. However, it is not compulsory to choose one of these methodologies to set a science-based target. Instead, companies can develop their own, or merge two existing methodologies, depending on their baseline (SBTi, 2017c). The SBTi acknowledges that there is no 'best' methodology to follow and companies are suggested to do what is suited the existing circumstances. A list of existing methodologies and their inputs and outputs presented in Table 3-4. For more detailed information on the SBTi methodologies, please refer to the Science-based Target Setting Manual Draft (SBTi, 2015; SBTi, 2017c).

Table 3-4. Summary: Methodologies for setting science-based targets

Information	Absolute Emissions Compression	CSI	Content-Based Metric (CSO)	C-FACT	GEVA	SDA	3% Solution
Base Year	Flexible	Flexible	2005	Flexible, prefers 2009	Flexible, prefers 2010	Flexible, from 2010 onward	Flexible (2005-2010)
Target Year	Flexible	Flexible through 2050	Flexible through 2050	Flexible through 2050	Flexible through 2050	Flexible through 2050	2020
Emissions Scenario	Flexible	Flexible, although IPCC Fourth Assessment Report used in current implementation	Flexible	Flexible, although IPCC Fourth Assessment Report used in current implementation	Flexible, although IPCC Fourth Assessment Report used in current implementation	IEA 2DS	Based on proprietary cost abatement curves
Level of sector differentiation	None	None	None	None	None	Sectoral	Sectoral (designed for companies with substantial U.S. emissions)
Allocation Mechanism	Contraction (absolute)	Contraction (intensity)	Contraction (intensity)	Contraction (absolute)	Contraction (intensity)	Convergence (for homogeneous sectors)	Contraction (absolute)
Input Data (Base Year)	Absolute emissions, scope 1+2+3 if desired	Combined scope 1 and 2 intensity; Gross Profit	Scope 1 and 2 absolute and intensity emissions (separately); Gross Profit, Revenue, Physical Activity — Absolute scope 1, scope 2, or scope 1+2+3 if desired; Gross Profit, Revenue	Either intensity or absolute scope 1, scope 2, or scope 1+2; Gross Profit	Either intensity or absolute scope 1, scope 2, or scope 1+2; Gross Profit	Scope 1 and 2 absolute emissions (separately); Physical Activity; Gross Profit	Scope 1 and 2 absolute emissions
Input Data (Target Year)	Growth Projection (specified by method scenario)	Growth Projection (As projected by company); Gross Profit/Margin	Growth Projection (As projected by company); Gross Profit/Margin Target (as determined by company) — Growth Projection (As projected by company); Gross Profit/Margin Target	Growth Projection (specified by method scenario)	Growth Projection (specified by method scenario)	Growth Projection (as projected by company and only for homogeneous sectors)	Growth Projection (As projected by company) – requires change in market share
Target Year Outputs	Absolute reduction, scope 1+2+3 if desired	Combined scope 1 and 2 intensity	Scope 1 and 2 absolute and intensity emissions (separately)	Presents intensity and absolute reductions	Intensity target or absolute target	Scope 1 and 2 absolute emissions and intensity (separately)	Scope 1 and 2 absolute emissions

Source: adapted from SBTi (2017c)

The SBT methodologies practise two main approaches to emissions allocation at the company level: contraction and convergence. The former reflects all the existing sources of emissions to be reduced at the same rate, independent of such factors as growth, equity and cost. The latter, convergence approach reflects the emissions intensity of a sector converges to that essential to comply with 2°C pathway by 2050 (SBTi, 2017c).

After setting a target, it needs to be approved by the SBTi's Technical Advisory Group and the Steering Committee. Approved targets do not necessarily mean that the company will achieve them in the future. There is no penalty for not achieving the targets, yet, the initiative encourages transparency in case the goals are not met. The initiative does not provide companies with actions to reduce emissions; instead, it sets a target to achieve. For some companies, it might be an easy process to set and achieve the targets. However, for certain business sectors, it might be challenging to address specific actions and emission scopes. Therefore, not all the companies have committed to the initiative. Besides the drivers pushing companies to commit to the SBTi, some barriers keep certain companies indecisive.

The SBTi (2017a; 2017b) highlights the importance of building internal support for science-based targets to be achieved. The initiative provides companies with tips on how to get internal support (SBTi, 2017c). For example, to find internal champions within prominent departments, people that are not on the sustainability team; make a good business case, indicating how much money the SBT could help them to save; and make it easier to understand the targets and more desirable to meet the target. In addition, to communicate the target successfully is equally important for the company to build credibility among stakeholders. The SBTi (2017c) suggests complying with the GHG accounting and reporting principles to disclose both, qualitative and quantitative sides of SBT. In addition, companies are suggested to be transparent in reporting their progress. For more information on gaining internal support and communication of the targets, please refer to the SBTi Manual Version 3.0 (2017c pp. 40-50)

3.3 The Basis

The name of the initiative '*Science-Based Target*' is precise, implying that the target set is based on science. Specifically, it is based on the three science basis: the IPCC, the 2°C target and the GHG Protocol. This section of Chapter 3 will present these three basis of the SBTi one by one to get a more in-depth picture of the initiative and more importantly to understand the science behind.

3.3.1 The IPCC

The Intergovernmental Panel on Climate Change (IPCC) is an intergovernmental body under the support of the United Nations (UN) has a task to present humanity with the scientific view of climate change along with its economic and political impacts (IPCC, 2017; Spencer, 2003). It has identified humanity's 'carbon budget' – stating the estimated amount of CO_2 that can be produced if humanity would keep their business as usual. The Fifth Assessment Report (IPCC, 2014) emphasised the current state of the climate change in relation to the carbon budget left for us to use. It also included its socioeconomic and environmental effects. The total carbon budget is estimated to be 2900GT, while the amount used from 1870 to 2011 is approximately 1900GT (IPCC, 2014). The approximate amount of the budget left for humanity to use 1,000GT.

The SBTi provides companies with an opportunity to calculate the amount of carbon emissions that should be reduced based on the IPCC's carbon budget (IPCC, 2014). However, the initiative does not rationalise how the budget is allocated among the companies.

Moreover, it does not take into account other human activities. Despite the controversy around the science, the IPCC aims to create awareness of climate change and provides the guidelines based on science for the humanity to follow. Therefore, the SBT initiative leads companies not only to set science-based targets but also push towards political negotiations.

3.3.2 The 2°C target

Humanity needs targets to take some control of the actions, achieve maximum results and create accountability. Moreover, humanity needs targets to do the best it can to achieve the main goal. The 2°C target to minimise CO_2 emissions was first presented in the 1970s and then widely adopted in the 20th century (Randalls, 2010). The countries within the United Nations Framework Convention on Climate Change (UNFCCC) have adopted the 2°C target to address climate change. Following the Copenhagen Accord in 2009, the target was formally decided by the UNFCCC in 2012. Victor and Kennel (2014) emphasised that the 2°C target is impractical as it is associated only with possible policies and emissions. According to Knutti et al. (2015), no scientific assessment that rationalises the target as an adequate level of warming. In other words, the target is rather a political consensus that is considered to be realistic and acceptable by policymakers to achieve.

Victor and Kennel (2014) stated single index of climate-change risk does not exist. In its place, the authors offer a set of indicators to measure the risks that humanity lays on the climate and its potential effects. It does not communicate what particular countries and/or people have to do to achieve it. Knutti et al. (2015) stated that the more local and the more precise targets produce higher uncertainty the future, requiring to be collective at the global level to achieve set goals. In some areas setting goals have been effective when transformed into certain achievable actions. For example, the Millennium Development Goals (MDGs) presented by the UN (Bourguignon et al., 2010). A total of eight goals with targets and deadlines were set to improve the lives of the planet's poorest people. In 2014, Sustainable Development Goals (SDGs) were developed and accepted incorporating a total of 17 goals with 169 targets covering a broad range of sustainable development challenges (UNDP, 2017). For example, goals include improving health and education, protecting oceans and forests, addressing climate change, and ending poverty and hunger. Companies around the world are now connecting their targets with SDGs. Ultimately, the 2°C target is a useful tool to start negotiations, yet it can be ineffective in generating necessary emission cuts.

3.3.3 The GHG Protocol

The GHG Protocol is a partnership between the World Resource Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). It works with NGOs, governments, industry and other organisations, offering a standardised framework for GHG accounting and reporting to address climate change. The GHG Protocol provides guidance how companies can calculate emissions and measure emissions along the whole value chain. It also provides a set of calculation tools to assist companies with their GHG emissions. The Protocol includes emissions from Scope 1, 2 and 3.

Scope 1 accounts to the direct GHG emissions, while scopes 2 and 3 both, account for indirect emissions. The difference between scopes 2 and 3 is that the former accounts to the GHG emissions from purchased steam, electricity and other energy sources. The latter one refers to the GHG emissions from waste, travel, and purchased goods or services. The SBTi does not require companies to include scope 3 in their target calculation if that accounts for less than 40%. Scope 3 is not included because it follows the requirements and boundaries established by financial reporting standards.

As for the Scope 2, 'market-based method' is a new concept that originally comes from the Corporate Standard (The GHG Protocol, 2015). This method presents the emissions from purchased electricity that can differ from the one produced locally. It is important because different suppliers and contracts generate emissions depending on the energy source and/or technology (Sotos, 2015). Therefore, companies have a choice to invest in more sustainable energy. More demand for low-carbon energy could establish more supply and consequently reduce emissions. Based on the GHG Protocol, many suppliers are now required by law to disclose greenhouse gas emissions and energy mix to their consumers.

3.4 The ALARP Principle

The three science basis described before providing a guideline for companies to reduce their carbon emissions in line with science. The SBTi ensures companies to set ambitious targets to reduce its CO_2 emissions. In comparison to the targets set by the companies before, these targets are very aggressive as they incorporate science in the process of target setting. Such targets are generally very ambitious and aim for a significant reduction in carbon emissions. To demonstrate what such change means to the companies, in this section, the author presents a principle that has a similar reduction aim.

The principle originates in the United Kingdom (UK), the Health and Safety at Work etc. Act 1974 (HSWA, 1974), the 'As Low As Reasonably Practicable' (ALARP) principle is the risk that should be reduced as far as rationally feasible (HSE, 2017). If the cost involved in minimising the risk, even more, is uneven to the benefit obtained, it means that the risk is ALARP. In other words, the ALARP principle results from the tremendous effort, money and time spent to minimise risks. By focusing on companies, the SBTi provides companies with an opportunity to reduce their emissions to be in line with the 2°C target that is similar to the ALARP principle. As described above, following the SBTi process, companies are ensuring that the targets on carbon emissions are set as low as reasonably practicable for their business. To determine whether the ALARP was achieved, a cost-benefit analysis can be used. The principle does not state whether minimising the risk will contribute on the global level.

3.4.1 Overview

Taking into account the number of companies operating worldwide, the GHG emission scopes covered, and political circumstances, it is unclear if the SBTi will achieve a desirable effect reduce CO_2 emissions by companies. In other words, there are many assumptions and variations in procedures to consider. Yet, it goes without saying that in relation to carbon emissions, the SBTi makes a difference to the companies with approved targets.

3.5 Voluntary Initiatives

Based on the OECD (2001) study, voluntary initiatives are a global phenomenon, with substantial intra-regional disparities in practice. The same study highlighted that some of the initiatives are more 'voluntary' than others, companies being under strong pressure to adopt them. According to OECD (2001), such pressure can come from legislation, regulations, employees or a civil society. The same study also stressed the existence of the divergences of commitment and management practice of the initiative, as there is no 'one-size-fits-all' tactic. For example, some companies have more advanced practices in comparison to others. The effectiveness of voluntary initiatives is linked to the broader scope of both, private and public governance. Private initiatives cannot be effective if other parts of the system do not work properly. The study also pointed out a build-up of managerial knowledge in both, ethical and legal compliance. Voluntary initiatives also contribute to the consensus on global norms for business conduct (OECD, 2001).

As for the climate change related voluntary initiatives, the Global Reporting Initiative (GRI) project was developed in 1997 by the Centre for Education and Research in Environmental Strategies (CERES) to provide a new perspective to businesses decisions. It is done by integrating natural resources, ecological systems, and societal concerns into assessing performance. GRI also developed guidelines for companies to report on their performance. Based on the reports, there is an evident increase in the climate change performance. Other voluntary initiatives (such as CDP, and GRI) in relation to climate change, usually have a specific focus and target big companies with their operations worldwide.

Companies can have several reasons to implement the initiatives, for example, reputation, legislation, and a 'trend' lead by companies-innovators that are the first to implement it. There is no study available to identify the concrete reasons behind the implementation of voluntary initiatives related to climate change. Once founded, every initiative takes a certain position in the world and amongst companies, based on its focus, 'popularity', and the years existing on the market.

3.6 The SBTi and the World

To put the SBTi in a bigger picture of climate discussion, the author analysed whether investor and company related organisations have mentioned and/or promoted the initiative. The organisations were selected based on the criteria of being both, global and carbon related. Table 3-5 presents the list of the organisations and whether they have mentioned and/or promoted the SBTi or not.

Table 3-5. The List of Global and Carbon Related Organisations

#	Name	Type	Mention of the SBTi
1	United Nations Environment Programme Finance Initiative (UNEPFI)	Related to the United Nations	NO
2	Sustainable Development Goals (SDG)		NO
3	Portfolio Decarbonisation Coalition (PDC)		NO
4	United Nations Guiding Principles Reporting Framework		NO
5	World Resources Institute (WRI)	Non-governmental Organisation	YES
6	2° Investing Initiative (2II)		YES*
7	CDP		YES
8	World Business Council for Sustainable Development (WBCSD)	Company	YES**
9	Global Reporting Initiative (GRI)	Non-profit Organisation	NO

10	Bloomberg Quantitative Risk Experts	Related to Bloomberg L. P.	NO
11	Bloomberg New Energy Finance (BNEF)		NO
12	Carbon Tracker Initiative	Think Tank	NO
13	Task Force on Climate-related Financial Disclosure (TCFD)		NO

* The SBTi was not mentioned, only science-based targets
** The SBTi was mentioned in comparison to the 2° Investing Initiative

Source: Author (2017) Adapted from (2° Investing Initiative, 2015; Bloomber Finance L.P., 2017; Bloomberg L.P., 2017; Carbon Tracker Initiative, 2017; CDP, 2017; GRI, 2017 SDG, 2017; Sullivan and Petrovic, 2016; TCFD, 2017; UNEPFI, 2017; WRI, 2017; WBCSD, 2017)

As it can be seen from the Table 3-6, the SBTi was not mentioned and/or promoted by nine organisations out of thirteen. Organisations that have mentioned the SBTi are either the creators of the initiative or are indirectly related to the founders through partnership. For example, WBCSD and WRI have founded the GHG Protocol that is used for the SBTi. The 2° Investing Initiative (2015) mentioned the SBTi only to compare it to itself. In conclusion, the SBT initiative is not broadly mentioned and/or promoted by the carbon-related global organisations yet.

3.7 Technology Adoption Lifecycle

As a voluntary initiative, companies are not required to implement the SBTi. As mentioned in section 3.5 Voluntary Initiatives, there can be multiple reasons for companies to implement them. An uptake of initiatives by certain companies might result in a snowball effect, making more companies to follow the 'trend'. The SBTi is a young initiative, founded in 2015 after the Paris agreement and as for the end of May 2017, a total of 266 companies have committed to the SBTi. According to the World Bank (2017), there are a total of 43,192 listed companies in stock exchanges around the world. The number of formal unlisted companies would be way larger as there is no international registry for other companies. Based on the number of listed companies, it can be seen that the number of companies committed to the initiative is low. To understand the development and further uptake of this initiative by companies, the author introduced the Technology Adoption Lifecycle model in this section.

According to the technology adoption lifecycle sociological model that defines the adoption of a new product or innovation (Beal and Bohlen, 1957), the SBTi can be seen as a product, while companies are adopter groups. Built on the research by Gross and Ryan (1943), Bohlen and Rogers (1957) named this model as 'diffusion process'. The lifecycle is based on the demographic and psychological types of defined adopter groups. This process of adoption of a new product or innovation is usually explained as a standard distribution. This model presents five types of adopters explained in Table 3-6.

Table 3-6. Categories of Adopters

#	Type of Adopter	Description
1	Innovators	The first to adopt a product/innovation, risk-oriented and are more prosperous
2	Early Adopters	Have the highest degree of leadership, less prosperous, more educated
3	Early Majority	Adopt an innovation after a varying degree of time, more conservative, yet open to new ideas
4	Late Majority	Fairly conservative, sceptical, less socially active
5	Laggards	Very conservative, oldest and more focused on traditions

Source: Author (2017) adopted from Beal and Bohlen (1957)

Innovators and early adopters, both are enthusiasts and visionaries as they are the pioneers in adopting the new product. Early majority and late majority, are characterised as mainstream adopters of the product (Rogers, 2003; Moore, 2014). The last category of adopters are laggards who are considered to be resisters to the change brought by the new product or innovation. This model is also known as Rogers' bell curve shown in Figure 3-3. The area under the curve represents the number of clients.
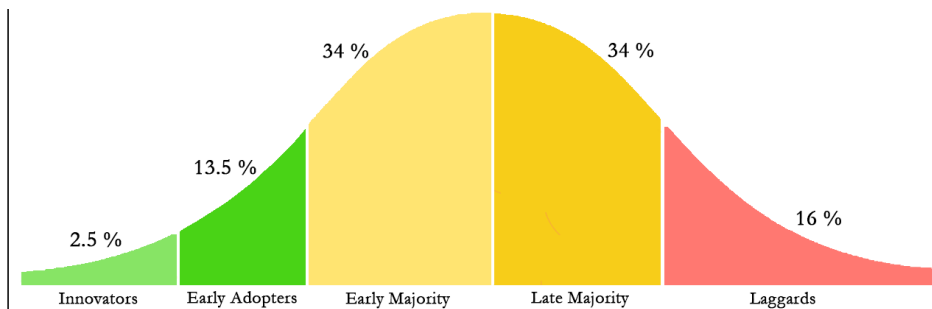
Figure 3-3. Bell Curve: Categories of Adopters
Source: Sanchez (2017) adopted from Rogers (2003)

Moore (2014) has explored the diffusion process by Rogers (2003) further, stating that there is a chasm between the early adopters of the product and the early majority. The chasm is developed due to the differences in expectations between the two categories of early adopters and early majority. Moore (2014) states that in case an organisation can create a bandwagon effect, establishing a product or innovation as a standard, it can be considered a success. Yet, the chasm can only be applied to discontinuous products or innovations, because those are better explained by the original technology adoption lifecycle.

As mentioned before, applying the technology adoption lifecycle on the initiative at hand, the SBTi is a product and companies are adopters. Based on the 'bell curve', companies that have their targets approved can be considered as innovators. Due to the possibility of companies to withdraw from the commitment stage of the initiative for a number of reasons (for example, finance and resources) the commitment to the SBTi is not considered as a counting point. Instead, approved targets mean to receive verification by the initiative. Based on the nature of the SBTi, it does not focus on small and medium enterprises (SMEs), therefore leaving out a

large quota of companies worldwide. For the purpose of this thesis, pioneering companies that have their science-based targets approved will be addressed as companies-innovators to enhance understanding.

3.8 Conclusion

In conclusion, the SBTi is a tool to direct companies, to be in line with the Paris Agreement to minimise carbon emissions beyond low-hanging fruits, to set science-based targets. Science contributes to the dialogue, identifying consequences of various trajectories (Knutti & Rogelj, 2015; Raupach et al., 2014). The decision-making process and determination of companies to conduct actions to reduce CO_2 emissions to be in line with science are of a normative origin. Particularly, the target depends on values, ethics, global trends, and equity.

For certain companies, it is challenging to set targets due to their business sector, while for others it is an easy process. SMEs are also left out from the initiative at the moment. Based on the technology adoption lifecycle, the time-period when a company gets its target approved determines which category of adopters it belongs to. To set and get targets approved are different from achieving them as those have two different objectives, where actions play an important part. It determines whether a difference related to climate change will be made or not.

More and more companies are considering to implement the SBTi. The author analysed case studies *HEXPOL* and *Nolato* in Chapter 5, explored how the initiative could be applied in their business context. Lessons learnt from companies with approved targets have been implemented to the two case studies. The findings of this thesis, which are presented in the next chapter, provide the insights of the SBTi implementation in practice. It also provides a perspective of the organisations both directly and indirectly involved with science-based targets.

4 Findings

This chapter presents the key findings that were obtained during the interviews and the analysis of the cases. First, the insights from the expert interviewees are presented from the companies-innovators with approved science-based targets. It covers drivers and barriers to implement science-based targets and presents six key aspects of implementation introduced in section 4.1.2. In addition, the perspective of organisations related to science-based targets is presented to provide a comprehensive outlook and highlight its development. Finally, the author provides an overview of this chapter.

4.1 Companies' Perspective

A total of nine interviews were conducted by the author with the companies that have their science-based targets approved by the SBTi.

4.1.1 Drivers and Barriers

For the purpose of this research, drivers and barriers for the SBTi implementation are understood as both, internal and external. It is done to get a broader picture of the companies' relationship to the initiative. Barriers for the SBTi implementation vary and scope 3 was mentioned as a barrier twice. The full list of the barriers faced by the companies with approved target interviewed by the author is shown in Table 4-1. A brief explanation accompanies every barrier and driver. Three companies out of nine said to have no barriers to the SBTi implementation.

Table 4-1. The List of Drivers and Barriers for the SBTi implementation

#	Drivers (number of times)	Barriers (number of times)
1	CDP – for those companies reporting to CDP, setting a science-based target with the SBTi can bring additional points.	Change in the Methodologies – challenging for companies to keep up with a change as those mean a consequent change in targets themselves.
2	Commitment to Company's Strategy – the SBTi reinforces internal and external actions of companies to address climate change and social responsibility.	Internal Communication – could be challenging to get people on board within the company, to communicate science-based targets to those departments that are not related to sustainability.
3	Communication (2x) – it is important for companies to both, internally and externally communicate on their sustainable performance, including setting targets based on science to ensure transparency.	Long-term Target – could be challenging for companies to commit to the target that is longer than 5 years due to the uncertainties such as, the market, technology development, and availability of natural resources.
4	External Verification – for those companies with targets set based on science, the SBTi validates their performance.	Prediction of the Market Development – due to the uncertainties on the market, companies are challenged to set activities to achieve their long-term goals.
5	GHG Emissions Reduction – by setting targets based on science the SBTi allows	Scope 3 (2x) – due to the nature of the scope, for some industries it is challenging to ensure

	companies to significantly reduce their emissions by reassessing their operations.	availability and consistent collection of quality data.
6	Logical Follow-up (2x) – companies with set science-based targets found the SBTi as a next step to verify their targets.	Technological Innovation – due to the technological development and uncertainty within it, it is challenging for some industries to keep up with a change.
7	Relevance – the current trend around the SBTi and doing 'enough' to address climate change.	Time – to ensure calculation of solid targets and activities to achieve it, companies are challenged to deliver quality results in a specific time-frame.
8	Reliability and Responsibility (3x) – the SBTi allows companies to be transparent in their goals and actions in relation to both, environment and society.	
9	Risk Reduction – knowing CO2 hot-spots and areas for potential improvement can reduce risks of a company on a long-term.	

Source: Author (2017)

Scope 3 was mentioned by the companies as a challenge but not as a barrier. Some companies that did not cover scope 3 in their targets have mentioned that it would be challenging to include it because of their business sector. The SBTi does not require to cover scope 3 emissions unless they are higher than 40%.

As for the drivers, some of them were the same for several companies. The most important driver for the SBTi implementation is 'reliability and responsibility' that was mentioned by three companies out of nine. This driver was backed-up by the companies' concern of doing a fair share to address climate change. 'Communication' and 'logical follow-up' as drivers, both were mentioned twice. The latter driver was reasoned by the interviewees as the targets were already in place and were presented to the SBTi to be approved. 'Communication' as a driver was mentioned to be important for the companies to communicate their targets and progress to the world. The interviewees also mentioned the importance to communicate targets that are not achieved. The rest of the drivers presented in Table 4-1 were mentioned once each.

4.1.2 The SBTi in Practice

In order to apply lessons learned from the nine companies to *HEXPOL* and *Nolato*, the author distilled six key aspects that can help companies to implement the SBTi. These aspects were identified based on the SBTi process. These aspects include targets set by the companies; methodologies used to set targets; concrete actions to achieve targets; internal changes as a consequence of the SBTi implementation; benefits; and overall attitude on the SBTi. These aspects are further discussed in this section.

Targets

Science-based targets set by the companies vary depending on the business sector, base-year, methodology, scopes included, and whether the goal is absolute or normalised. The full list of science-based targets set by the companies' interviewed is presented in Table 4-2. The targets aim is to be aggressive and be in line with science. Seven companies out of nine had their targets set in line with science even before the SBT initiative was developed. Those companies

presented their targets to the initiative and had them approved. One out of those seven companies has chosen to develop new, more aggressive targets with the SDA methodology provided by the SBTi. Another two company out of those seven has backed their targets with the SDA methodology. The rest of the seven companies have either developed their own or relied on other methodologies.

Table 4-2. Science-based Targets Set by the Companies

#	Company	Target
1	AMD	Commits to reduce scope 1 and 2 emissions 20% by 2020 from a 2014 base-year. Also commits to improve the compute performance per watt of energy consumed by their mobile APU processors by 2500% by 2020 from 2014 base-year. It also has a goal for suppliers' wafer foundry scope 1 emissions to stay 30% below Semiconductor Industry Association average, and for wafer foundry electricity use to stay 40% below industry average, using a normalised manufacturing index.
2	Dong Energy	Commits to reduce GHG emissions per kWh from energy production 96% by 2023, using a 2006 base-year. This is equivalent to generating electricity with a carbon intensity of 20 g CO_2e/kWh by 2023.
3	Eneco	Commits to reducing GHG emissions per GWh from electricity consumed by its customers 25% by 2020 from a 2012 base year. It also commits to reducing GHG emissions per household from the natural gas and district heating consumed by its private customers 16% by 2020 from a 2012 base-year. Finally, it commits to reduce GHG emissions per GWh of electricity for employee operations 50% by 2020 from a 2012 base-year.
4	Enel SpA	Commits to reduce CO_2 emissions 25% per kWh by 2020 from a 2007 base-year. The target includes the decommissioning of 13 GW of fossil power plants in Italy, and is a milestone in the long-term goal to operate in carbon neutrality by 2050.
5	IPC	Commits to reduce emissions 20% per letter and parcel delivery by 2025, from a 2013 base-year (scopes 1, 2 and 3).
6	PostNord	Commits to reduce scope 1, 2 and 3 absolute emissions 40% from 2009 to 2020.
7	Sopra Steria Group	Commits to reduce absolute GHG emissions from scopes 1, 2 and 3 (business travel and leased assets such as off-site business centres) 21% by 2025, from a 2015 base-year. The long-term vision of the company is to reduce GHG emissions per employee 76% by 2040 from the same base-year. It also commits to having key suppliers, representing at least 70% of supply chain emissions, managing their GHG emissions and 90% of these suppliers with GHG reduction targets in place by 2025.
8	Swisscom	Commits to reduce its scope 1 emissions by 10%, its scope 2 emissions by 100%, and its scope 3 emissions by 18%, all by 2020 from 2013 levels.
9	Verbund AG	Commits to reduce GHG emissions 90% by 2021 from a 2011 base-year (Scope 1, 2 and 3 emissions from fuel-and-energy related activities and business air travel). This is a milestone in the long-term goal to achieve carbon neutrality by

		2050.

Two companies out of nine had some of their targets set yet, those were not aggressive enough in relation to science. These two companies had chosen to analyse methodologies provided by the initiative. Then, they decided what methodology will cover which of the three scopes, to have aggressive targets set. One of the two companies went through the process by itself, and another company has cooperated with consultancies to develop science-based targets. These two companies mentioned that the overall process was time-consuming despite having relevant resources at hand. Both companies stated that it took a long time to choose a methodology(ies) that suits best and negotiate their targets with the SBTi. Scope 3 emissions were either wholly or partially covered by six out of nine companies interviewed. There is also a variation of absolute and relative targets covered by the companies, depending on the scopes addressed.

Methodologies

As mentioned in the previous section, seven companies out of nine had already implemented climate-change targets before the initiative was developed. Therefore, those companies did not use methodologies proposed by the initiative. However, one of those six companies stated that it had developed a methodology with the help of Ecofys consultancy and it is similar to the SDA methodology proposed by the SBTi. One of the nine companies has backed its targets up with the SDA methodology. The other five companies stated that they had developed their own methodologies to set science-based targets. Two of the nine companies mentioned that for next target setting, they would work directly with the initiative to set more aggressive targets.

Half of the interviewees stated that methodologies change through time and once those change, it means that company's calculations are outdated and there is a need to start everything from the beginning. To have solid calculations for methodologies to be applied, interviewees argued that there is a need for solid data reporting year by year. All nine companies affirmed that they have reporting systems in place for scope 1 and 2. In addition, scope 3 is voluntary for all methodologies presented by the SBTi, if it is less than 40% emissions. As mentioned previously, it is challenging for the companies to get solid data for scope 3 to be accurately calculated. Therefore, some companies chose not to address it at the moment.

Actions

The SBTi provides guiding methodologies to set targets in line with science. However, it does not provide companies with a set of actions how to achieve goals. Based on the interviews, companies are taking a number of actions depending on the scope covered, target, and business area. Majority of the interviewees mentioned the importance of having not only top-down but also a bottom-up approach for actions to achieve targets. It is crucial to have both, a target and actions relevant to one's business in place to have a successful outcome. Interviewees also emphasised that it is essential to break the target down to concrete actions because the science-based target is set for a longer-term than five years and it is challenging to predict the future. Consequently, having a long-term target being split into shorter ones is more effective for the companies to follow.

4.1.2.1.1 Concrete Examples

This section provides examples of concrete steps that companies are taking to achieve their targets. Please keep in mind that companies are undertaking more actions than mentioned in the following paragraphs. For more information, please refer to the companies' websites and/or Annual Reports, the full list is presented in Appendix IV.

- *AMD* is running a number of projects to achieve its climate targets, for example, increasing the amount of renewable energy sourced, accelerating energy efficiency in product design, and working with wafer manufacturing partners on 'best-in-class' goals (AMD, 2017; Murrill, personal communication, June 13, 2017).

- *Dong Energy* is engaged in a number of internal initiatives to achieve its targets. Deployment of offshore wind is one of such initiatives. According to Dong Energy (2017), "offshore wind represents a scalable and efficient green technology and is an important element in the green transformation". By installing the most offshore wind turbines in the world, with its capacity, it is possible to cover an annual power consumption of 9.5 million people. By 2020, Dong Energy expects to double their installed capacity. The company is also phasing out coal entirely from their power and heat production by 2023 (Dong Energy, 2017).

- *Eneco Group* invests in renewables, expanding their plans, to fulfil customer demand. For example, Dutch railway is sourcing 100% renewable energy from the wind. Since 2011, Eneco Group supplied 100% green electricity to all of the company's private and SME clients. In addition, the company is also investing in new solutions such as residential heat pumps and researching on the alternative to natural gas (Meijer, personal communications, June 15, 2017).

- *Enel Group* is also focusing on investing in renewables and fossil fuels. In addition, the company is giving a second life to plants. By linking its target to the UN Sustainability Development Goals, Enel Group is aiming to provide affordable and clean energy to 3 million people in Africa, Asia and Latin America by 2020 (Todaro, personal communications, June 27, 2017).

- To reach the group's target, participating posts in the *IPC* sustainability programme are engaged in activities such as educating drivers on eco-driving and increasing the use of alternative vehicles and fuels. For example, the saving of more than 399m litres of fuel over five years reflected in the budgetary saving of more than 316m Euros (IPC, 2015). As for carbon emissions, participants in the IPC sustainability programme have decreased their total carbon emissions by 22.4% from 8,830,000 tonnes in 2008 to 6,825,000 in 2015. Actions include sourcing renewable energy, introducing e-bikes as a means of transportation, and implementing low carbon solutions in building, e.g. LED lights (Reitsma, personal communications, June 7, 2017).

- *PostNord* is training and educating car drivers to keep better fuel efficiency. In PostNord Denmark, as a part of the fuel efficiency competition among the drivers, the champions are then educating all other drivers. On the group level, PostNord has Environmental Fund, which is an internal fund that supports strategic programmes across the company, e.g. on energy saving, clean technologies, and electric trucks. It has a longer payback time and has proved to be successful, for example, electric tracks are being implemented this year in Sweden (Boas, personal communications, June 26, 2017).

- *Sopra Steria* stated that due to its geographical spread, in some countries, Scope 1 is challenging to address because of its dependence on backup generators using oil due to interruptions in electricity. Addressing Scope 2 is relatively easier, actions include sourcing renewable energy, energy optimisation and by the purchase of renewable energy instruments (IREC, GO). Sopra Steria's actions addressing Scope 3 includes leveraging technology to reduce travel, replacing air transportation with trains where possible, educating employees on climate actions and sustainable behaviour, and working with suppliers to ensure they have emissions reduction targets and/or activities (Niranjan, personal communication, June 6, 2017).

- *Swisscom* is focusing on fuel for heating and transport, as well on the electricity coming from renewable sources such as solar and the wind. For example, in 2016, 448 GWh was sourced exclusively from domestic renewable energy. In 2016, the company saved 458,404 tonnes of CO_2 emissions (Salina, personal communication, July 12, 2017).

- As for *Verbund*, the company is working on closing thermal power plants for its scope 1; it has already lowered its direct CO_2 emissions by 67% since 2012. Verbund is also engaged in reducing the use of fossil fuels for its scope 3. In addition, it is involved in energy procurement renewables and electro mobility. For example, Verbund is investing in selected hydropower plant projects as well as in increasing the efficiency of existing plants (Anonymous, personal communication, June 27, 2017; Verbund AG, 2016).

Internal Changes

Interviewees were also asked if the SBTi implementation has changed company's perception of its sustainability policy/operations, processes and ambition. As it can be seen in Table 4-3, that majority have answered 'No' to these three sections. The reasoning behind it was either that targets were there before, or a company has 'initiatives' in place, for example, EMS and/or ISO1400. In addition, most of the interviewees stated that the only change that has happened is that targets became validated by an external validator. Moreover, it is easier to communicate targets that have third party validation, thus, giving more credit to the company.

Table 4-3. Changes after the SBTi implementation

#	Name	Perception of sustainability operations	Processes	Ambition
1	AMD	Yes (Validator)	Yes (Communication)	Yes
2	Dong Energy	No	No	No
3	Eneco	Yes	No	Yes (Reinforced)
4	Enel SpA	No	No	No
5	IPC	No	No	Cannot Say
6	PostNord	No	No	No

7	Sopra Steria Group	No	No	No
8	Swisscom	No	No	No
9	Verbund AG	No	No	No

Source: Author (2017)

Benefits

The companies at hand were also asked what kind of benefits they are already gaining and are expecting to gain from the SBTi implementation. The companies mentioned a total of thirteen different benefits. Table 4-4 shows companies gaining or expecting to gain various benefits. Every benefit follows a brief explanation. 'Communication' is the top mentioned benefit, by four companies out of nine. Whiles, companies interviewed mentioned 'CDP Ratings' and 'Validation' twice each, the other benefits were mentioned once only.

Table 4-4. Benefits Companies are Gaining or Expecting to Gain from the SBTi Implementation

#	Benefit (number of times)
1	Communication (4x) – the SBTi allows companies to successfully transfer science into targets and make it understandable both, externally and internally.
2	Cost and Consumption Reduction – to identify KPS and address climate change makes company's processes and operations more effective.
3	Customer Relations – to successfully demonstrate good governance and a commitment to the strategy and science-based targets.
4	Good Governance – the SBTi makes companies reassess their current operations and processes leading a transition towards low-carbon economy.
5	Investor Relations – allows companies to easily communicate their sustainability strategy and reinforces decision making process.
6	New Business Models without CO_2 – promotes innovative solutions to pursue a low-carbon economy.
7	New Business Opportunities – reassessing current operations and processes allows companies to apply new solutions to address CO_2 emissions.
8	Rating - CDP (2x) – setting a science-based target provides extra points for the CDP rating.
9	Replication – allows companies to effectively improve performance and guarantee data durability.
10	Report - Utilities – provides an opportunity to reliably and easily deliver desirable results to the wider public.

11	Reputation – by responsibly and reliably communicating set targets, companies reinforce their position on the market.
12	Transparency – the SBTi allows companies to responsibly communicate their targets and activities to address climate change.
13	Validation (2x) – implementation of the SBTi reinforces targets set by the companies.

Source: Author (2017)

For example, Sopra Steria's main driver is "to show its stakeholders how we are approaching climate change and environmental sustainability and how we are delivering against our declared goals" (Niranjan, personal communication, June 6, 2017). Niranjan (personal communication, June 6, 2017) emphasised that it is important for companies to be open and transparent in their governance, strategy and achievements. Despite 'transparency' as a benefit being mentioned only once, its importance for companies was mentioned across all of the interviews. 'Transparency' was frequently stated along the importance of 'communication', going hand-in-hand with the companies' position in the global market.

Attitude

Overall, interviewees have a very positive attitude towards the SBTi, calling it a useful tool to address climate change. For example, PostNord representative stated that it is "a good initiative to make business involved" (Boas, personal communications, June 26, 2017). Whiles Hansen and Lohse (personal communications, August 30, 2017) from Dong Energy highlighted that easily communicate reduction targets are in relation to something really meaningful like Paris Agreement and 2 °C scenario.

Despite a generally positive outlook on the SBT initiative, one interviewee has expressed concerns, stating that due to its technical outlook it is only for specialists. The interviewee also stated that the initiative is time-consuming and not well known. Another company specified that EMS is a foundation of an organisation and has to have a solid foundation to measure and validate targets accurately. As for the latter, to fulfil it, a company needs to have employee engagement. Ultimately, there are a set of things that have to be working to ensure effectiveness and usefulness of the SBTi and successfully address climate change.

4.2 Investor's and consultant's Perspective

Besides analysing the perspective of the companies with approved science-based targets to answer the research questions introduced in Chapter 1, interviews with organisations were conducted to get an in-depth and roundup understanding of the SBTi and its future development. It addition, to understand how consultancies and investors use the information on the SBTi and science-based targets in general.

4.2.1 TruCost

Founded in 2000, Trucost assesses provides the tools, data and information required by investors, companies, policymakers to ensure a shift to a low-carbon economy. In other words, the company is pricing and evaluating sustainability risks to for transparency and climate resilience in the future. According to Trucost (Werner, 2016), there are a number of benefits for companies, investors and suppliers to develop science-based targets:

- Demonstrate robust environmental risk management to all stakeholders.

- Reduce energy and fuel costs.
- Understand the extent to which your business may be limited by carbon taxes and emission limits.
- Make the business case for investment in emission reduction or energy conservation projects.

On the SBTi

According to Burks (personal communication, July 1, 2017), investors are looking for two things in the companies. First, they are looking for overall environmental impact and second, for disclosure and discussion of how climate change will impact a company and its future. Basically, for company's transition to a low-carbon economy. Both, EU Commission and TCFD have emphasized the importance of such disclosure by the companies. As for the trends in emissions disclosure by the corporate sector, since the Paris Agreement 2015, there are more companies that measure and disclose their emissions publicly. Burks also noted that there has been a lot of work done on setting Scope 3 than it was before. Moreover, the data on Scope 3 is more precise than before, allowing more accurate calculations for setting targets.

Yet, to set a target for Scope 3, there is a need for a lot of primary data, and there is still not enough disclosure on the market and reliable year-to-year data. It is challenging to address scope 3 emissions, especially those located upstream, in the supply chain of a company. Therefore, most of the companies are modelling their scope 3 emissions. To ensure more transparency and primary data for Scope 3, Burks, emphasized the importance of regulations at the governmental level. For example, in France and Singapore, even smaller companies are required to disclose their CO_2 emissions, therefore including SMEs. Such actions can allow Scope 3 emissions data to become more accurate, providing companies with a baseline and possibility to track it year on year.

Burks stated that companies that set SBT are very advanced in their actions and efforts to reduce CO_2 emissions. Those companies not only want to show themselves as low carbon leaders but more importantly, they want to understand what is required to ensure this transition. Companies that go through the efforts to implement SBT are committing to it for multiple reasons, for example, to do a fair share, increase revenue, and decrease costs. Burks emphasized the importance of rethinking of a current business model to exist in a low-carbon world. In her opinion, it is just a matter of time to get everyone on board and ensure better purchasing decisions and transition to a low-carbon economy.

The SBTi is a new initiative, and it continues to evolve as there is a need for test and trial, to see what is working and what does not. However, such changes can be challenging for the companies as the whole guideline changing down the line, therefore might disrupt the work that was already done. Overall, according to Burks, this initiative is easy to use, understand and it is generally fair for the companies. In addition, such economic desegregation about global emissions reduction targets is straightforward and is easy to communicate. Methodologies proposed by the SBTi produce different targets, yet, there are no 'easy' targets. For more robust target Burks suggested C-fact methodology, that has different targets for operations in developing and developed nations.

According to Burks, a commitment to the SBTi provides a company with financial, benefits, giving a chance to be a brand leader and an opportunity to reassess business is done, and in what way it can be improved. As for the barriers to committing to the SBTi, Burks mentioned the challenge of tracking progress against a target. Another barrier is company's confidence in achieving the target and going public, especially if it is a long-term target. It is due to the fact

that most of the times companies are calculating their emissions and set targets based on what is feasible and achievable.

Burks emphasised that the SBTi allows companies to go beyond what is immediately feasible for companies to do, in a way changing the business model and/or the way services are delivered. In other words, this initiative makes companies go beyond low-hanging fruits and become more creative and innovative in their emissions reduction. Burks highlights the importance of the companies to go through this 'exercise' even if they do not go public with the result. But, to understand what is required for the low-carbon economy transition and what the actual emission reduction target should be. As for other means of addressing CO_2 reduction, Burks advocated internal carbon tax for the companies. The initiative might not make a change globally, however, it indeed transforms the way companies do business, incorporating a low-carbon economy.

4.2.2 Ecofys

Founded in 1984, Ecofys is a leading consultancy in renewable energy, energy systems and markets, energy and carbon efficiency, and energy and climate policy. The company has a vision of achieving 'sustainable energy for everyone', it creates effective, sustainable, smart and practical solutions for and with public and corporations globally to achieve its goal. The company is taking a key part in developing methodologies for companies to set science-based targets. It also worked with the SBTi to develop the SDA methodology for them.

On the SBTi

Scientific modelling of 2°C scenario provides a sectorial CO_2 budget, then it is allocated by absolute, economic or physical areas chosen by a company. Some companies have a very simple CO_2 footprint, and they do not need support to set science-based targets. There is an offline tool that companies can request from the SBTi to use for simple science-based target setting. For companies with a more complex CO_2 footprint, tailor-made support is needed such as given by the SBTi or a consultancy company. Next to this, Linthorst (personal communication, 14 August, 2017) emphasized that corporate CO_2 emissions could be too sensitive and confidential for some companies to disclose. The interviewee added, that this could be especially the case for heavy emitters.

Linthorst agreed that heavy emitters and SMEs are not committing to the initiative yet. However, the interviewee forecasts that in the future there will be more pressure from investors that will allow more companies to commit to the initiative. However, in cases when the SBTi changes and/or updates requirements, it needs to have a clear strategy because it is challenging for companies to keep up. Therefore, Linthorst highlighted communication to be the key tool for both sides.

The interviewee highlighted several benefits companies could get by implementing the SBTi, such as getting additional points with CDP scoring, receiving recognition, leadership, make a company more efficient, steering it towards more innovation. Moreover, it could prepare companies for the future of the low-carbon economy and attract new talents. As for challenges implementing the SBTi, heavy emitting companies might struggle as it would require heavy investments. Setting a target for Scope 3 can also be challenging for some companies. Modelling scope 3 emissions is hard if a company has a complex supply chain (e.g. retail and food). For CO_2 emissions calculations, there is a need to use input and output to estimate the emissions, but the accuracy can be quite low. To improve accuracy for modelling, Linthorst suggests companies expand its supplier engagement, e.g. to get more data from suppliers.

There are a number of initiatives to address climate change, and *We Mean Business* is acting as an umbrella for the initiatives. Linthorst stated that internal carbon pricing is a driver for a company to take action and could help to make a business, getting people on board. It is also linked to investors, giving a policy signal that could keep global warming below 2°C. Linthorst added that at the moment there is a lot happening in investor communities in relation to climate change and that the SBTi fits in the discussion. The interviewee stressed that carbon pricing is a tool and not a goal in itself, therefore suggesting companies to implement the SBTi.

As for the SBTi on the global level, Linthorst emphasized that this initiative is unique and is massively growing. Linthorst stressed that the SBTi did a great job to engage corporations to address climate change. Besides changing the way companies operate, this initiative also makes changes on the global level as it ensures targets to be ambitious. There were intensity targets before, but now those are shifting to be absolute, therefore, contributing to the change in the trend. On the long-term, it requires changing company's supply chain. With the supplier engagement programs, companies trigger a snowball effect, influencing the whole supply chain. Therefore, making more companies such as heavy emitters and SMEs implement the SBTi and proceed towards a low-carbon economy.

4.2.3 Sustainalytics

Sustainalytics, founded in 1992, is a global leader in both, ESG and Corporate Governance research and ratings. It provides its services to the world's leading investors integrating ESG and Corporate Governance knowledge into investment procedures. The company's mission is to provide investors with the relevant insights to make more responsible decisions, contributing to a more just and sustainable global economy (Sustainalytics, 2017).

On Science-Based Targets

According to Oviedo (personal communication, August 2, 2017), currently, mainstream investors are looking to integrate ESG way more than before. Since 2015, there is more demand for asset management among the companies, and it is top-down, allowing more efficiency. However, ESG is not standardised and is very broad, consequently, taking a long time to be integrated into a company. Oviedo highlighted the importance of making ESG a part of investment decisions. In order for investors to make better decisions, there is a need a better quality quantifiable data. For example, it is challenging to quantify human rights, and the result could vary depending on the method.

Oviedo emphasised that governmental regulations can improve disclosure, consequently, improve decision-making processes for investors. A stock exchange was stated as one of the tools that can influence the shift towards more disclosure among the companies especially SMEs. Regulations by the governments can also influence the level and quality disclosure. According to Oviedo, it is important to start small and proceed up. Setting targets based on science can provide companies with multiple benefits, especially with the shift towards the transition to a low-carbon economy.

4.2.4 The ISS-Ethix

Founded in 1999, ISS-Ethix is a proxy advisory company providing proficiency services in environmental, social and governance to incorporate Responsible Investment (RI), creating long-term value for the market. These solutions are offered for asset managers, owners, asset service providers, and hedge funds to understand business from a climate and risk perspective (ISS-Ethix, 2017).

On Science-Based Targets

Companies will look different in the 2°C world in comparison to now as they will have to reduce their emissions dramatically. Besides reducing the CO_2 emissions, companies will have to rethink their business operations to be 2°C compliant. At the same time, investors would be investing more in 2°C compliant companies, subsequently, changing their portfolios. According to Horster (personal communication, August 2, 2017), investors want to know two things: first, they want to know if there is any impact on the planet; second, investors look at the risks, how does climate change impact investment returns. For the latter, it can be a physical risk (e.g. weather conditions) and/or legislation (e.g. by the French Energy Transition Law investors have to report whether investments are 2°C compliant).

Horster stated that there are two ways of knowing whether companies are in transition to be 2°C compliant. First, is to check what companies *say*, second, is to see what companies *do*. For example, the SBTi checks what companies are *saying*. As for what companies are *doing*, for example, 2°C Investment Initiative is looking at industry data and check which companies are spending money on actions to achieve their claims. Horster stressed that in the ideal world these two processes would be combined to achieve best results of being 2°C compliant. The interviewee stated that government level regulations could contribute to the shift and more disclosure by the companies in their compliance.

According to Horster, the SBTi is indeed still a niche initiative, however, it is steadily growing and providing companies and investors with an opportunity to reassess their actions for a 2°C world. The interviewee highlighted that being in line with a 2°C target is more than just minimising the emissions produced. But rather, it is a question of "how can the product and the services I am offering help to reduce emissions out there" (Horster, personal communication, August 2, 2017). In other words, it is changing not only the way companies used to operate but also the preferences and thinking of investors. Horster emphasised that a holistic climate change strategy should come from a toolbox of options that a company has. Depending on the business model, it applies those 'tools' that suit better for the goal.

4.2.5 Common Themes

Based on the interviews with the above organisations, the author identified eight common key themes in relation to the science-based targets (Table 4-5). Despite the shift by companies towards low-carbon economy being slow, it is a visible one, with a potential for a snowball effect. This trend is growing, engaging more companies to set science-based targets, even if not by establishing the SBTi.

Table 4-5. Common Themes in relation to SBTi

#	Theme
1	A change after the Paris Agreement 2015
2	Saying vs. Doing
3	A shift towards setting absolute targets
4	Potential influence by the governments and/or stock exchange/investors
5	Drive companies to rethink their business models/strategies

6	To do a 'fair share' in relation to the CO_2 emissions
7	A growing trend around the science-based targets
8	Increasing disclosure and transparency

Source: Author (2017)

A visible change after the Paris Agreement 2015 triggered some companies to rethink their operations and question if they are doing a 'fair share' to address climate change. There are more disclosure and transparency in relation to companies' actions and carbon emissions. It was accompanied by the assessment of the absolute carbon emissions instead of intensity. Setting targets in line with science push companies to rethink their business models, enabling them to update strategies and actions to achieve those targets. Actions that companies undertake to reach these goals play a major role realise goals within a set timeline. Governments, stock exchanges and investors can influence this shift, for example, by investing in companies with science-based targets, requiring companies to report their emissions, and requesting companies with targets based on science to sign-up.

These themes reinforce the existence and importance of the shift lead by the companies towards a low-carbon economy. At the moment, this change is at the initial stage, meaning that it is still not enough to reach a majority and change global carbon emissions. However, this shift will accelerate with an increasing number of companies to set science-based targets and an additional push from governments and investors. Consequently, not to be left behind, companies with their operations worldwide will seek to set targets based on science and verify those by implementing the SBTi.

4.3 Overview

In conclusion, this chapter presented findings from both companies and expert interviews. The latter one provided a view on the SBTi from the organisations' (that deal with companies and science-based targets) perspective and discussed the future of the science-based target setting. The data collected from companies on their SBTi implementation, provided insights on the process, actions to achieve the goals and their attitude towards the initiative. These two perspectives provide a solid ground to assess the SBTi implementation at *HEXPOL,* and *Nolato* introduced in the next chapter. The results and analysis of these findings and its application on the two case studies can be found in Chapter 6.

5 Case Studies

This chapter presents two case studies of the Swedish based companies *HEXPOL* and *Nolato*. The lessons learned from the companies with approved science-based targets presented in Chapter 4 are applied to the companies to advise them on strategies for the SBTi implementation. First, the author presents *HEXPOL* and its baseline: current carbon emissions, carbon reduction targets and initiatives. The author presents initiatives *HEXPOL* is involved in and the overview of the sustainability targets. Then, energy consumption, air emissions, transport, products and suppliers' areas of the improvement are analysed. The author applies the same process on *Nolato*. Finally, an overview of the chapter is provided.

5.1 HEXPOL

Founded in 2008, *HEXPOL* is a Swedish publicly listed company with 4,400 employees in Asia, Europe and North America. A total of 34 sites are under *HEXPOL's* operations, most of which are new and well equipped (HEXPOL AB, 2016a). It is an industrial company, leading in the market for rubber, offering innovative solutions in advanced polymer compounds. Such compounds include wheels for forklifts, gaskets for plate heat exchangers and castor wheel applications (HEXPOL, 2016b). The Group's business is divided into two business areas: *HEXPOL Engineered Products* and *HEXPOL Compounding*. The company's customers include engineering, automotive and construction industries. *HEXPOL* recognises that company's activities impact both, environment and society. The company is convinced that they can contribute to the sustainable development and do its' a fair share to address climate change (HEXPOL AB, 2016a).

5.1.1 Sustainability: Initiatives and Targets

HEXPOL's overall sustainable development strategy goal is to reduce risks and create business opportunities by developing 'greener' products and efficiently using the resources such as water, materials, and energy. All these measures are produced in line with the CDP reporting system since 2009. *HEXPOL* focuses on energy, material and water consumption, chemicals, air emissions, transport, product innovation and suppliers (HEXPOL AB, 2016b). For this research, the author focuses on the energy consumption, air emissions and transport, products and suppliers presented in the next sections.

The company takes responsibility for all aspects of its business, working towards sustainable future. Climate change is integrated into HEXPOL's business strategy. *HEXPOL AB* (2016a p.9) defines its sustainability strategy as follows:

> "Taking responsibility for people, environment and society is an important part of HEXPOL's corporate culture and something that creates value related to sustainable development – environment, work environment, social responsibility, business ethics – are integrated into everyday work and the strategic planning."

Based on HEXPOL's Sustainability Report 2016 (HEXPOL AB, 2016b), in a 5-year perspective, the company's Key Performance Indicators (KPI) (tonnes of CO_2/net sales) are unchanged. Despite this, the measures to improve energy efficiency have a positive effect, reducing emissions. There is increased use of biomass, such as sawdust and wood in Sri Lanka. Moreover, the opportunity to purchase 'green energy' at some sites minimises CO_2 emissions. In recent years, the lower prices for raw material have a negative effect on Climate Change KPI. The full list of KPIs is presented in Table 5-1.

Table 5-1. HEXPOL — Financial Sustainability KPIs

	2016	2015	2014
Financial Responsibility			
Sales, MSEK	10,879	11,229	8,919
Operation profit (EBIT), MSEK	1,921	1,964	1,456
EBITA margin, %	17.7	17.5	16.3
Average number of employees	4,090	3,867	3,661
Environmental Responsibility			
Breach of environmental and occupational environment legislation, number of cases	2	0	1
Energy consumption, GWh/MSEK sales	0.033	0.030	0.035
Water consumption, m³/MSEK sales	81	68	77
Greenhouse gas emissions, CO_2 tonnes/MSEK sales	13,1	11,4	12,9
Waste, tonnes/MSEK sales	1.8	1.6	1.7
Certified environmental management system, % of total no. of plants	89	93	96
Social Responsibility			
Workplace accidents, (cases of ≥ 1 day's absence; cases per million hours worked	127 (15.1)	111 (15.9)	104 (14.3)
Certified health and safety management system, % of total no. of plants	89	93	96
Female employees, %	13	14	14
Training on HEXPOL's Basic Principles and Code of Conduct, % of number of employees	>90	>90	>90
Application of ethical & humane principles and number of registered breaches of corruption rules	0	0	0
Evaluation of suppliers; evaluations performed are environmental/social responsibility	1945	800	170

Source: Adapted from Sustainability Report 2016, 2015 and 2014 (HEXPOL AB, 2016b; HEXPOL AB, 2015; HEXPOL AB, 2014)

To support these KPIs, *HEXPOL* is involved in a number of internal and external initiatives. For example, the company is reporting to CDP since 2009 and has linked its targets to the UN

Sustainable Development Goals in 2016. Table 5-2 presents *HEXPOL's* targets respective to the area of this research. All targets, reflected in Scopes 1 and 2 (location-based) are intensity targets, neither of these scopes is a verified by a third party. These targets are not based on science. There is no Scope 3 data available. Since 2017 *HEXPOL* is a part of the UN Global Compact, which is reflected in *'Materializing Our Values',* the company's code of conduct (UN Global Compact, 2017a; HEXPOL AB, 2016a p.49).

Table 5-2. HEXPOL's Targets

Area	*Targets*	*Outcome*	*New targets*
Energy	Energy consumption (GWh/net sales) is to be reduced continuously. Connected to the UN SDG 7: Affordable and clean energy	Carrying out installations of energy-efficient production equipment, infrastructure and energy monitoring to ensure more efficient energy use, and installation of LED lights. Energy audits analyses and measures to save energy.	Positive trend, possible to achieve the target
Carbon Emissions	To reduce emissions of carbon dioxide (tonnes/net sales) by 15% by the end of 2018 in comparison to the average for 2010-2011. This target is linked to the UN SDG 13: Climate action.	To achieve this target, HEXPOL uses biofuels, energy optimization measures, and purchases green electricity to reduce CO_2 emissions. However, it was offset by the increased production and activities in countries where electricity is acquired from fossil fuels.	No change
Environmental Management Systems	All *HEXPOL AB* facilities should have certified Environmental Management Systems (EMS), ISO 14001. The target is linked to UN SDG 9 'Industry, innovation and infrastructure'.	More than 90% of the sites are certified according to ISO 14001 standard. At three sites, certification is scheduled for the upcoming year.	Positive trend, possible to achieve the target
Environmentally Sustainable Products	Implementing life-cycle thinking when producing new products. It incorporates an efficient use of materials, water, and energy. The target is linked to UN SDG 9 'Sustainable industry, innovation and infrastructure', and	In 2015 the Dryflex Green product line was launched. Producing more 'greener' products.	No deadline

	Goal 12 'Responsible consumption and production'		
Suppliers	HEXPOL Supplier Sustainability Guideline is implemented in the supply chain of the company. This target can be linked to UN SDG 12 'Sustainable consumption and production'.	HEXPOL AB continued to work on the guideline for suppliers during 2016. The suppliers were notified of the requirements and were urged to adopt HEXPOL's values. More than 1,000 suppliers were evaluated based on the guideline.	Positive trend, possible to achieve the target
Society, Investors and Analysis	Reporting must be with GRI and CDP guidelines. *NEXPOL AB* shall continue to follow the Global Compact. The Group is expected to undertake measures at the national and global levels to pursue sustainable development goals.	Social engagement activities at the local and global levels. Providing transparent information to 'green investors'.	No deadline

Source: Author (2017) adapted from HEXPOL Sustainability Report (HEXPOL AB, 2016b p.12-15)

The company has achieved ISO 14001 certifications for its sites and ISO 50001 for four of its units. Since 2015, *HEXPOL* is also compliant with the EU Energy Efficiency Directive, reporting to the Swedish Energy Agency (HEXPOL AB, 2016b p.19). The company communicates its sustainable development in sustainability report according to the Global Reporting Initiative (GRI) G4 guidelines. *HEXPOL* does not have internal carbon pricing and does not participate in emissions trading scheme (ETS).

HEXPOL also incorporates requirements from its customers that contribute to its sustainability advancement. Taking geographical factor into account, the decisions on business focus on the Group's interested and not on the personal relations. For example, in 2016, a total of 97% of companies informed requirements from customers such as the ISO 14001, environmental product declarations, code of conduct, and other CR requirements.

The following sections of this chapter include some examples of targets and actions executed by the company. For more information, please refer to the HEXPOL Sustainability Report 2016.

5.1.2 Energy

Energy is related to Goals 7, 9, 12 and 13 of the SDGs. *HEXPOL*'s has been systematically addressing sustainability challenges at its sites. These challenges vary depending on a site location, include energy reduction, technology upgrade, product innovation, and an upgrade to ISO 14001: 2015 standard. Since 2016, an update of the new standard begun at all the 34 units of the company and to be completed by the end of 2018. Two newly acquired sites are preparing for ISO 14001 certification.

Since 2008, the absolute energy consumption has generally increased (Figure 5-1). It is due to the growing business of the company, acquisitions and increased production. *HEXPOL* is actively applying the Sustainable Development Goals on the group level as part of the company's commitment to the UN Global Compact (HEXPOL AB, 2016a). In order to successfully address energy consumption, each site has set specific targets followed by concrete actions to achieve set goals. Only 4 out of 34 sites do not have energy targets and actions set. Actions vary depending on the site and targets. For example, actions include: replacement of conventional lights by LED lamps, introducing energy-saving equipment and cooling systems, insulating existing technology.
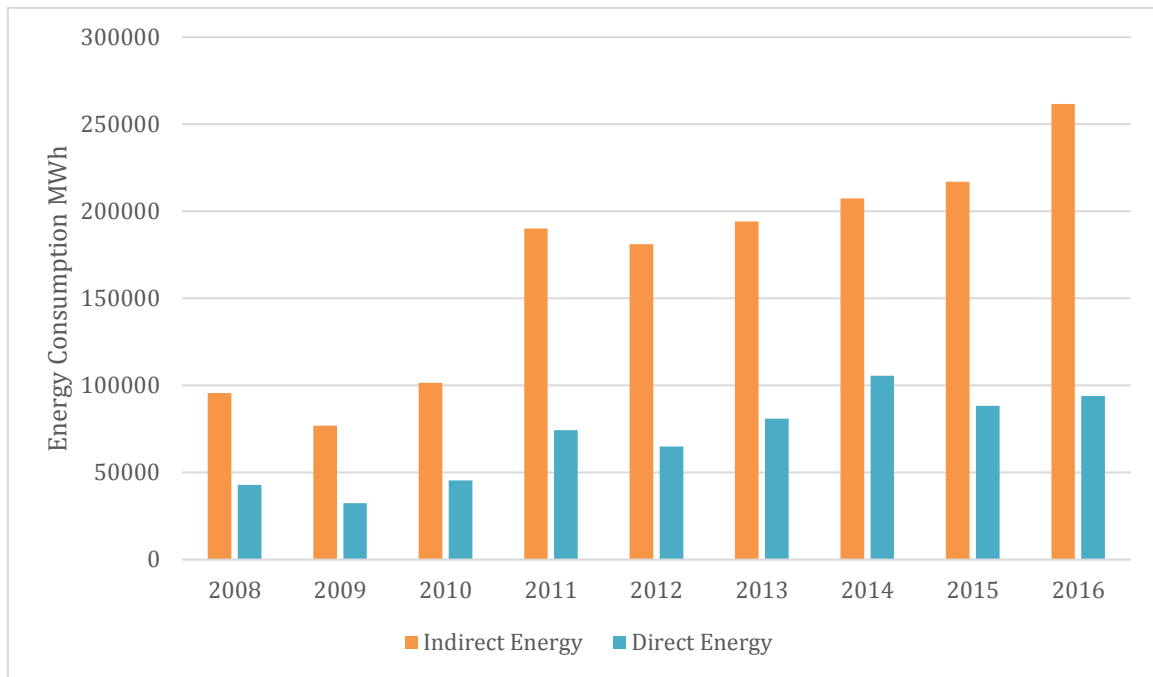
Figure 5-1. HEXPOL AB Energy Consumption 2008-2016

Source: Adapted from HEXPOL Sustainability Report (HEXPOL AB, 2016b)

As for the concrete examples, *HEXPOL Germany* and *HEXPOL Sri Lanka:* four sites in total, have implemented ISO 50001. Only 1 site out of 34, Gislaved Gummi, Sweden is selling surplus energy of 85 MWh to the district heating system. This site's total energy consumption is 15,473 MWh as for 2016, with 8,998 MWh coming from the green electricity (hydropower). A total of 11 sites out of 34 are actively purchasing various types of green energy. For example, 2 sites in Sri Lanka are both purchasing 30% of its energy from hydropower. Stellana site in Sweden is purchasing 1,550 MWh (98,78% biofuels) from district heating. In addition, Vigar site in Spain is getting 25,6% (approx. 1.866 MWh) of its total electricity consumption from renewable energies, whiles, *HEXPOL Compounding,* Unicov in the Czech Republic is getting 350,2 MWh from water, wind and solar power stations (ratio is unknown) (HEXPOL, 2016).

As for the other means of energy saving, Gislaed Gummi site in Sweden installed heat recovery on Compounding building. It saved 27% energy during 2016 compared with the baseline years 2010-2011. In the USA, Kennedale site has reduced CO_2 emissions by 10%, the use of propane by 35%. This site also reduced forklift traffic by introducing better scheduling. The use of power saving installations decreased energy use by >10% at *HEXPOL*

Compounding, Qingdao site in China. For more information on the sites please refer to the HEXPOL Sustainability Report 2016 (HEXPOL, 2016).

Indirect energy consumption (e.g. electricity, district heating, and etc.) is generally significantly higher, nearly double than direct energy consumption (e.g. fuel oil, natural gas, propane, and etc). In 2016, HEXPOL's energy consumption accounted for 355,560 MWh, where top 3 sources of energy are: purchased electricity (24,6304 MWh), natural gas (58,305 MWh) and renewable (26,874 MWh). Based on the *HEXPOL's* energy consumption 2016, two sites, *Dyersburg (USA)* and *Elastomeric Technologies,* Bokundara (Sri Lanka) have the highest total in comparison to other 32 sites, 60,264 MWh and 25,418 MWh, respectively. The third highest site by energy consumption is *Jonesborough* in the USA (20,396 MWh). None of the 34 sites are sourcing its energy from coal. More sites are undergoing ISO 50001 standard certification that will improve the Group's overall energy consumption (HEXPOL, 2016).

5.1.3 Carbon Dioxide Emissions

Energy consumption is closely related to the air emissions. Overall, the absolute CO_2 emissions have increased since 2008 (Figure 5-2,) mainly because of the acquisitions and growth in production. The recent target to reduce CO_2 emissions (tonnes/net sales) by 15% by the end of 2018, compared to the average for 2010-2011, has no change despite the purchase of green electricity, use of biofuels and energy optimisation measures to reduce emissions of GHG. It is due to the increased activity in countries with the electricity produced from fossil fuels. The means to reduce CO_2 emissions continue on the group level.

Figure 5-2. HEXPOL AB Total CO₂ Emissions 2008-2016

Source: Adapted from HEXPOL Sustainability Report 2016 (HEXPOL AB, 2016b)

A total number of 12 sites out of 34 have a decreasing (average 10%) trend in CO_2 emissions in the past three years. The other 12 sites have an increasing trend in CO_2 emissions (average 10%). The rest eight sites have a similar trend of their emissions (HEXPOL, 2016). Only one site has no data available. A total number of 17 sites out of 34 have an air emissions monitoring programme, and one site has this programme for dust. Top 3 emitting sites are

Dyersburg (USA), *Burton* (USA) and *Jonesborough* (UAS) emitting 23949, 10483 and 10123 tonnes CO_2 respectively (HEXPOL, 2016). Those three sites produce their emissions predominantly from indirect energy use, electricity.

Most challenges to reduce emissions appear to be in the USA, Mexico, Germany and China because the indirect purchase of electricity comes from fossil sources. In addition, the purchase of 'green' electricity has fallen dramatically at the sites in the Czech Republic. It is due to the same share of 'clean' and 'dirty' energy. According to HEXPOL AB (2016b p.21), in 2016, allowance of 'green electricity' was 4% in comparison to more than 90% in the previous years. Each site has its own climate change target, developed specifically for the site. A total of 9 sites out of 34 do not have own detailed targets set because of various reasons (e.g. they reason that the target for increased energy efficiency also covers climate change). The remaining 25 sites have actions relevant to their performance and geographical location including, innovation, energy-saving technology, reducing energy consumption and CO_2 emissions (HEXPOL, 2016).

5.1.4 Transport, Products and Suppliers

A total of 29 sites out of 34 have a reduced the environmental impact of transport. Concrete activities include changed routes and coordinated transports, statistics for CO_2 for HEXPOL's largest transporters, an introduction of CSR requirements for transport companies, increased use of video conference and online communications, combined shipments, and the use of hybrid cars (HEXPOL, 2016). For example, Santa Fe Springs site in the USA has set a target to optimise and consolidate incoming and outgoing freight to reduce emissions from transport.

As for the products, 19 sites have reduced the environmental impact of products, and 21 sites which products contributed to environmental benefits. These include such changes as increased energy efficiency during production, the use of recycled materials, improved product quality, efficient logistics, and application of specific wheels that require less energy. In addition, some customers such as IKEA and Max Seal, legislation in the EU demand environmentally friendly products (HEXPOL, 2016).

Regarding the values chain, *HEXPOL* requires suppliers to comply with the company's Code of Conduct. Despite the challenge to address its supply chain, *HEXPOL* (2016), is engaged in assessing suppliers by questionnaires, audit and evaluation, to create long-term and transparent relationships.

HEXPOL has not yet in detail calculated carbon dioxide emissions from purchase and transport of purchased raw materials (synthetic and natural rubber, plastic, carbon black, various types of chemical products). As all the key raw materials are fossil-based, it is likely that upstream emissions are significant. It is confirmed by preliminary estimations. Also, the use of the company's products causes emissions of carbon dioxide. On the positive side is the circumstance the use of some of *HEXPOL*'s products creates energy savings in buildings, reduced fuel consumption in vehicles and other positive effects. During recent years the use of recycled polymer raw materials has increased (Brorson, 2017).

5.2 Nolato

Founded in 1938, *Nolato AB* is a Swedish publicly listed group with 6,418 employees in Asia, Europe and North America. A total of 20 sites are in under *Nolato's* operations. It is an industrial company developing and manufacturing products in polymer materials like silicone, plastic and TPE. Majority of *Nolato's* operations are based abroad. Company's customers are

engaged in pharmaceuticals, automotive, medical technology, telecom and other sectors (Nolato AB, 2017b). The company has three areas of business: medical, telecom and industrial. Development, production and sales vary depending on the business area. *Nolato's* business is based on long-term innovative and close collaboration with customers. *Nolato AB* aims to create added value for its stakeholders by leading polymer technology (Nolato AB, 2016).

First, the author presents initiatives *Nolato AB* is involved with and the overview of sustainability targets. Then, energy consumption, air emissions and transport, products and suppliers' areas of improvement are analysed. Finally, an overview of this chapter is provided.

5.2.1 Sustainability: Initiatives and Targets

Nolato aims to reduce CO_2 emissions through energy efficiency, transport emissions audit, minimising the use of fossil fuels and purchase of fossil-free electricity. All these measures are reported in line with the CDP reporting system. *Nolato* concentrates on energy and water consumption, material and chemicals, air and wastewater emissions, transport, products and suppliers (Nolato AB, 2016; Nolato AB, 2017b). For the purpose of this research, author focusses on the energy consumption, air emissions and transport, products and suppliers presented in the next sections.

The company takes responsibility for all aspects of its business, working towards sustainable improvement. Climate change is integrated into *Nolato*'s business strategy. *Nolato AB* (2017b, p.38) defines its sustainability strategy as follows:

> "Work on sustainability issues is an integral part of Nolato's strategy for growth and value creation and is a natural part of our day-to-day work. The aim is to contribute to a better environment, create business opportunities, reduce costs, minimise risks and meet the requirements and expectations of external and internal stakeholders."

Table 5-3 provides a general overview of the company's Sustainability KPIs from 2014 to 2016. It can be seen that *Nolato* is improving in relation to its suitability work.

Table 5-3. Nolato Financial Sustainability KPIs

	2016	2015	2014
Financial Responsibility			
Sales, SEKm	4,447	4,726	4,234
Operation profit (EBITA), SEKm	457	570	470
EBITA margin, %	10.3	12.1	11.1
Average number of employees	6,418	7,759	8,020
Environmental Responsibility			
Breach of environmental and occupational environment legislation, number of cases	0	1	0
Energy consumption, MWh/SEKm sales	0.038	0.035	0.038

Water consumption, m³/SEKm sales	36.8	37.9	37.8
Greenhouse gas emissions, CO_2 tonnes/SEKm sales	11.5	12.1	14.7
Waste, tonnes/SEK million sales	1.2	1.1	1.0
Certified environmental management system, % of total no. of plants	91	95	100
Social Responsibility			
Workplace accidents, (cases of ≥ 1 day's absence; cases per million hours worked	63 (5.0)	35 (2.3)	43 (2.9)
Certified health and safety management system, % of total no. of plants	27	30	26
Female employees, %	49	50	52
Training on Nolato's Basic Principles and Code of Conduct, % of number of employees	>90	>90	>90
Application of ethical & humane principles and number of registered breaches of corruption rules	0	0	0
Evaluation of suppliers; evaluations performed are environmental/social responsibility	173	134	161

Source: Adapted from Sustainability Report 2016 (Nolato AB, 2016 p.6)

In order to support these KPIs, *Nolato* is involved in a number of internal and external initiatives. For example, it is reporting to CDP since 2015 and has implemented the UN Sustainable Development Goals in 2016. Since 2010, *Nolato* is a part of the UN Global Compact, committing to make its ten principles a part of the company's strategy, culture and day-to-day operations (UN Global Compact, 2017b). Moreover, the company has also achieved ISO 14001 certifications for its sites and ISO 50001 for two of its units. Since 2016, *Nolato* is also compliant with the EU Energy Efficiency Directive reporting to the Swedish Energy Agency (Nolato AB, 2016 p6). The company reports its sustainable development in its sustainability report according to the Global Reporting Initiative (GRI) G4 guidelines. *Nolato* does not have internal carbon pricing and does not participate in emissions trading scheme.

Nolato firmly believes that sustainability actions generate business benefits. ISO 14001 requires having an objective-based management of environmental challenges. Therefore, the company is working to achieve local environmental targets. In 2010, *Nolato* developed long-term targets for the main sustainable development areas (Nolato AB, 2016). After these targets were steadily raised, individual units within the company received substantial freedom in setting their own, upgraded targets. Based on the Nolato Sustainability Report (Nolato AB, 2016), some of the targets were reached in 2016, followed by designing new targets. *Nolato* links its targets to the UN Sustainable Development Goals, therefore, raising the company's sustainably-related actions to a higher level (Nolato AB, 2016, p.12). Table 5-4 provides an overview of the key sustainable performance areas relevant to the scope of this research. All

targets, reflected in Scopes 1 and 2 (location-based) are intensity targets, neither of these scopes are verified by a third-party. These targets are not based on science.

There is currently limited Scope 3 data available, but the company has since 2016 started to collect emission data from the transport of finished goods. *Nolato* has not yet calculated carbon dioxide emissions from purchase and transport of purchased raw materials (mainly plastic). As all major raw materials are fossil-based, it is likely that upstream emissions are significant. Also, the use of the company's products causes emissions of carbon dioxide (Brorson, 2017).

Table 5-4. Nolato's Targets

Area	Targets	Outcome	New Targets
Energy	The object is more efficient energy use and for 2014-2016 Nolato targeted a 10% reduction compared with the average for 2011-2012. The Group-wide KPI is GWh/net sales and many production units use locally adapted targets. This target is linked to UN SDG 7 'Affordable and clean energy'.	Work on energy audits and efficiency improvements continued. The installation of energy-efficient production equipment, LED lighting, infrastructure and energy monitoring contributed to the more efficient use of energy. The Group target was achieved and a new long-term target has been established.	The objective is more efficient energy use and for 2017-2020 Nolato is targeting a 20% reduction compared with the average for 2011-2012. The Group-wide KPI is GWh/net sales.
Carbon Emissions	The target is a 10% reduction in the greenhouse gas carbon dioxide (CO_2) during 2014-2016 compared with the average for 2011-2012. The target relates to CO2 emissions from energy consumption. The Group-wide KPI is tonnes of CO2/net sales and there are also different types of local targets. The target is linked to UN SDG 13 'Climate Action'.	To achieve this target, Nolato is working to achieve more efficient energy usage, phase out fossil energy, make transportation more environmentally sustainable and purchase electricity from renewable sources. This work is generating results, but the situation in China poses a significant challenge as the Group is only able to use electricity there mainly generated from coal. Despite this, the Group target was achieved and a new long-term target has been established.	The target is a 20% reduction in the greenhouse gas carbon dioxide (CO_2) during 2017-2020 compared with the average for 2011-2012. The target relates to CO2 emissions from energy consumption. The Group-wide KPI is tonnes of CO_2/net sales.
Customers	Customers' requirements regarding the environment and social responsibility should be met by a comfortable	The results of customer evaluations and audits remained good. Three plants in China and one in Malaysia have been	Achieved, new target is not set

	margin.	approved as Sony Green Partners.	
Environmental Management Systems	The objective is for all units to be certified in accordance with the international ISO 14001 environmental management system. Acquired companies should be certified within two years. The target is linked to UN SDG 9 'Industry, innovation and infrastructure'.	All units, apart from the two companies acquired in 2016, are certified under ISO 14001. Work has begun on introducing environmental management systems at the acquired companies. Other plants are working on updating their management systems to comply with the new requirements in ISO 14001: 2015. This work must be completed by the end of 2018.	A positive trend, but work remains to achieve the target.
Environmentally Sustainable Products	In 2016, Nolato will take part in at least three projects aimed at reducing the environmental impact of new or existing products. The target is linked to UN SDG 9 'Sustainable industry, innovation and infrastructure', and Goal 12 'Responsible consumption and production'	Projects for environmental adaptation of existing and new products are undertaken in cooperation with customers or on our own initiative. This target is part of the Group's continual improvement measures and has no specific deadline.	A positive trend, but work remains to achieve the target.
Suppliers	Improved evaluation of suppliers' sustainability work. In 2016, each company should have evaluated at least five suppliers. This target can be linked to UN SDG 12 'Sustainable consumption and production'.	In 2016, Group companies conducted 173 evaluation of suppliers' sustainability work. The suppliers satisfied Nolato's requirements at an acceptable or good level. Cooperation was discontinued in one case due to certain deficiencies.	Achieved, new target is not set
Society, Investors and Analysis	Reporting must be with GRI and CDP guidelines. Nolato shall continue to endorse the Global Compact. We shall achieve good results in evaluations by analysts and independent institutions through transparent information	Social engagement activities in China and elsewhere. Good results from evaluations of sustainability work in business magazines and by investors. CDP-based reporting of carbon emissions and reporting to the UN (COP).	Achieved, new target is not set

	in the field of sustainability.		

Source: Author (2017) adapted from Nolato Sustainability Report (Nolato AB, 2016 p.12)

Nolato incorporates requirements from its customers that benefit to its sustainable development. For example, requirements include environmental management systems, code of conduct, product labelling and others (Nolato AB, 2016).

The following sections of this chapter include some examples of targets and actions implemented by the company. For more information, please refer to the Nolato Sustainability Report (2016).

5.2.2 Energy

Taking the nature of production into account, the company at hand has been actively addressing sustainability challenges at its sites. These challenges vary depending on a site location, include: employee development, supply chain audits, energy reduction, energy and waste monitoring system installation, upgrade to ISO 14001: 2015 standard, and technology upgrade. *Nolato* is in a process to upgrade its 20 plants to the updated ISO 1400: 2015 standard by the end of 2018 (Nolato AB, 2016 p.4). The company has already upgraded some sites according to the new standard.

Overall, energy consumption has increased since 2003 as shown in Figure 5-3. Energy is related to Goals 7, 9, 12 and 13 of the SDGs. On the group level, *Nolato* is actively applying the Sustainable Development Goals as part of the company's commitment to the UN Global Compact (Nolato AB, 2015). To address energy consumption, each site has set specific targets and actions to address the goal. Only 3 out of 20 sites do not have own detailed energy targets and actions because of various reasons. Actions addressing energy targets vary depending on the site and targets to achieve. For example, actions include replacement of conventional lights by LED lamps, adjusting overall lighting layout, introducing energy-saving equipment, minimisation of oil consumption, and existing insulating machines.
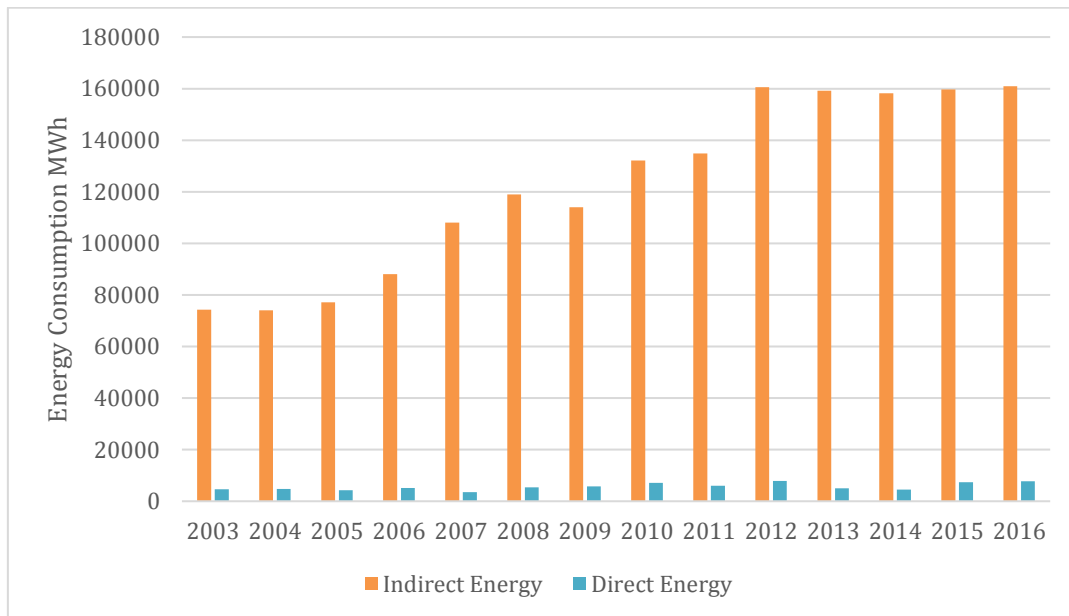

Figure 5-3. Nolato AB Total CO$_2$ Emissions 2004-2016
Source: Adapted from Nolato Sustainability Report 2016 (Nolato AB, 2016)

As for the concrete examples, *Nolato's* two UK-based sites have implemented ISO 50001. The Hungarian site is now purchasing green energy. Transport to Hungary was optimised, consequently increasing lorry fill factor by 15% (Nolato, 2016). Implementation of a new energy-efficient technology contributed to 1% and an average of 35% energy consumption reduction at *Nolato Contour* (Baldwin) and *Nolato Jaycare* (Newcastle) respectively. In addition, *Nolato Plastteknik* (Goteborg) has reduced its energy key ratio by 11%, due to the investment in the efficient machinery. At the *Nolato MediTech* (Horby) site, power consumption KPI was reduced by 4% compared to 2,015 kWh/Net Sales.

Indirect energy consumption (electricity, district heating, etc.) is in general significantly higher, usually almost double than a direct energy consumption (fuel oil, natural gas, propane, etc.). In 2016, *Nolato's* energy consumption accounted to 16,8642 MWh, where top 3 sources of energy were: electricity (143,756 MWh), district heating (17,126 MWh) and natural gas (6,607 MWh). Based on the *Nolato's* energy consumption in 2016, two sites, *Nolato Beijing* and *Hungary* have the highest total energy consumption, in comparison to other 18 sites, 52,464 MWh and 27,468 MWh respectively. The third site by energy consumption is *Nolato Cerbo* (13,986 MWh). A total of 4 sites out of 20 are sourcing energy from renewable sources (Nolato, 2016). Two of the sites belong to the *Nolato UK* that has received ISO 50001 certification and now source blue energy (nuclear). The other two sites are in Beijing and Hungary, sourcing solar energy of 26,8 MWh and 24,309 MWh respectively.

5.2.3 Carbon Dioxide Emissions

Energy consumption is closely related to the air emissions. Overall, CO_2 emissions have decreased since 2013 as presented in Figure 5-4. The recent target to reduce CO_2 emissions by 10% during 2014-2016 compared to the average for 2011-2012 was achieved, and *Nolato* is now developing a new long-term target. Most challenges to reduce emissions appeared to be in China because the Group is only able to use electricity from coal (Nolato, 2016). Each site has its own climate change target, developed specifically for the site. A total of 3 sites out of 20 do not have targets set because of various reasons. The other 17 sites have actions relevant to their performance and geographical location including, innovation, energy-saving machines, reducing CO_2 emission and energy consumption.
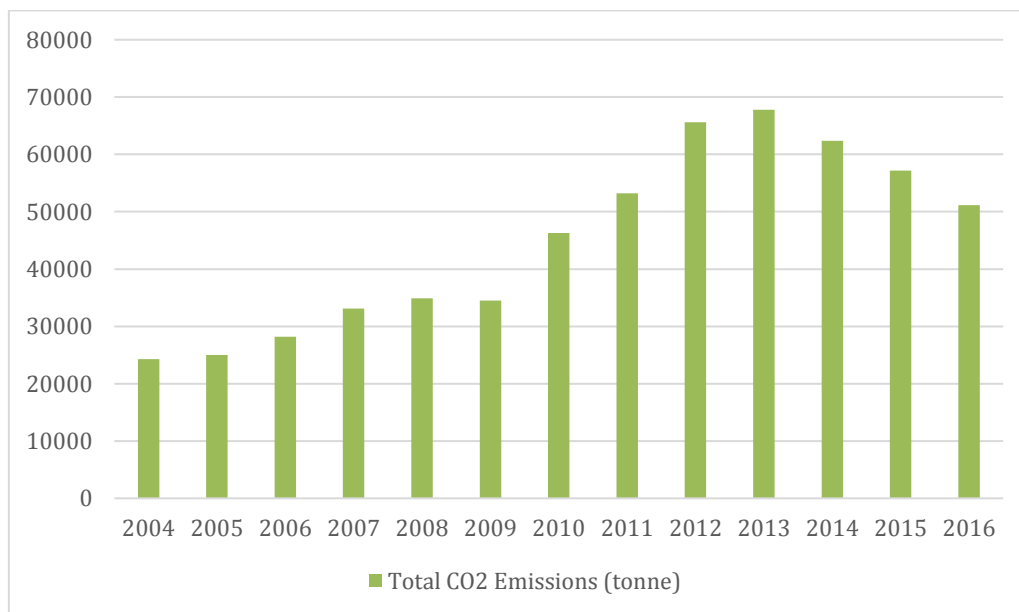

Figure 5-4. Nolato AB Total CO_2 Emissions 2004-2016
Source: Adapted from Nolato Sustainability Report 2016 (2016)

A total number of 8 sites out of 20 have a decreasing (around 10%) trend in CO_2 emissions in the past three years. The other six sites have an increasing trend in CO_2 emissions (around 10%). The rest 6 companies have a similar trend of their emissions (Nolato, 2016). Only 6 sites out of 20 have an air emission monitoring programme. Top 3 most emitting sites are *Nolato Mobile* (Beijing), *Nolato Contour* (Baldwin) and *Nolato Cerbo* (Trollhattan) emitting 32,008, 2,474 and 2,342 tonnes CO_2 respectively. Those 3 sites produce their emissions largely from indirect energy use, electricity (Nolato, 2016).

5.2.4 Transport, Products and Suppliers

A total of 19 sites of *Nolato* are improving transport system by changing routes, increasing the use of video conferences, introducing environmental requirements for transport companies, and monitor CO_2 emissions. For example, in 2016, *Nolato* (2016) has introduced Scania's new truck models, contributing to increased orders for the company. This new generation of trucks has an energy-efficient technology and a more comprehensive approach to transport systems.

As for the products, 6 sites have reduced the environmental impact of products and products that contributed to environmental benefits. These include such changes as the use of recycled materials, improved product quality, efficient logistics, and reduced material weight. In addition, some customers such as Sony, and Pfizer demand environmentally friendly products (Nolato, 2016).

As for suppliers, *Nolato's* 19 sites inform suppliers on its Code of Conduct and related documents. Depending on geographical location, for example (some suppliers are asked to follow the Code of Conduct), other sites require them to sign 'Supplier Corporate Social Responsibility Declaration'. Other sites request suppliers to have ISO 14001 or an equal certification in place. A total of 17 sites are checking the CSR performance of suppliers, depending on their location, predominantly by questionnaires. Despite the fact that supply chain is challenging to address, *Nolato* is engaged in supplier auditing and evaluation, to create a long-term and transparent relationship. In 2016, 1 supplier was terminated due to the poor environmental and social performance (Nolato, 2016).

5.3 Overview

This chapter introduced the case studies *HEXPOL* and *Nolato* to analyse the SBTi implementation. Both companies have a well-developed environmental management system in place, are reporting to CDP, and have linked their goals to the UN SDGs. Sustainability is implemented in their strategy, signalling the importance of their progress in the future. They are both engaged in a number of internal and external initiatives to minimise carbon emissions. Slowly but surely companies are reducing their CO_2 emissions at all their sites.

The effectiveness depends on several factors, for example, the geographical location and availability of such sources as renewable energy that can significantly decrease emissions level. Both companies are also working in the areas of transport, products and suppliers to ensure their sustainable future. Neither *HEXPOL* nor *Nolato* assess their emissions as absolute. In addition, neither of them have Scope 3 data available. An overview of *HEXPOL's* and *Nolato's* progress in relation to Scopes 1, 2 and 3 is presented in the next chapter to understand the achievements needed to implement the SBTi.

6 Results and Analysis

This chapter presents the results and analysis of the findings introduced in a previous chapter. First, barriers and drivers to implement the SBT initiative are assessed. Then, the author presents the case studies providing an overview of the current strategy in relations to Scopes 1, 2 and 3. The author also provides recommendations for the future actions.

6.1 Analysis of Barriers and Drivers

As presented in Chapter 4, companies can face several barriers and drivers to implement an initiative to address a certain issue. Moreover, companies in various business sectors and of a different level of advancement might have a number of barriers and drivers, applicable only to them. However, those can be similar to some companies. There is no study or data available on the barriers and drivers respective to the company profile. Therefore, the author provides new information in this area.

6.1.1 Barriers

Based on interviews with nine companies a number of barriers to implement the SBTi were identified. It is, however, important to highlight that despite facing those barriers, companies interviewed found solutions and as a result, successfully implemented science-based targets.

Based on the information collected, the question is, if these barriers are applicable for *HEXPOL* and *Nolato*. An analysis of the barriers is presented in Table 6-1 in relation to the case studies. The 'applicability' of the barriers is based on the companies' profile presented in Chapter 5. The author has set the coding for the case studies by answering a question 'Is it a barrier for *HEXPOL/Nolato*?'. The codes for the answers on this question are following: '*Yes*' if it is a barrier, '*Maybe*' if there is a potential to be a barrier and '*No*' if it is not a barrier. A short explanation follows all of the codes.

Table 6-1. List of Barriers in Relation to HEXPOL and Nolato

#	Barrier	HEXPOL	Nolato
1	Change in the Methodologies	Yes – there are continuous changes in methodologies developed by the SBTi and in case one of the methodologies is used for setting targets then changes, it could be challenging to keep up, especially if the changes are substantial.	Yes – there are continuous changes in methodologies developed by the SBTi and in case one of the methodology is used for setting targets then changes, it could be challenging to keep up, especially if the changes are substantial.
2	Internal Communication	No – there is a high environmental awareness within the company, climate strategy is in place; a number of initiatives to reduce CO_2 emissions were already considered for implementation in the next two years.	No – there is a high environmental awareness within the company, climate strategy is in place; a number of initiatives to reduce CO_2 emissions were already considered for implementation in the next couple of years.
3	Long-term Target	Maybe – the current timeframe for sustainability targets is three years. There could be challenges to apply a perspective of 5 – 10 years. With the	Maybe – the SBTi requires targets to be set longer than 5 years, it might be challenging for some sites that are located in the developing

5		new acquisitions and ongoing environmental upgrade on those sites might challenge long-term target setting at this moment.	countries
4	Prediction of the Market Development	Yes – there are multiple factors that could influence the company, taking a relatively steady development of the market in this business sector. Currently some customers (mainly automotive industry) ask for lighter and more environmental friendly products. Some customers show low in interest in climate-change issues and are more focused on price and technical specifications.	Yes – there are multiple factors that could influence the company, taking a relatively steady development of the market in this business sector. *Nolato* aims to develop 'greener products', but this can be hindered by some customers. This is especially valid for the medical products where changes in materials and specifications can take very long time.
5	Scope 3	Yes – as there is no solid data available that could be used to set credible targets. The company is very dependent of fossil raw materials, but currently has limited possibilities to make a major breakthrough using more bio-based raw materials.	Yes – as there is no solid data available that could be used to set credible targets. The main raw materials are fossil-based plastics. The company has an ambition to introduce more bio-based raw materials. It is likely that this process will take many years and could be hindered by lack of availability and higher prices.
6	Technological Innovation	Yes –technological innovation (introduction of new types of equipment, processes and products) is relatively slow in this sector.	Maybe – technological innovation is rather high in this sector. More advanced productions methods and final products. However, investment in new equipment can cause high costs. The company is highly dependent on technical product specifications from its customers. This can hinder the development of processes and materials.
7	Time	Yes – it is connected with other barriers and could challenge the SBTi implementation due to whole process of setting targets, implement relevant activities, collect data, and follow-up on the progress	Yes – it is connected with other barriers and could challenge the SBTi implementation due to whole process of setting targets, implement relevant activities, collect data, and follow-up on the progress

Source: Author (2017)

Overall, it can be seen in Table 6-1 that majority of the barriers recognised in the interviews are applicable for *HEXPOL* and *Nolato*. On a long-term, an analysis of these barriers can be incorporated in the future risks by companies. An understanding of these barriers can prepare companies and speed up a path towards a low-carbon economy and set a ground for more aggressive activities to reduce CO_2 emissions.

6.1.2 Drivers

Despite the equal number of barriers and drivers mentioned by the companies, some of the drivers were repeated three or two times. For example, 'Reliability and Responsibility' was mentioned three times, whiles 'Logical Follow-up' and 'Communication' were mentioned twice each (for more information, please refer to Chapter 4). Companies interviewed are innovators in the area of science-based targets and are generally more advanced. Those drivers apply to the business areas of companies interviewed as they are leading the way for others. In addition, their business sector enables them to set science-based targets easily.

However, the question is, if these drivers are applicable for *HEXPOL* and *Nolato*. An assessment of the drivers, collected from interviews with a total of nine companies, is presented in Table 6-2 in relation to the case studies. The 'applicability' of the drivers is based on the profile of the companies presented in Chapter 5. The coding for the case studies have been set by the author by answering a question: 'Is it a driver for *HEXPOL/Nolato*?'. The codes for the answers on this question are following: '*Yes*' if it is a driver, '*Maybe*' if there is a potential to be a driver and '*No*' if it is not a driver. A short explanation follows all of the codes.

Table 6-2. List of Drivers in Relation to HEXPOL and Nolato.

#	*Driver*	*HEXPOL*	*Nolato*
1	CDP reporting	No – to get the highest CDP ratings is not considered to be a primary goal	No – to get the highest CDP ratings is not considered to be a primary goal
2	Commitment to Company's Strategy	Yes – would reinforce the importance of the climate change that is already incorporated in a current strategy, providing more credibility.	Yes – would reinforce the importance of the climate change that is already incorporated in a current strategy, providing more credibility.
3	Communication	Yes – would contribute to external and internal communication.	Yes – would contribute to external and internal communication.
4	External Verification	Maybe – it would be a bonus point, especially with the development of the new acquisitions, however, the company does not put it as a primary goal.	Maybe – it would be a bonus point however, the company does not put it as a primary goal.
5	GHG Emissions Reduction	Yes – will reinforce current activities for carbon emissions reduction and trigger new ones. A long-term target may have a deeper impact on the company's strategy.	Yes – will reinforce current activities for carbon emissions reduction and trigger new ones. A long-term target may have a deeper impact on the company's strategy.
6	Logical Follow-up	No – the company has already energy and climate-change targets that are followed up and	A long-term target may have a deeper impact on the company's

		communicated.	strategy.
7	Relevance	Yes – for the necessary transition of the company towards a low-carbon economy.	Yes – for the necessary transition of the company towards a low-carbon economy.
8	Reliability and Responsibility	Yes – it would reinforce current actions taken by the company in relation to sustainability, providing more credibility within and outside the company, especially for new acquisitions; and strengthen current relations with stakeholders.	Yes – it would reinforce current actions taken by the company in relation to sustainability, providing more credibility within and outside the company, and strengthen current relations with stakeholders.
9	Risk Reduction	Yes – will allow the company to protect its reputation, increase interested parties' confidence and reduce risks and costs.	Yes – will allow the company to protect its reputation, increase interested parties' confidence and reduce risks and costs.

Source: Author (2017)

Generally, it can be seen in Table 6-2 that the majority of drivers identified in the interviews are applicable for *HEXPOL* and *Nolato*. In the long-term, these drivers would benefit these two companies to implement either science-based targets or the SBTi in the future once they are ready. An understanding of these drivers could also speed up a path towards a low-carbon economy and set a ground for more aggressive activities to reduce CO_2 emissions.

6.2 Benefits

An implementation of science-based targets can bring a number of direct and indirect benefits. A list of benefits was identified based on the interviews with the companies that have already implemented the SBTi. The author identified a total of thirteen benefits, the full list is presented in Table 6-3 and applied to *HEXPOL* and *Nolato*. The coding is done by answering a question posed by the author: 'Is it a benefit for *HEXPOL* and *Nolato*?'. The codes for the answers on this question are following: '*Yes*' if it is a benefit, '*Maybe*' if there is a potential to benefit a company and '*No*' if it is not a benefit. A short explanation follows all of the codes.

Table 6-3. List of Benefits in Relation to HEXPOL and Nolato.

#	*Benefit*	*HEXPOL*	*Nolato*
1	Communication	Yes – would strengthen communication of its sustainability.	Yes – would strengthen communication of its sustainability.
2	Cost and Consumption Reduction	Yes – on the long-term, but it might require some investments at first, depending on the advancement of the site.	Yes – on the long-term, but it might require some investments at first, depending on the advancement of the site.
3	Customer Relations	Yes – with rising requests form clients it will strengthen current customer relations	Yes – with rising requests form clients it will strengthen current customer relations

4	Good Governance	Yes – would reinforce existing governance of the company, specifically for new acquisitions, and prepare for future legislation change.	Yes – would reinforce existing governance of the company and prepare for future legislation change
5	Investor Relations	Yes – in the long-term it would strengthen current relations and attract more investors as there is a growing trend in investor community	Yes – in the long-term it would strengthen current relations and attract more investors as there is a growing trend in investor community.
6	New Business Models without CO_2	No – unless we assume that technological advancement would allow such operations and processes for this business sector.	No – unless we assume that technological advancement would allow such operations and processes for this business sector.
7	New Business Opportunities	Yes – processes and products with lower climate footprint would likely provide a stronger business strategy.	Yes – A long-term target may have a deeper impact on the company's strategy.
8	Rating - CDP	Yes – the SBTi would contribute CDP ratings.	Yes – the SBTi would contribute CDP ratings.
9	Replication	Yes – improve performance and data durability guarantee.	Yes – improve performance and data durability guarantee.
10	Report - Utilities	No – it is not explicitly applicable.	No – it is not explicitly applicable.
11	Reputation	Yes – would strengthen reputation, and provide opportunities for better customer and investor relations; advance internal and external communication; would benefit new acquisitions.	Yes – would strengthen reputation, and provide opportunities for better customer and investor relations; advance internal and external communication.
12	Transparency	Yes – would advance current level of transparency, which is essential for the company's stakeholders.	Yes – would advance current level of transparency, which is essential for the company's stakeholders.
13	Validation	Maybe – the company does not seek to validate its actions to reduce carbon emissions, however, it could be beneficial.	Maybe – the company does not seek to validate its actions to reduce carbon emissions, however, it could be beneficial.

Source: Author (2017)

In comparison to the four benefits stated by the SBTi (such as increased innovation; reduced regulatory uncertainty; strengthened investor confidence and credibility; and improved profitability and competitiveness), companies-innovators revealed nine more possible benefits. It can be seen in Table 6-3 that majority of the benefits apply to *HEXPOL* and *Nolato* if these two companies decide to implement science-based targets or go for the SBTi. It reinforces the importance of the science-based target setting for companies and provides two case studies

with opportunities they would face once either science-based targets or the SBTi are implemented.

6.3 Case Study Analysis

The findings of both, the literature review and qualitative data analysis provided relevant information for the second research question. Divided into three sub-questions, RQ2 applies the SBTi in practice for two Swedish companies, *HEXPOL* and *Nolato*. These companies' current CO_2 reduction activities were broken down by Scope 1, 2 and 3 into areas such as transport, suppliers, use of fossil fuels, products, fossil-free electricity and increased energy efficiency. The CO_2 reduction potential of the current and planned activities was evaluated and the possibilities for more actions were identified for each of the specified areas. The SBTi is a 'young' initiative, companies that have their targets approved are pioneers and advanced in the area. Therefore, the recommendations were developed largely based on the companies' experience.

6.3.1 HEXPOL

Based on the findings presented before, *HEXPOL* has a well-developed sustainability policy in place. For scope 1 emissions, *HEXPOL* is addressing both, buildings and cars, however, more action is needed, as not all the sites are engaged in phasing out fossil fuels. The company has many activities in relation to Scope 2. Yet, not all the sites are at the same level, therefore, despite a positive trend, some sites require to introduce more actions. Fossil free electricity as part of the scope 2 can significantly reduce CO_2 emissions, however, geographically, not all the sites have such an opportunity. Therefore, the trend is rather neutral. As mentioned before, there is no scope 3 data available at *HEXPOL*. Therefore, it is challenging to assess the improvements in this scope. All three sectors (transport, suppliers and products) are active but need to implement more specific targets. Transport is actively addressed, also as a part of the scope 1, to phase out fossil fuels. There is a potential for improvement in every scope as those results are combined from sites and not looked at individually.

The overview of the activities in relation to the Scopes 1, 2 and 3 are presented in Table 6-4. It also presents current trends in relation to the activities and whether there is a potential for additional actions. These activities are not the same for all the sites where *HEXPOL's* operations take place. Every site implements activities relevant to them. Some sites are more advanced than others in setting targets to reduce their CO_2 emissions. For example, sites certified with ISO 50001 are more advanced than the others due to the scope of such certification. Geographical location also plays a major role in reducing carbon emissions, due to the local opportunities, for example, availability of renewable energy, and local legislation. *HEXPOL* has intensity targets set for its scope 1 and 2 that contribute to the process of setting science-based targets that are more ambitious.

It can be seen that implementing the SBTi by *HEXPOL* will result in internal changes in the company, revising the way company operates. By taking a step-by-step approach to analyse a baseline to set science-based target, the SBTi can bring long-term benefits to the company as shown in Table 6.4. Moreover, setting science-based target will result in more ambitious and aggressive targets requiring a more consistent set of activities to reduce CO_2 emissions. Taking into account the Technology Adoption Lifecycle model and the determined baseline of the company, *HEXPOL* can decide on what type of adapter they want to be and when to implement the SBTi to their advantage. By setting targets based on science or taking a step further by implementing the SBTi, *HEXPOL* can prepare itself for a transition to a low-carbon economy.

Table 6-4. Overview of HEXPOL's Actions

Scope	Area	Current Trend	Ongoing/Planned Activities	Is there a Potential for Additional Activities?
1	Use of fossil fuels (e.g. buildings, processes)	Neutral	Company cars with lower fuel consumption; company car policy.	Yes
2	Increased energy efficiency	Positive	Reduce the use of natural gas; boiler combustion efficiency test and adjust; use press for steam saving; increase thermal insulation material to reduce heat losses; installation of the mould pre-heating for energy saving and improve efficiency; installation of heat recovery; ISO 50001 certification; installation of Condensate Recovery System; TPU wheels energy consumption control; updating injection machine to variable frequency motor; implementation of the cooling system of higher efficiency with heat recovery; installation of a power monitoring system; installation of an optimised compressed air system and installation of LED illumination in product area; installation of automatically closing doors; installation of heat pumps; implementation of the energy curtailment programme; lower unnecessary idle time; continued compressed air audit programme to eliminate air leaks; installation of movement censored light switches in office areas; recirculation of dust collection air through HEPA filters back into facility to prevent heat/cooling loss; use of low energy lighting; reduce propane use; modify energy use by season; implementation of more efficient boiler.	Yes
2	Fossil-free electricity	Neutral/Negative	Some of the HEXPOL plants buy fossil-free electricity. There is a potential to buy more, but high presence in USA and China limits the possibility for additional 'green energy'. The availability in the Czech Republic has been reduced.	Yes
3	Transport	Positive	Changed routes and coordinated transports; coordinating Alfa, SPX and Sondex's transport services; purchased a low fuel consumption of cars instead of two high fuel consumptions of cars; statistics for CO2 from two largest transporters, Schenker (car) and G-Solution (lake); introduced environmental/CSR requirements for transport companies; routines to	Yes

			measure CO2 emissions; increased use of video conferences; use of hybrid car; increased use of online communications; use of company truck for local transfers to reduce use of OTR trucks; ask transport companies to use only Euronorm 4 trucks or better and coordinated transports; combined shipments; all outbound transport is the responsibility of the customer; reduction of LTL and combination loads with other facilities; striving to fill up the transport vehicles; use of hybrid company cars; collecting information on emissions from all transports, including suppliers, sales personnel, travel (flight) etc.	
3	Suppliers	Neutral	Request environmental policy; questionnaire sent to the suppliers yearly; conducting audits; check on the basic environmental and safety situation; suppliers' visits through the year; EMS-questionnaire; Supplier evaluation to ABC-analysis; HUK & EUP EMS – questionnaire and supplier evaluation to ABC-Analysis; use of the Supplier Sustainability Guideline; requirements for ISO-certificates; sending out supplier declaration every third year.	Yes
3	Products	Positive	Increased energy efficiency during production; bio composites; use recycled (waste) rubber and plastics in products; rubber gaskets that are used in plate heat exchangers; substitute the thermoset wheels with thermoplastic ones; development of light weight wheels for KION (transports, energy and wear); ongoing project with new PA wheels to reduce hydrating of PA wheels; quicker processing times.	Yes

Source: Author (2017) Adapted from HEXPOL AB (2016)

6.3.2 Nolato

Based on the findings presented before, *Nolato* has a well-developed sustainability policy. For scope 1 emissions, *Nolato* is addressing both, buildings and cars, however, more action is needed, as not all the sites are engaged in phasing out fossil fuels. The company has many activities in relation to Scope 2. However, not all the sites are at the same level, therefore, despite a positive trend, some sites require to introduce more actions to reduce CO_2 emissions. Fossil free electricity as part of the scope 2 can significantly reduce CO_2 emissions, yet, because of some site's, not all of them have such an opportunity. Therefore, the trend is rather neutral. As mentioned before, there is no scope 3 data available at *Nolato*, therefore it is challenging to assess the improvements in this scope. All three sectors (transport, suppliers and products) are active but need to implement more specific targets and collect year to year data. Transport is largely addressed, also as a part of the scope 1, to phase out fossil fuels. There is a potential for improvement in every scope as those results are combined from sites and not looked at individually.

The overview of the activities in relation to the Scopes 1, 2 and 3 are presented in Table 6-5. It also shows current trends in relation to the activists and whether there is a potential for additional activities. These activities are not the same for all the sites where *Nolato's* processes take place. Every site introduces activities relevant to them. Some sites are more advanced than others in setting targets to reduce their carbon emissions. As mentioned before, sites certified with ISO 50001 are more advanced in CO_2 emissions reduction than the others, due to the scope of such certification. The location also plays an important role in reducing carbon emissions, due to the local opportunities, including but not limited to availability of renewable energy, and local legislation. *Nolato* has intensity targets set for its scope 1 and 2 that contribute to the process of setting science-based targets that are more ambitious.

It can be seen that if *Nolato* implements the SBTi, it will result in internal changes in the company, changing the way company operates. By taking a step-by-step approach to conduct an analysis to determine a baseline to set science-based target, the SBTi can bring long-term benefits to the company as shown in Table 6-5. Moreover, setting science-based target will result in way more ambitious and aggressive targets requiring a consistent set of activities to reduce CO_2 emissions. Based on the Technological Adoption Lifecycle model and the determined baseline of the company, *Nolaro* can choose what type of adopter they want to be and when to implement the SBTi to its advantage. By setting targets based on science or taking a step further and implementing the SBTi, *Notalo* can prepare itself for a transition to a low-carbon economy.

Table 6-5. Overview of Nolato's Actions

Scope	Area	Current Trend	Ongoing / Planned Activities	Is there a Potential for Additional Activities?
1	Use of fossil fuels (e.g. buildings, processes)	Positive	Partly phased fuel oil for heating of buildings.	Yes
2	Increased energy efficiency	Positive	Replace conventional lights by LED lights; use of energy efficient injection moulding machines; new cooling down machines and air compressor; ISO 50001; purchase of energy-efficient electrical moulding machines instead of the hydraulic presses; repair and start-up of existing free cooling system for cooling water; minimise oil consumption; installation of heat pumps; installation of geothermal system; installation of energy saving equipment; adjusting lighting layout.	Yes
2	Fossil-free electricity	Neutral	The company purchases fossil-free electricity at several plants. A new energy contract will provide all Swedish plants with 'green electricity'. Probably not possible to buy fossil-free electricity for the large plant in Beijing.	Yes
3	Transport	Neutral	Changed routes, increased use of video conferences; require transportation to use green label vehicles.	Yes
3	Suppliers	Neutral	Send environmentally friendly declaration (QOP-B12-f1) and Social Responsibility Declaration (QOP-B12-f2) to suppliers; request suppliers to sign 'Supplier Corporate Social Responsibility Declaration'; to sign 'Environmental protection warranty'; all purchase requests and orders contain demand to follow Nolato CoC and CSR questionnaires; request ISO: 14001 or similar certification; Supplier visits and questionnaire; inform suppliers about Nolato environmental policy, principles and CoC; conduct audits.	Yes
3	Products	Positive	Use recycled materials; investigating to replace aluminium with plastics; investigating to replace chroming on plastics by new methods; reviewed and amended packing specifications for products; conversion of old technology sprue mould to new hot runner mould to reduce material usage and	Yes

			waste. Target to increase the use of recycled materials and introduce more bio-based plastics.	

Source: Author (2017) Adapted from HEXPOL AB (2016)

Recommendations for HEXPOL and Nolato

Both *HEXPOL* and *Nolato* are well known in a polymer sector offering high-quality products. These companies provided an interesting case study for a possible application of the SBTi. The analysis of literature, expert and organisation interviews provided a broad outlook of the SBTi and its application in practice for companies-innovators. This data resulted in a set of explorative recommendations for companies to pursue the implementation of science-based targets. Based on the author's experience with *HEXPOL* and *Nolato*, a few recommendations on possible improvements in emissions reduction and science-based targets shall be given. The same set of recommendations is given for these two companies because they are in the same business sector and are similar in their operations. Overall, there is a need for a life-cycle perspective, a more long-term thinking, and continuous practical measures. The full list of recommendations is shown in Table 6-6.

Table 6-6. List of Recommendations

#	Recommendation
1	Establish a life-cycle perspective on carbon dioxide emissions, including raw materials, transport and use of products.
2	Go through existing carbon reduction activities and introduce a unified set of actions for all sites to implement (if relevant).
3	Continue implementation of ISO 50001.
4	Decide if targets will be group-wide, geography-wide or site-wide. Introduce more ambitious targets if necessary.
5	Based on the choice of targets, decide if some sites are allowed to expand (e.g. size, production, activities).
6	Introduce consistent data collection for scope 3.
7	Consider introduction of an internal carbon tax as a tool to reduce CO_2 emissions.
8	In case finance and resources permit, go through the 'exercise' of setting science-based targets (e.g. the SBTi), to understand risks and opportunities of the low-carbon economy.

Source: Author (2017)

Companies are suggested to review their target setting recourses, criteria and recommendations (shown in Table 6-6) as also mentioned in the SBTi 'Call for Action' process. Similar to this step, the author recommends companies to get an in-depth understanding of the companies' activities to reduce CO_2 emissions. Taking into account multiple locations, provide companies with a set of tools to minimise carbon emissions. For example, ISO 50001 is an example to address energy use effectively. An internal carbon tax is another tool to address carbon emissions that is run internally, providing an understanding of different departments and preparing companies for future carbon pricing legislation. An internal carbon tax, however, has its own shortcomings such as fair distribution among departments, and geographical location.

It is also important for companies to decide whether targets will be group-wide, geography-wide (e.g. sites located in the same country) or site-wide (specific for every site). It is

significant, as those sites located in developing countries and might be limited by legislation, flexibility, and energy sources. For some companies, scope 3 was mentioned throughout all the interviews as a challenge due to the lack of available data. Therefore, to be prepared for scope 3 carbon emissions reduction, it is recommended to start collecting quality data to enable measurement of carbon emissions figures year by year.

Prior to applying these recommendations, *HEXPOL* and *Nolato* are suggested to decide which type of adopters they want to be, in relation to the Bell Curve discussed in Chapter 3. Understanding the type of the adopter they want to be, will enable them to pursue these recommendations and implement the SBT/SBTi successfully. Based on the assessment of these two companies, both of them have a lot of potential in reducing their carbon emissions further.

In the intermediate future, *HEXPOL* and *Nolato* may apply these recommendations in practice that will provide insights regarding the companies' environmental performance, specifically CO_2 emissions reduction. These recommendations may also set a solid ground for the SBTi implementation in the future and prepare both companies for a transition to a low-carbon economy. It is reinforced by data gathered from the organisations related to science-based targets. Linking the findings from 'Common Themes' Table 4-5 presented in Chapter 4 to the case studies, will enable them to prepare themselves for possible legislation. Also, will allow them to rethink their business model, not only 'say' but also 'do' a 'fair share' to address climate change.

6.4 Other Findings

Besides applying the SBTi to *HEXPOL* and *Nolato*, to understand the achievements needed to implement this initiative, there are other related findings. A total of four key themes were mentioned throughout the interviews with both, companies and experts from related organisations to provide a global perspective and credibility to this initiative.

Whiles, analysing data from interviews, companies with approved targets have been actively engaged in target-setting before the Paris Agreement in 2015. It appears that there is a direct connection between the development of the science-based targets and company's implementation of the initiative. Therefore, findings showed that companies-innovators (innovators based on the Rogers Bell Curve) that companies implementing this initiative are generally advanced and do not require significant investments to achieve set targets. Consequently, these companies are doing a 'fair share' to reduce carbon emissions by combining what they *'say'* with what they *'do'*.

The second important finding that was noted in the interviews is that science-based targets drive companies to rethink and entirely change their business model. Science-based targets go beyond low-hanging fruits and are aggressive and set goals that would lead a company to operate in a low-carbon economy world. For some companies, it is an easy process due to a number of reasons such as business sector, and/or geographical scope. For other companies, it might require heavy investments, and/or change in the whole operation processes. Going beyond what is practically feasible for companies to achieve, it might be challenging for some companies to publicly commit to the initiative, in case of failure to achieve the target.

Another theme that came out during the interviews multiple times is the need for solid data and more disclosure among the companies. In order to set reliable science-based targets, companies need to have relevant data that could be measured year by year, especially for scope 3. Governments and investors can influence the level of disclosure through legislation and requirements.

Finally, the last key theme mentioned is that there will be more uptake of the initiative by the companies in the future. As of August 26, 297 companies have committed to the SBTi, working on setting targets. A total of 65 companies out of 297 have set and approved science-based targets (SBTi, 2017). Alternatively, if companies are not implementing the initiative, some of them are going to set science-based targets by themselves. Consequently, there would be more disclosure and availability of reliable data that is necessary for science-based target setting.

6.5 Reflections, Recommendations and Future Research

At the beginning of the research the author made two assumptions for RQ1 such as 'pioneering (companies-innovators) have drivers and barriers to implement the SBTi', 'there are more drivers and barriers to commit to the initiative' and 'the companies with approved science-based targets are willing to improve and have developed a set of actions to achieve the goal'. Based on the research outcome these three assumptions in relation to RQ1 are correct. In relation to the RQ2, the author's assumption 'it is challenging for some companies in certain industry/sector to minimise their emissions in comparison to others' was proved to be correct as well.

When reflecting on the research process, it should be underlined that the approach taken by the author is inherently exploratory. In order to understand the Science-Based Targets initiative (SBTi), future research should be done after a significant quota of companies commits to the initiative. In other words, not only innovators (companies advanced in sustainability performance) would implement the initiative, but also SMEs and heavy emitters. Due to the lack of available data, this research predominantly relies on the qualitative data and sustainability reports. The analysis is liable to exclude confidential data. In order to better understand the initiative, further research should consider company's internal performance measurement.

It is questionable if conducting comparative studies would contribute to the understanding of the implementation of the initiative. Even if companies might be in the same business sector, their geographical scope and a level of internal sustainability advancement might vary, therefore producing different approaches to achieving the targets. Moreover, to acquire a more representative and broader perspective on the practical application of the initiative, it is suggested to involve more companies. For successful communication with companies, it is advised to contact Investor Relations department unless contact information of a sustainability department is available online. In case a similar study will be conducted, for the effective outreach of the companies and experts, it would be advised to call directly instead of sending follow-up emails.

To analyse the SBTi development, it could be beneficial to conduct a similar study in 5-10 years' time to analyse major changes (if any) within the initiative; what are the drivers and barriers to implement the initiative and compare those findings to the current study and explore its development. It would also be beneficial to assess what kind of heavy emitting companies joined the initiative (if any) and what how was the implementation process for them. In addition, to analyse the development and application of the SBTi could incorporate an examination of the initiative's status on the global level, the level of its uptake by the SMEs and explore what changes (if any) have been made by the initiative to the CO_2 emissions globally.

6.6 Overview

In conclusion, this chapter presented results based on the literature review and interviews conducted by the author. The barriers and drivers to the implementation of the SBTi that were identified during the interviews were applied to the two case studies, *HEXPOL AB* and *Nolato AB* to understand possible development in relation to the initiative. The benefits stated by the interviewed companies were also applied to the two case studies in order to produce better recommendations. This assessment was followed by the analysis of case studies' activities to reduce CO_2 emissions, respective to the Scope 1, 2 and 3. A current trend in relation to the scopes and a potential for more activities were also identified to produce relevant recommendations for these companies. Then, other findings were discussed as those contribute to the understanding of the SBTi development and reinforce its global significance. Finally, the author shared reflections and recommendations on this study, also presenting possibilities for future research in this area.

7 Conclusion

The paper focused on Science-Based Target initiative's development and its application to two case studies. The aim of this research was: 1) to investigate drivers and barriers in companies that already have implemented SBTs, 2) to gather views from organisations that have an interest in CDP and SBTi (consultancies and investors); and 3) to use the findings and contribute to the two case studies, *HEXPOL AB* and *Nolato AB* in analysing the SBTi application in practice. Both companies have experience reporting to CDP, and this research evaluates whether the SBTi is the next step that these companies should pursue to contribute to a low carbon economy.

Taking this into consideration, the following two research questions (RQs) were answered:

-   *RQ1:* How is the initiative perceived and what are the main drivers and barriers for companies to implement SBTi?

-   *RQ2:* How can SBTi be applied in practice – case studies at *HEXPOL* and *Nolato?*

This paper addressed each question through a set of complementary methods, such as literature review, qualitative content analysis of expert interviews and sustainability reports. In order to understand the SBTi process, its basis and methodologies, the author reviewed existing literature on the topic. To get a more comprehensive understanding of what position the initiative has in the world, the author interviewed four organisations either from investor or consultant sides. The author also assessed the SBTi implementation in practice by conducting interviews with nine companies to get an in-depth information on the practical side. Six key aspects were distilled by the author (based on the SBTi target setting process) that can help companies to implement the SBTi. These key aspects include: 1) science-based targets that were set by the companies; 2) methodologies if used any; 3) actions to achieve set targets; 4) internal changes made by the SBTi implementation; 5) benefits companies are getting or planning to get; 6) a general attitude of these companies to the SBTi itself and the process. Besides those overlapping areas, the author also assessed barriers and drivers to the Science-Based Targets initiative implementation.

As for RQ1, the analysis found that there are both, barriers and drivers to implement the SBTi. It is important to highlight that there is no literature or report done on this matter, therefore, making this research explorative in nature. A total of seven barriers were identified by the author as the result of the interviews. Barriers mentioned include a future change in the methodologies that can affect current achievements; internal communication within a company to set targets; setting longer-term target in comparison to the previous ones; prediction of the market development that can affect a contain sector; reducing Scope 3 emissions; technological innovation that can affect a certain sector; and time for improvement. Some companies stated that did not face any barriers to implement the initiative. Other companies that faced barriers relevant to them have identified and addressed those barriers successfully.

As for drivers, a total of nine drivers were identified by the author, with some drivers being repeated. Drivers include easier communication of the carbon reduction targets and improvement; cost and consumption reduction as a result of the SBT; enhanced customer relations; good internal and external governance of a company; enriched investor relations; new business opportunities in a sector/business; development and application of new business models without CO_2; higher CDP ratings; replication; improved report utilities; strengthen a company's reputation; better transparency; and validation. Companies that

already implemented the SBTi can be seen as innovators that want to reliably and responsibly communicate about their CO_2 emissions. These companies also want to ensure a logical internal follow-up and improvement on their sustainability performance.

Regarding RQ2, the ways the nine companies-innovators have implemented the SBTi were assessed and then applied to two case studies, *HEXPOL AB* and *NOLATO AB*. Prior to this, the author presented profiles of both companies, overviews of the activities and targets related to the CO_2 emissions reduction. The data collected from the interviews and reports was then applied to the case studies profiles were presented in Chapter 5. *HEXPOL AB* and *NOLATO AB* current CO2 reduction activities were broken down by Scope 1, 2 and 3 into areas such as transport, suppliers, use of fossil fuels, products, fossil-free electricity and increased energy efficiency. The CO2 reduction potential of the current and planned activities was evaluated, and the possibilities for more actions were identified for each of the specified areas. This analysis has shown that there are advanced possibilities to reduce carbon emissions for both companies. Depending on the companies' decisions to implement the SBTi and join the list of companies-innovators and transition to a low-carbon economy, it is important for these companies to ensure that they are ready for this step.

By incorporating the results to two case studies, the author produced a set of recommendations. These recommendations are based on the six overlapping areas within the SBTi implementation mentioned before that are applied to *HEXPOL AB* and *NOLATO AB* to develop science-based targets and/or implement the SBTi. Recommendations include a list of actions (such as establish a life-cycle perspective on carbon dioxide emissions, including raw materials, transport and use of products, scope 3 data collection, and continuous implementation of ISO 50001) companies could follow to strengthen their current activities and initiatives to reduce carbon emissions. Based on the Rogers Bell Curve, the categories of adopters, *HEXPOL* and *Nolato* are recommended to decide what type of adopter they want to be and take relevant actions to achieve this goal. The author also highlighted that a current baseline of the companies should be considered for a further decision-making process on the SBTi implementation.

Last but not least, other findings were identified by the author throughout the research. First, companies interviewed were already engaged in science-based targets before the SBTi was set up. Second, the initiative drives companies to rethink and entirely change their business model make a successful transition to a low-carbon economy. Third, there is a need for quality data and more disclosure among the companies to set credible targets. The final theme of the interviews is that in the future there will be more application of the initiative by the companies.

As more companies start to set their targets based on science to address climate change, it is important that they integrate those into their business models. This research is exploratory in nature and aims to make a humble contribution by analysing the Science-Based Targets initiative and applying collected data to two Swedish companies, *HEXPOL AB* and *Nolato AB*. The author hopes that it will trigger discussions around the SBTi and support more companies to set science-based targets either by themselves or by implementing the initiative.

Bibliography

2° Investing Initiative. (2015). *2° Investing Initiative Annual Report 2015* (pp. 1-34). London: 2° Investing Initiative. Retrieved from http://2degrees-investing.org/IMG/pdf/2dii_annual_report_2015_final.pdf

Andrew, J., & Cortese, C. (2011). Accounting for climate change and the self-regulation of carbon disclosures. *Accounting Forum*, *35*(3), 130-138. http://dx.doi.org/10.1016/j.accfor.2011.06.006

Anonymous. (2017, June 27). About the SBTi. Telephone Interview.

AMD. (2017). *Environmental Sustainability. Amd.com*. Retrieved 7 July 2017, from http://www.amd.com/en-us/who-we-are/corporate-responsibility/environment

Beal, G., & Bohlen, J. (1957). *The Diffusion Process* (pp. 56–77). Special Report No. 18. Agriculture Extension Service: Iowa State College.

Bloomberg L.P. (2017). *Bloomberg. Bloomberg.com*. Retrieved 4 June 2017, from https://www.bloomberg.com/europe

Bloomberg Finance L.P. (2017). *Bloomberg New Energy Finance | Bloomberg Finance L.P.. Bloomberg New Energy Finance*. Retrieved 4 June 2017, from https://about.bnef.com

Boas, S. (2017). About the SBTi.

Bourguignon, F., Gunning, J.W., Benassy-Quere, A., Dercon, A., Estache, A., Kanbur, R., Maxwell, S., Platteau, J.P., Spadaro, A. (2010). The Millennium Development Goals: An Assessment. In R. Kanbur & M. Spence, *Equity and Growth in Globalising World* (pp. 17-40). Washington DC: World Bank.

Brorson, T. (2017). On HEXPOL AB and Nolato AB.

Burks, B. (2017, June 26). About the SBT. Personal Interview.

Carbon Tracker Initiative. (2017). *2 degrees of separation: Transition risk for oil and gas in a low carbon world* (pp. 1-36). Carbon Tracker Initiative. Retrieved from http://www.carbontracker.org/wp-content/uploads/2017/06/2D-of-separation_PRI-CTI_report_correct_4.pdf

Carbon Trust. (2017). *What are scope 3 emissions, how can they be measured and what benefit is there to organisations measuring them?. Carbontrust.com*. Retrieved 4 June 2017, from https://www.carbontrust.com/resources/faqs/services/scope-3-indirect-carbon-emissions/

CDP. (2014). *The A List The CDP Climate Performance Leadership Index 2014* (pp. 1-46). London: CDP. Retrieved from https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/000/624/original/CDP-climate-performance-leadership-index-2014.pdf?1470231794

CDP. (2017). *Home - CDP. Cdp.net*. Retrieved 5 June 2017, from https://www.cdp.net/en

CDP. (2017). *Science based targets - CDP. Cdp.net*. Retrieved 4 June 2017, from https://www.cdp.net/en/campaigns/commit-to-action/science-based-targets

Clarkson, P., Overell, M., & Chapple, L. (2011). Environmental Reporting and its Relation to Corporate Environmental Performance. *Abacus*, *47*(1), 27-60. http://dx.doi.org/10.1111/j.1467-6281.2011.00330.x

Dong Energy. (2017). *Energy supply. Dongenergy.com.* Retrieved 7 September 2017, from http://www.dongenergy.com/en/sustainability/sustainability-strategy/sustainability-programmes/energy-supply

Eneco Group. (2017). *Sustainability. Enecogroup.com.* Retrieved 12 June 2017, from https://www.enecogroup.com/what-we-do/sustainability/

Enel. (2015). *Sustainability Report. Enel Sustainability Report 2015.* Retrieved 12 June 2017, from http://sustainabilityreport2015.enel.com/#start

GRI. (2017). *UN Guiding Principles Reporting Framework. Ungreporting.org.* Retrieved 4 June 2017, from https://www.ungreporting.org

Hansen, S., & Lohse, S. (2017, August 30). About the SBTi. Telephone Interview.

HEXPOL. (2016). *HEXPOL Sustainability Report* (pp. 1-17). HEXPOL AB.

HEXPOL AB. (2014). *Sustainability Report 2014* (pp. 1-44). Malmö: HEXPOL. Retrieved from http://investors.hexpol.com/afw/files/press/hexpol/201504229441-1.pdf

HEXPOL AB. (2015). *Sustainability Report 2015* (pp. 1-48). Malmö: HEXPOL AB. Retrieved from http://investors.hexpol.com/afw/files/press/hexpol/201604264795-1.pdf

HEXPOL AB. (2016a). *Annual Report 2016 - Strong global positions in advanced polymer compounds* (pp. 1-112). Malmö: HEXPOL AB. Retrieved from http://investors.hexpol.com/afw/files/press/hexpol/201703234180-1.pdf

HEXPOL AB. (2016b). *Sustainability Report 2016* (pp. 1-56). Malmö: HEXPOL AB. Retrieved from http://investors.hexpol.com/afw/files/press/hexpol/201704121040-1.pdf

Horster, M. (2017, August 2) About the SBT. Telephone Interiew.

HSE. (2017). *Risk management: Expert guidance. Hse.gov.uk.* Retrieved 9 July 2017, from http://www.hse.gov.uk/risk/expert.htm

HSWA. (1974). *Health and Safety at Work etc. Act 1974. Legislation.gov.uk.* Retrieved 9 July 2017, from http://www.legislation.gov.uk/ukpga/1974/37/contents

IPC. (2015). *Eco-driving at the core of sustainability programmes in the postal industry. Ipc.be.* Retrieved 7 June 2017, from https://www.ipc.be/en/Newsroom/in-the-spotlight/eco-driving/eco-driving-at-the-core-of-sustainability-programmes-in-the-postal-industry

IPC. (2017). *Sustainability. Ipc.be.* Retrieved 12 June 2017, from https://www.ipc.be/en/knowledge-centre/sustainability

IPCC. (2014). *Climate Change 2014 Synthesis Report Summary for Policymakers Chapter* (pp. 1-32). IPCC.

IPCC (2014) *Climate Change 2014: Synthesis Report.* IPCC: Geneva, 1-151 pp.

IPCC. (2017). *Intergovernmental Panel on Climate Change. Ipcc.ch.* Retrieved 9 July 2017, from http://www.ipcc.ch

Knutti, R., Rogelj, J., Sedláček, J., & Fischer, E. (2015). A scientific critique of the two-degree climate change target. *Nature Geoscience*, *9*(1), 13-18. http://dx.doi.org/10.1038/ngeo2595

Kolk, A., Levy, D., & Pinkse, J. (2008). Corporate Responses in an Emerging Climate Regime: The Institutionalization and Commensuration of Carbon Disclosure. *European Accounting Review*, *17*(4), 719-745. http://dx.doi.org/10.1080/09638180802489121

Kvale, S., Brinkman, S. (2009). InterViews – Learning the craft of qualitative research interviewing (2ⁿᵈ ed.) Sage: London.

Linthorst, G. (2017, August 14). About the SBT. Telephone Interview.

Luo, L., & Tang, Q. (2014). Does voluntary carbon disclosure reflect underlying carbon performance?. *Journal Of Contemporary Accounting & Economics*, *10*(3), 191-205. http://dx.doi.org/10.1016/j.jcae.2014.08.003

Matisoff, D., Noonan, D., & O'Brien, J. (2013). Convergence in Environmental Reporting: Assessing the Carbon Disclosure Project. *Business Strategy And The Environment*, *22*(5), 285-305. http://dx.doi.org/10.1002/bse.1741

Meijer, G. (2017, June 15). About the SBTi. Telephone Interview.

Mitchell, J., Percy, M., & McKinlay, B. (2006). Voluntary Environmental Reporting Practices: A Further Study of 'Poor' Environmental Performers. *Australian Journal Of Corporate Law*, *19*(2).

Moore, G. (2014). *Crossing the chasm* (3rd ed.). [New York, NY]: Collins Business Essentials.

Murrill, J. (2017, June 13). About the SBT. Telephone Interview.

Neu, D., Warsame, H., & Pedwell, K. (1998). Managing Public Impressions: Environmental Disclosures in Annual Reports. *Accounting, Organizations And Society*, *23*(3), 265-282. http://dx.doi.org/10.1016/s0361-3682(97)00008-1

Niranjan, S. (2017, June 14). About the SBTi. Telephone Interview.

Nolato AB. (2014). *Sustainability Report 2014 - Our Sustainability Work in 2014* (pp. 1-29). Torekov: Nolato AB. Retrieved from https://www.nolato.com/-/media/NolatoWeb/Documents/Sustainability-reports/nolato-sustainabilityrep-2013.ashx?la=en&hash=351850AB1760B29184E3DC79609D161640F2A551

Nolato AB. (2015). *Sustainability Report 2015 - Our Sustainability Work in 2015* (pp. 1-32). Torekov: Nolato AB. Retrieved from https://www.nolato.com/-/media/NolatoWeb/Documents/Sustainability-reports/nolato-sustainable-2015.ashx?la=en&hash=89215C07C56C06AAE7E77225CFAE17DFCB8DAC53

Nolato AB. (2016). *Sustainability Report 2016 - Our Sustainability Work in 2016* (pp. 1-32). Torekov: Nolato AB. Retrieved from https://www.nolato.com/-/media/NolatoWeb/Documents/Corporate-responsibility-files/nolato-sustainability-report-2016.ashx

Nolato. (2016). *Nolato Sustainability Report* (pp. 1-17). Nolato AB.

Nolato AB. (2017a). *Sustainabilty everyday - Nolato*. *Nolato*. Retrieved 8 August 2017, from https://www.nolato.com/en/corporate-responsibility/environment

Nolato AB. (2017b). *Annual Report 2016 - 'One Nolato' for continued growth and success* (pp. 1-96). Nolato AB. Retrieved from http://mb.cision.com/Main/966/2227156/650035.pdf

PostNord. (2016). *PostNord's 2016 Annual and Sustainability Report*. Retrieved 12 June 2017, from http://www.postnord.com/en/media/press-releases/postnord/2017/postnords-2016-annual-and-sustainability-report/

Putt del Pino, S., Cummis, C., Lake, S., Reig, P., & Rabinovitch, K. (2016). From Doing Better to Doing Enough: Anchoring Corporate Sustainability Targets in Science. *WRI*, 1-16. Retrieved from http://www.wri.org/sites/default/files/From_Doing_Better_to_Doing_Enough_Anchoring_Corporate_Sustainability_Targets_in_Science.pdf

OECD. (2001). "Private Initiatives for Corporate Responsibility: An Analysis", *OECD Working Papers on International Investment*, 2001/01, OECD Publishing. http://dx.doi.org/10.1787/816826411085

Oveido, S. (2017, August 2). About the SBT. Telephone Interview.

Randalls, S. (2010). History of the 2°C climate target. *Wiley Interdisciplinary Reviews: Climate Change*, *1*(4), 598-605. http://dx.doi.org/10.1002/wcc.62

Rankin, M., Windsor, C., & Wahyuni, D. (2011). An investigation of voluntary corporate greenhouse gas emissions reporting in a market governance system. *Accounting, Auditing & Accountability Journal*, *24*(8), 1037-1070. http://dx.doi.org/10.1108/09513571111184751

Raupach, M., Davis, S., Peters, G., Andrew, R., Canadell, J., & Ciais, P. et al. (2014). Sharing a quota on cumulative carbon emissions. *Nature Climate Change*, *4*(10), 873-879. http://dx.doi.org/10.1038/nclimate2384

Reitsma, P. (2017, June 7). About the SBTi. Telephone Interview.

Rogelj, J., McCollum, D., O'Neill, B., & Riahi, K. (2012). 2020 emissions levels required to limit warming to below 2 °C. *Nature Climate Change*, *3*(4), 405-412. http://dx.doi.org/10.1038/nclimate1758

Rogers, E. (2003). *Diffusion of Innovations* (5th ed.). Riverside: Free Press.

Salina, P. (2017, July 12). About the SBTi. Telephone Interview.

Sanchez, I. (2017). *Bell Curve: Categories of Adopters*.

SBTi. (2015). *Science-based Target Setting Manual - Draft* (pp. 1-69). London: The SBTi.

SBTi. (2017a). *About the Science Based Targets initiative*. *Sciencebasedtargets.org*. Retrieved 9 July 2017, from http://sciencebasedtargets.org/about-the-science-based-targets-initiative/

SBTi. (2017b). *FAQ*. *Sciencebasedtargets.org*. Retrieved 9 July 2017, from http://sciencebasedtargets.org/faq/

SBTi. (2017c). Science-Based Target Setting Manual – Draft Version 3.0 (pp. 1-71). London: The SBTi.

SBTi. (2017d). *SBTi Call to Action Guidelines* (pp. 1-15). SBTi.

SBTi. (2017e). *SBTi - Companies Taking Action*. *Sciencebasedtargets.org*. Retrieved 13 September 2017, from http://sciencebasedtargets.org/companies-taking-action/

SBTi. (2017f). *Why set a science-based target?*. *Sciencebasedtargets.org*. Retrieved 9 July 2017, from http://sciencebasedtargets.org/why-set-a-science-based-target/

SDG. (2017). *Sustainable development goals - United Nations*. *United Nations Sustainable Development*. Retrieved 4 June 2017, from http://www.un.org/sustainabledevelopment/sustainable-development-goals/

Solomon, S., QIn, D., Manning, M., Chen, Z., Marquis, M., & Averyt, K. et al. (2007). *Climate Change 2007: The Physical Science Basis*. Cambridge: Cambridge University Press.

Sotos, M. (2015). *The GHG Protocol Scope 2 Guidance: An amendment to the GHG Protocol Corporate Standard* (1st ed., pp. 1-120). Washington D.C.: World Resources Institute. Retrieved from http://www.ghgprotocol.org/scope_2_guidance#supporting-documents

Sopra Steria. (2017). *Corporate Responsibility. Soprasteria.com.* Retrieved 12 June 2017, from https://www.soprasteria.com/en/group/corporate-responsibility

Spencer, W. (2003). *The Discovery of Global Warming* (pp. 1-240). Cambridge: Harvard University Press.

Sullivan, R., & Petrovic, L. (2016). *Investment Portfolios in A Carbon Constrained World: The Second Annual Progress Report of the Portfolio Decarbonization Coalition* (pp. 1-30). Geneva: The Portfolio Decarbonization Coalition. Retrieved from http://www.unepfi.org/wordpress/wp-content/uploads/2016/11/PDCreport2016.pdf

Swisscom. (2017a). *Climate protection, CO2 reduction, renewable energy. Swisscom.ch.* Retrieved 7 July 2017, from https://www.swisscom.ch/en/about/company/sustainability/climate-protection.html

Swisscom. (2017b). *2016 Swisscom climate report in accordance with ISO 14064: Direct and indirect climate impact of Swisscom's activities (Scope 1, 2 and 3 emissions and savings) Climate strategy of Swisscom* (pp. 1-25). Berne: Swisscom. Retrieved from https://www.swisscom.ch/content/dam/swisscom/en/about/responsibility/climate-protection-energy/documents/2016-climate-report.pdf.res/2016-climate-report.pdf

TCFD. (2017). *Recommendations of the Task Force on Climate-related Financial Disclosures* (pp. 1-74). Basel: Task Force. Retrieved from https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf

Todaro, F. (2017, June 27). About the SBTi. Telephone Interview.

UNFCCC Secretariat. (2015). *Adoption of the Paris Agreement* (p. 22). Paris: United Nations Framework Convention on Climate Change. Retrieved from http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf

UNFCCC. (1992). *United Nations Framework Convention on Climate Change* (pp. 1-24). United Nations.

UNEPFI. (2017). *United Nations Environment – Finance Initiative –. Unepfi.org.* Retrieved 4 June 2017, from http://www.unepfi.org

UN Global Compact. (2017a). *HEXPOL AB. Unglobalcompact.org.* Retrieved 13 June 2017, from https://www.unglobalcompact.org/what-is-gc/participants/111141-HEXPOL-AB

UN Global Compact. (2017b). *Nolato AB. Unglobalcompact.org.* Retrieved 8 August 2017, from https://www.unglobalcompact.org/what-is-gc/participants/10431

UNDP. (2017). *Sustainable Development Goals. UNDP.* Retrieved 14 July 2017, from http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

Vectors Market. (2017). *Free vector icons designed by Vectors Market. Flaticon.* Retrieved 13 June 2017, from https://www.flaticon.com/authors/vectors-market

Victor, D., & Kennel, C. (2014). Climate policy: Ditch the 2 °C warming goal. *Nature*, *514*(7520), 30-31. http://dx.doi.org/10.1038/514030a

Verbund AG. (2016). *Intergated Annual Report 2016* (pp. 1-285). Verbund AG.

WBCSD. (2017). *25 leading global companies join together to accelerate transformational change in global food systems. World business council for sustainable development.* Retrieved 4 June 2017, from

http://www.wbcsd.org/Projects/FReSH/News/25-leading-global-companies-join-together-to-accelerate-transformational-change-in-global-food-systems

Werner, B. (2016). *The road from Paris leads to science-based targets*. *Trucost.com*. Retrieved 20 June 2017, from https://www.trucost.com/trucost-blog/road-paris-leads-science-based-targets/

World Bank. (2017). *Listed domestic companies, total*. Retrieved 7 September 2017, from https://data.worldbank.org/indicator/CM.MKT.LDOM.NO?year_high_desc=false

WRI. (2017). *Science Based Targets Initiative | World Resources Institute*. *Wri.org*. Retrieved 4 June 2017, from http://www.wri.org/our-work/project/science-based-targets-initiative

Appendices

Appendix I. Semi-Structured Interview Guide for Companies

A: Opening Questions:

1. Could you please state your position in (name of the company) and your responsibilities?
2. Does your company report to CDP? If yes, for how long? If not, why?
3. How did the processes of (name of the company) change in the past year (if changed at all?)?
4. Do you find it beneficial to report to CDP? If yes/no, why?

B: The implementation of SBTi:

5. What are the main reasons for your company to commit to SBTi?
6. Have there been any external drivers in SBTi implementation? (For example, a specific shareholder).
7. How did you communicate about SBTi within your company? (To your shareholders, to clients, to suppliers, to other stakeholders).
8. Did the commitment to the SBTi change your company's perception of its sustainability policy and/or operations?
9. How did the implementation of the SBTi influence (name of the company) ambitions?
10. Which existing methodology did you use to implement SBTi within your company?
11. What kind of benefits do you expect to gain or already gaining from implementing the SBTi?

C: Barriers and Drivers

12. What were the barriers and drivers if any to commit to the SBTi?
13. Have you identified specific costs related to the implementation of the SBTi by your company?

D: Open Questions:

14. Whar are, according to you, the biggest drivers for companies to implement the SBTi?
15. In your personal opinion, do you find commiting to the SBTi as a next step after reporting to CDP? If yes/no, why?
16. According to you, do companies need to commit to both, CDP and SBTi to successfully address climate change?
17. In your personal opinion, do you find SBTi a useful tool to address climate change or there are more effective initiatives companies should follow? If no, could you give an example of the initiative?

C: Closing Question:

18. Is there anything that you would like to add?
19. It is possible to contact you for follow-up questions and clarification?
20. Would you like to have a copy of the final thesis?

Appendix II. Semi-Structured Interview Guide for Organisations

A: Opening Questions:

1. Could you please state your position and your responsibilities at (name of the company)?
2. How is your organization involved with the SBTi or science-based targets?

B: Core Questions: New Trends
3. Was there something that grabbed your attention / something new after the Paris Agreement? What was it?
4. Was there any change on the investor side after the Paris Agreement? What was it?
5. What is investor's relation to SBTi, if any?
6. What investors are looking for in the companies?
7. What companies are aiming for in relation to the initiative?
8. What position does SBTi take on the global market?
9. What are the benefits for companies to commit to SBTi? What are the barriers?

C: Open Questions
10. In your personal opinion, will this initiative influence the global market and if yes, then how?
11. What is your personal opinion on SBTi and science-based targets in general?
12. In your personal opinion, would you say that companies should commit to SBTi? Why?
13. Do you think that SBTi/science-based targets is an effective tool to address climate change or there are better initiatives to follow?

D: Closing Question:
14. Is there anything that you would like to add?
15. It is possible to contact you for follow-up questions and clarification?
16. Would you like to have a copy of the final thesis

Appendix III. List of Companies with Approved Science-Based Targets

A total of sixty-five companies are presented as for 4 September 2017.

Source: Science-Based Targets Initiative (SBTi, 2017e)

Appendix IV. List of Companies with Corresponding Sustainability Reports and Websites

#	Company Name	Sustainability Report	Website
1	Advanced Micro Devices, Inc	http://www.amd.com/en/corporate-responsibility	www.amd.com
2	Dong Energy	http://www.dongenergy.com/en/sustainability	www.dongenergy.com
3	Eneco	https://www.enecogroup.com/what-we-do/sustainability/	www.eneco.nl
4	Enel SpA	http://sustainabilityreport2015.enel.com/#start	www.enel.com
5	International Post Corporation (IPC)	https://www.ipc.be/en/knowledge-centre/sustainability	www.ipc.be/
6	PostNord AB	http://www.postnord.com/en/media/press-releases/postnord/2017/postnords-2016-annual-and-sustainability-report/	www.postnord.com/
7	Sopra Steria Group	https://www.soprasteria.com/en/group/corporate-responsibility	www.soprasteria.com
8	Swisscom	https://www.swisscom.ch/en/about/company/sustainability.html	www.swisscom.ch
9	Verbund AG	https://www.verbund.com/en-at	www.verbund.com

Source: Author (2017)