Towards Net Zero

How to integrate climate impact assessments in E.ON's investment process

Carl Johan Flisberg and Henrik Shadman

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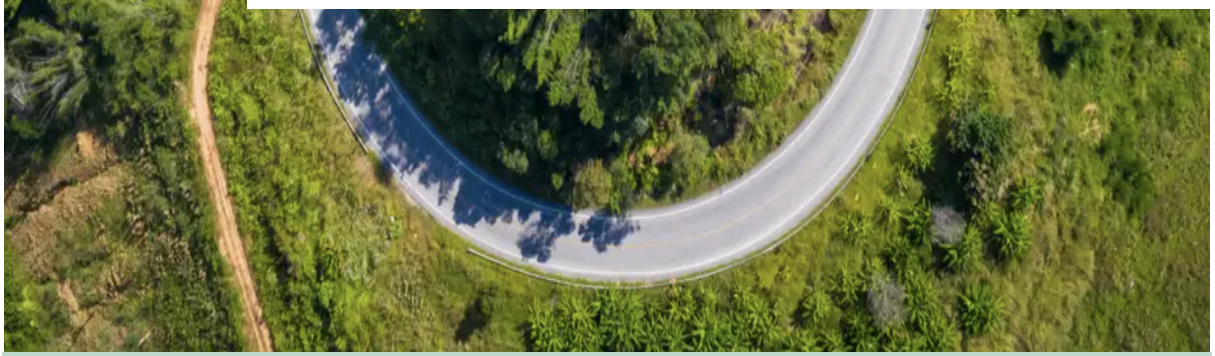

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Abstract

This master thesis explores the integration of climate impact assessments within the investment processes of energy companies, with a specific focus on E.ON in Sweden. The urgency to address climate change has intensified, necessitating transparent and effective strategies within corporate investment decisions to mitigate environmental impact. This study aims to bridge the gap between theoretical frameworks and practical application by identifying, evaluating, and recommending suitable carbon assessment tools that can be embedded into the strategic decision-making processes of energy companies. The study employs a qualitative approach, incorporating a comprehensive literature review and empirical data collection through interviews and workshops with internal stakeholders at E.ON, as well as other energy companies. The research methodology is grounded in Yin's case study method, which facilitates an in-depth exploration of the subject.

Key findings from the research indicate that integrating specific carbon assessment tools, such as the Carbon Emissions Ratio (CER) scale and a structured checklist, can significantly enhance the visibility and management of carbon impacts at both project and portfolio levels. These tools not only aid in aligning investment decisions with broader environmental goals but also strengthen corporate accountability and stakeholder confidence in sustainability commitments.

The thesis concludes with strategic recommendations for implementing these tools within E.ON's investment framework. Broader implications for similar energy companies are also discussed, as well as potential areas for future research, emphasizing the need for continuous improvement and adaptation of assessment tools to keep up with evolving environmental standards and stakeholder expectations. This study contributes to the academic and practical understanding of sustainable investment practices in the energy sector, aiming to foster a more sustainable future.

Keywords: Climate impact assessment, carbon assessment tools, sustainable investments, carbon emissions ratio, carbon accounting, internal carbon pricing, change management

Sammanfattning

Detta examensarbete utforskar integrationen av metoder för att bedöma klimatpåverkan inom investeringsprocesser hos energiföretag, med särskilt fokus på E.ON i Sverige. Vikten av att ta itu med ökande klimatförändringar har intensifierats, vilket kräver en transparent och effektiv strategi för företag för att minska sin miljöpåverkan från investeringar. Denna studie syftar till att identifiera, utvärdera och rekommendera lämpliga verktyg för klimatbedömning som kan integreras i energiföretagens strategiska beslutsprocesser. Genom detta kan gapet mellan teoretiska ramverk och praktisk tillämpning täppas till. Studien använder en kvalitativ ansats, som inkluderar en litteratursökning och empirisk datainsamling genom intervjuer och workshops med interna intressenter på E.ON, samt andra energiföretag. Forskningsmetodiken är grundad i Yins fallstudiemetod, vilket möjliggör en mer djupgående utforskning av ämnet.

Viktiga resultat från studien visar att integrationen av specifika verktyg för klimatbedömning, såsom Carbon Emissions Ratio (CER) scale och en checklista, kan förbättra visualiseringen och hanteringen av koldioxidutsläpp på både projekt- och portföljnivå. Dessa verktyg bidrar inte bara till att styra investeringsbeslut i linje med mer omfattande miljömål, utan stärker också företagets ansvar och intressenters förtroende för dess hållbarhetsåtaganden. Avhandlingen avslutas med strategiska rekommendationer för implementering av dessa verktyg inom E.ON:s investeringsprocess. Vidare diskuteras bredare implikationer för liknande energiföretag, samt potentiella områden för framtida forskning, vilket betonar behovet av kontinuerlig förbättring och anpassning av verktygen för att hålla jämna steg med utvecklande miljöstandarder och förväntningar. Denna studie bidrar till den akademiska och praktiska förståelsen av hållbara investeringspraxis inom energisektorn.

Nyckelord: Klimatbedömning, koldioxidredovisning, hållbara investeringar, koldioxidpris, koldioxidintensitet, förändringsledning

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Secondly, we would like to thank our supervisor at Lund University, Lars Bengtsson, for his invaluable support and guidance throughout the process of conducting this research. His experience and expertise helped us in structuring our work and made sure that we always stayed on course.

Lastly, this thesis would not have been possible without the contribution of those participating in interviews, workshops and meetings. Thank you for your time, effort and valuable knowledge.

Lund, May 2024

Carl Johan Flisberg & Henrik Shadman

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List of acronyms and abbreviations

AI	Artificial intelligence
CER	Carbon emission ratio
CO_2e	Carbon dioxide equivalents
CSRD	Corporate Sustainability Reporting Directive
EIS	Energy Infrastructure Solutions
EN	Energy Networks
ER	Energy Retail
ESRS	European sustainability Reporting Standards
ETS	Emission trading system
Gate 1	Strategic decision gate
Gate 2	Final investment decision
GHG	Greenhouse gas
ICP	Internal carbon price
KPI	Key performance indicator
MAC	Marginal abatement cost
PCA	Post completion audit
SDG	Sustainable development goals

1 Introduction

This section serves as an introduction to the thesis, starting with a background overview and a description of E.ON and the problem description. Subsequently, the purpose and research questions of the study are explained, along with the scope and specific focus of the thesis. The introduction concludes by identifying the target audience and providing an outline of the thesis structure.

1.1 Background

Human activities, primarily the emission of greenhouse gasses (GHG), have caused global warming, with global surface temperature rising quickly during the 21th century (IPCC, 2023). The continuous rise in GHG emissions is a result of, for example, unsustainable energy consumption, and increased production and consumption across various regions and nations (IPCC, 2023).

To combat climate change and mitigate its effects, a range of regulations, policies, and agreements have been implemented over the past decades. Notable among these are the Kyoto Protocol from 2005 that aims to reduce carbon dioxide emissions and the presence of GHG in the atmosphere (UNFCCC, n.d a). The Kyoto Protocol was replaced in 2015 by the Paris Climate Agreement which is a legally binding international treaty with the aim to address climate change and its negative effects (UNFCCC, n.d b). The agreement includes commitments from all major GHG-emitting countries to reduce GHG-emissions and limit the global temperature increase below 2°C (UNFCCC, n.d b). However, during the past years, it has been stressed that the need to limit global warming to 1,5°C by the end of this century is crucial, implying that GHG-emissions must peak before 2025 at the latest, and decline with 43% by 2030 (UNFCCC, n.d b).

Other global agreements such as the United Nations Sustainable Development Goals (SDG), which tackles climate change, as well as poverty and inequality also play a role in reaching the goals of the Paris Climate Agreement. The SDGs include goals such as “affordable and clean energy” and “climate action”, which involves taking urgent action to combat climate change and its impacts (UN, n.d). Furthermore, the European Union is actively working with developing the ecosystem for sustainability reporting and climate transparency that aligns with the EU-green deal. Such reporting directives include the Corporate Sustainability Reporting Directive (CSRD) which states that large companies, as well as listed small to medium sized enterprises are required to report on sustainability (European Commission, n.d a). While these regulations force companies to report on sustainability, there are also other driving factors that facilitate climate reporting such as social, economic and internal business aspects. The process of calculating and reporting GHG emissions is called carbon accounting and allows organizations to quantify their greenhouse gas emissions, understand their climate impact and set goals to reduce their emissions (IBM, n.d).

1.2 E.ON

E.ON is one of largest energy companies in Europe, and the largest owner of energy networks in Sweden (E.ON, 2022). Therefore E.ON is determined to take a leadership position in securing the energy system of the future (E.ON, 2022). Their primary vision and objective is to become the sustainable platform for Europe’s green energy transition (E.ON, n.d). This means that they achieve to be the decarbonization partner of choice for consumers, municipalities, industries, and businesses by connecting energy, heating and mobility sectors. Consequently, E.ON will create a new energy ecosystem for the green age (E.ON, n.d).

E.ON Sweden’s business areas include Energy Networks (EN), Energy Infrastructure Solutions (EIS) and Energy Retail (ER). The EN division is responsible for E.ONs electricity networks in Sweden. EIS focuses on building tailored customer solutions, such as district heating and solar energy solutions for business clients, while ER caters to similar needs of private consumers (E.ON, 2022).

E.ON is actively working to consistently reduce its environmental footprint, with the ambitious goal of achieving carbon neutrality in operations and energy consumption by 2030 (E.ON, 2022). Furthermore, they also have the goal of achieving net zero emissions in their whole value chain, by 2035 (E.ON, 2022).

1.3 Problem Description

Sustainability and climate reporting are becoming more common due to the rapid development of new directives and increased expectations from stakeholders. Consequently, there is a growing demand for transparency. This demand requires a deeper understanding of sustainability matters, including financial risks and opportunities, as well as the impact of certain activities throughout the entire value chain. Transparency involves clear and coherent communication on strategy, targets, results, challenges, and risks, which can help companies minimize risks of greenwashing and create credibility. Furthermore, sustainability efforts also affect a company's competitive advantage positively through increased financial performance, attracting top talent and risk mitigation by being in the forefront of regulatory compliance (Rafi, 2021).

Since E.ON is dedicated to being a driving factor towards a sustainable energy industry, they are now continuously working with and exploring ways to reduce their carbon footprint. Stricter regulations and policies, such as CSDR, combined with E.ON's ambitious goals of achieving net zero emissions through their whole value chain require quick and effective measures to be made. In order to secure a competitive advantage and be resilient in the future, it is imperative for E.ON to integrate sustainability in critical processes such as procurement, investments and strategic decision making.

As of now, investments are major contributors of E.ONs emissions. By evaluating their investment process and incorporating a climate assessment metric into the investment procedure, decision makers can be influenced to address and minimize carbon emissions from all scopes. Due to the high complexity regarding carbon emission

calculations, and the challenges regarding integration of carbon accounting and carbon assessment tools into a company's operations, several issues arise. There are uncertainties regarding how to measure the climate impact of investments in an efficient way. A contributing factor to this is the fact that the research area is a relatively new phenomenon. Therefore, how such a climate assessment tool should be designed as well as implemented into a company's decision making process has to be addressed due to the gap in existing research. Furthermore, change management theory plays a vital role in supporting the implementation, bridging the gap between research and practical application.

1.4 Purpose & Research Questions

The purpose of this master's thesis is to investigate how E.ON and similar energy companies can minimize their investments' climate impact, which aligns with their business operations and processes. Moreover, this thesis will explore suitable tools for how E.ON can assess their investments from a sustainability perspective and thereby provide an opportunity to evaluate these investments and contribute to climate-improving measures. Also, the implementation of potential tools will be discussed from a change perspective.

Furthermore, the purpose of this thesis is also partly to describe current methods and theories used by companies in order to assess investments regarding climate impact. Also, three case companies will be examined and described in order to see how these methods can be implemented in a real life scenario. By taking the methods out of the theoretical landscape and applying them to the context of E.ON, this thesis aims to contribute to closing the gap between research and practical application. With this purpose, the following research questions can be established:

R1: What theories and tools exist to evaluate a company's climate efforts based on investments?

R2: Which method(s) are best suited to provide an assessment of the climate impact of an energy company's investments?

R3: In what way(s) can climate impact be integrated as an aspect in the investment process of an energy company?

1.5 Delimitations and focus

The primary focus of this thesis is to address the climate impact related to investment within the business area EIS, particularly concerning carbon emissions and GHG-emissions. Specifically, the study will explore the implementation of climate improvement measures within E.ON Sweden, not the whole E.ON group. Sustainability is a broad term which includes both environmental, social and economical aspects. Throughout this thesis, "sustainability" exclusively refers to environmental sustainability. Furthermore, sustainability aspects beyond climate impact, such as biodiversity, are not addressed in this thesis. However, the methodology of a potential carbon assessment tool will be designed with scalability in mind, allowing for potential expansion to include other sustainability dimensions such as biodiversity and social aspects. Throughout this thesis, the phrase investments will refer to activities which require capital expenditure for exploring, developing or redeveloping parts of E.ON's business. For example, this includes projects such as the development of the distribution grid related to district heating and cooling, building and rebuilding of heating plants, or sustainability initiatives.

Moreover, the thesis aims to establish a framework or roadmap for integrating climate improvement measures into the decision-making and investment procedures of large energy companies. This necessitates an exploration of the macro-landscape of such organizations, which includes relevant laws and regulations related to sustainability, strategic implications of integration, and insights from change management theory to identify and address potential barriers.

Operational aspects, such as the collection of climate data from E.ON's suppliers for potential integration into a climate assessment tool, are not within the scope of this thesis. It is assumed that climate data is readily available. Furthermore, economic implications which may emerge from the integration of potential tools within E.ON's operations are not covered in this thesis. Lastly, this thesis does not focus on

operational adjustments aimed at reducing emissions in E.ON's day-to-day activities.

1.6 Target Audience

The target audience for this thesis is foremost aimed at the decision makers at energy companies who want to understand the challenges with implementing a climate assessment tool in their decision-making and investment procedure. However, this thesis can provide information for students, researchers or companies in other sectors that are interested in sustainable governance with the aim to reduce carbon emissions and track GHG emissions.

1.7 Thesis Outline

1. Introduction	In the first chapter, the background of the thesis is presented along with a brief introduction of the target company, E.ON. This is followed by a description of the research questions, purpose, delimitations and target audience.
2. Method	The research methodology and data gathering methods are presented and motivated. Also, research ethics and quality is discussed.
3. Theory	The theory presented in this thesis includes the research areas carbon accounting, strategic motives for carbon mitigation, carbon assessment tools and change management.
4. E.ON	The target company E.ON is described along with the investment and assessment processes currently in place.
5. Results	The results from the interviews and workshops are presented. Two new carbon assessment methods are introduced based on these results.
6. Discussion	The findings are discussed and the carbon assessment tools are evaluated. Based on the evaluation a recommendation is formed, as well as an implementation roadmap to ease integration.
7. Conclusions	The research questions are answered, followed by a discussion of the implications for E.ON, other energy companies, and external stakeholders. The section also outlines the limitations of the study and suggests potential areas for future research.

2 Method

This section outlines the research methodology used in this thesis, beginning with a detailed explanation of the chosen research approach. Thereafter the qualitative data collection method is described. The section also discusses the ethical considerations and quality assurance methods to ensure the integrity and reliability of the thesis. Finally, the section concludes with an overview of the techniques used to interpret the data, setting a baseline for the findings presented in the results section.

2.1 Research methodology

Research methodology is a way to assist with defining boundaries and principles for how to carry out the research in question. The methodology itself does not have to specify a detailed plan of action, but offers a selection of steps to follow to help get a sense of direction towards the end objective. A well thought through scientific research methodology should fulfill a number of criteria. These criteria emphasize the importance of building on prior research and literature and to ground statements and reasoning on a foundation of well established facts. Furthermore it should facilitate objective reviewing by openly disclosing sources of information (Höst et al., 2006).

The purpose of the study differs depending on the underlying characteristics and objectives of the research. Höst et al. describes four main purposes: descriptive, exploratory, explanatory and problem solving. A descriptive study is primarily used to examine and describe a phenomenon and how it works or is used. Explanatory studies aims to provide an in-depth understanding of the subject whilst an exploratory way of working focuses on causation. The problem solving approach, which is the most common at technical faculties, tries to find solutions to one or multiple identified problems (Höst et al. 2006). The nature of

this thesis can be considered both descriptive and problem solving. descriptive in the sense that the research questions R1 and R2 aims to find and thoroughly investigate theories and methods of defining the impact of an energy company's investments. Problem solving in the sense that the purpose of research question R3 is to solve the complication of implementing these methods into the investment process of such a company.

2.1.1 Yin's case study method

The primary research methodology used in this thesis is the case study method developed by Robert K. Yin (2018). The approach suits this study since it fulfills most of the three main criteria defined by Yin. It focuses on contemporary rather than historical phenomena and it does not require control over the behavioral events of the phenomena. The process can be either linear or iterative, and is made up of the following six steps: Plan, Design, Prepare, Collect, Analyze and Share (Yin, 2018). To fit the purpose of this study, adaptations have been made to the process which can be seen in figure 2.1.

Plan	Design	Prepare	Collect	Analyze	Share
Generate problem formulation Define purpose and research questions	Compose research process & methods - Core activities - Define process	Interviewee selection Literature review - Climate assessment methods - Change management - Carbon accounting - Carbon disclosure - Strategic motives	Interviews with internal stakeholders at E.ON Interviews with external energy companies Workshop with selected stakeholders at E.ON	Compilation of interview, literature review, and workshop results Current and best practice analysis Assess integration of climate assessment tools	Written report Presentation of thesis Presentation of created tools

Figure 2.1: Adaptation of Yin's six step case study method (Yin, 2018)

The starting point of the process, the “Plan” phase, consisted of constructing the problem formulation and defining the purpose of the thesis as well as the research questions to be answered. This was done in close collaboration with E.ON to fit their specific needs. During the “Design” phase, the research methods were established by investigating the core activities of the study and how to best answer the questions formulated in the problem description. This was then compiled into a more comprehensive process which was built upon Yin's pre-existing framework. Following the “Design” phase came the “Prepare” part of the process. This part consisted of reviewing former research by conducting a literature study to give a greater understanding of current existing theory and methods used in the field of carbon accounting, change management and the Swedish energy market, among others. It also included preparing for the external and internal interviews. The fourth step in the process, “Collect”, covered gathering data in the form of insights and knowledge. This information was obtained from both internal interviews with representatives from different departments at E.ON and external interviews with experts and key personnel at similar energy companies, as well as feedback from a workshop with selected stakeholders at E.ON with the aim of validating prior findings.

The second to last step, “Analyze”, consisted of analyzing and compiling the findings from the literature study, interviews and workshop. This was partly done by identifying best practices and methods used in the current business landscape and assessing them in relation to the internal processes of E.ON. The analysis phase was concluded with the design and recommendation of suitable assessment tools as well as the creation of a roadmap to help guide E.ON with future implementation. The final step, “Share”, aimed to wrap up the results of the whole process into the thesis as well as an oral presentation.

2.2 Researching methods

In order to effectively gather information, analyze and draw conclusions from this information and validate the findings a combination of different researching methods have been used in the writing of this thesis. The methods used were: a literature study with the aim of establishing a theoretical base, internal interviews to gather information and perspectives about internal processes of E.ON,

external interviews to gain insights from similar companies in the energy business and to hear expert opinions and a workshop to validate and collect in-put on these findings.

2.2.1 Literature study

To establish the theoretical foundation for this thesis and to provide a deeper understanding of its main concepts a literature study was conducted. In order to structure the process, a framework presented by Höst et al (2006) was used which organizes the study into three steps: a search with a wide focus, selection and a deep dive. During the first step a broad search was done by going through a wide range of literature, including publications in scientific papers and journals, books and previous masters' theses. The aim was to, by scanning the overall research landscape, yield an overview of existing knowledge and practices within the scope of the thesis. In this step, mainly the abstracts and conclusions of the sources were read. After the extensive search, a selection of the most relevant articles was carried out, which then was investigated more thoroughly than in the previous step, by reading through most parts of the articles. This was followed by the last step of the process which was to carry out another phase of information gathering, based on terminology and findings from the selected literature. These acted as keywords in the succeeding search, narrowing down the search into more specific areas of research. The objective of the last step was to provide a deeper understanding of the most relevant topics and methods used to assess the climate impact of investments and to help evaluate the applicability for E.ON's practices. These steps were then iterated multiple times during the course of the thesis when new subject matters arose.

To gather information the main search engines used for academic sources of information were Lubsearch and Google Scholar. Additionally, basic web search has been utilized to quickly read about concepts, and to find complementary information such as details about companies and regulations. Key search words used involved carbon accounting, carbon management, GHG protocol, climate assessment, climate assessment tool, internal carbon pricing, change management, carbon emissions ratio, carbon intensity and more.

2.2.2 Interviews

Interviews can serve the purpose of collecting factual and straightforward information but also to explore more complex and subtle matters. Some of the benefits with the method include the ability to generate valuable insights due to the depth of the information acquired, a high expected response rate and validity. Additionally, interviews are a well suited method for gathering data based on the participants own priorities, opinions and ideas. Consequently, the informant can expand on ideas, explain views and identify what the crucial factors are for them specifically (Denscombe, 2010).

Semi structured interviews were used to gain insights into specific practices at E.ON and to gain an additional point of view on important concepts, such as those of carbon accounting. Moreover, other energy companies were consulted to gather the experience of other organizations who have started to work with the climate assessment of investments. The interviews were, when possible, carried out in person but also performed online when geographical or time constraints got in the way. The first interviewees were chosen in accordance with the thesis supervisor at E.ON. These interviews then lead to new employees being consulted, based on tips from the previous conversations.

All interviews were recorded, with the consent of the informants. The process of analyzing the interview data was split into three steps, inspired by the techniques described by Ryan and Bernard (2003). According to their paper, the first step of any thematization of audio source material is the process of transcribing the files into text. Höst et al (2006) also emphasizes the importance of this step, meaning that it makes sure that no important information was missed or overlooked, and contributes to better and more reliable results. After following this, the text's were read through one by one. The purpose with this step was to find themes that were repeatedly occurring in the interview. The third and last step consisted of connecting these themes that had been identified in the singular interviews with each other. By adapting the cutting and sorting technique described by Ryan and Bernard (2003), the many themes of the individual interviews could be synthesized down to a smaller number of final themes. While the number of themes was boiled down to a smaller number, it is important to note that the

viewing points of all the people interviewed have been considered, to make sure that the themes represent the overall view of the interviewees.

To further increase the reliability of the data collected through the interviews, a selection of interviewees, which would represent multiple positions with different points of view, was made. Another way the information gained from the interviews was validated was through the workshop, which is described in more detail further down in this chapter.

2.2.2.1 Internal interviews

One of the intentions for performing internal interviews was to map out the investment process at E.ON and to find potential differences and similarities between departments or types of investment. Another motive was to investigate what aspects were, or could be, included in a climate assessment of new investments, and in what format such an assessment would have the most impact. Additionally, the interviews were used as a way to test new concepts, receive feedback and identify possible barriers of implementation. In total, eight employees at E.ON were formally interviewed, stretching over multiple departments including finance, sustainability and procurement. As questions arose during the research process, some of the interviewees were heard more than once. By using the thematization methods described previously, the themes that are further described in chapter *5.1.1 Findings from the internal interviews,* were: current methodologies, important aspects, implementation, facilitators and barriers. The full list of anonymized interviewees can be seen in table 2.1 below.

Table 2.1: Internal interviewees, their position at E.ON and the date of the first interview

Interviewee	**Position**	**Date of first interview**
Interviewee 1	Sustainability controller	9 February 2024
Interviewee 2	Senior Financial	9 February 2024

	Controller	
Interviewee 3	Senior Investment and Digitalization Controller	20 February 2024
Interviewee 4	Project Manager	26 February 2024
Interviewee 5	Project Manager	26 February 2024
Interviewee 6	Global Category Manager	27 February 2024
Interviewee 7	Sustainable Procurement Manager	4 March 2024
Interviewee 8	Senior investment controller	11 March 2024

2.2.2.2 External interviews

Complementary to the internal interviews, a number of external interviews were conducted. In total, six Swedish energy companies were contacted through email and phone calls, out of which three ended up agreeing to an interview. These interviews mostly dealt with how the interviewed companies had integrated sustainability as a parameter in the decision making process, with focus on the investment processes of the companies. The goal was to gain inspiration from the systems in use, as well as to identify motives, barriers and other important lessons learned from their process of implementation, and could later be applied to the conclusions of this thesis. Similarly to the internal interviews, thematization methodology was utilized in order to identify common themes from the external interviews. The themes that arose from the external interviews are further described in section *5.1.2 Findings from the external interviews,* and are: current methods of climate assessment, positive effects and motives and barriers. Besides talking to other similar companies, experts in the field of sustainable accounting were also contacted to gain another perspective on the matter. Unfortunately, none of the experts were available for interviews. For the full list of interviewees, see table 2.2, and for the guides used for the interviews, see appendix B.

Table 2.2: List of external interviewees

Name	Title	Organization	Date of interview
Interviewee 9	Energy System Specialist	Company 1	1 March 2024
Interviewee 10	Strategy & Business Development	Company 2	8 March 2024
Interviewee 11	Sustainability Controller	Company 3	1 March 2024

2.2.3 Workshop

A physical workshop was designed based on the findings from the internal and external interviews in combination with the theoretical foundation built by the literature review. The workshop was meant to be part of both the collect and analyze phase of the thesis methodology. It was done through presenting the findings from the interviews and by presenting a few potentially suitable methods of climate assessment to gather input from the participants to guide the continuation of the thesis. The later part of the workshop was made up of a conducted discussion, where the attendants were given a number of predefined questions that covered three aspects of the methods. This discussion later laid the foundation for which criteria would be used in order to structurally analyze the different methods of climate assessment. The full workshop agenda, including all the material presented can be seen in appendix C.

The participants of the workshop were picked from different divisions at E.ON, including finance and sustainability inside of EIS, as well as a representative from sustainability at Energy Networks. Also, the majority of the attendees had been interviewed prior to the workshop and therefore had a good understanding of the subjects of discussion, which helped ensure a high level of quality in the discussion. In order

to effectively lead the discussion, this part of the workshop was recorded, with the consent of the participants. The recordings were later transcribed and analyzed to ensure no important input was missed or overlooked. Moreover, the discussion was retroactively anonymised to protect the integrity of the participants. The transcripts, in combination with the transcripts from the interviews and the literature study laid the foundation for the results and discussion in the report.

2.2.4 Evaluation of methods

The potential methods for carbon impact assessment that emerged from the literature study, the interviews and the workshop were evaluated to determine their suitability to be designed and integrated at E.ON. This evaluation process started with deciding on which aspects the methods were to be assessed on. The discussions during the workshop and the insights from the interviews were both considered during this stage. From these, the most critical aspects regarding the climate assessment tools, which would be the evaluation criteria, could be established. These were: User friendliness, quantifiability, steering potential, feasibility and employee's opinions about the methods. While the first 4 were heavily inspired by the workshop attendees and interviewees, the last criteria was an addition made by the authors to help capture the wider opinion of both the interviewees and the workshop attendees.

After determining the criteria, the actual analysis and evaluation of the methods could begin. This stage of the process was made up of going through each method one by one and assessing it on the established criteria. Both the theories presented in chapter *3. Theory* and the results of the empiric research were considered to assess the potential that these methods could have if they were to be implemented into E.ON processes. However, none of the tools have been practically tested or implemented into E.ON's current processes and can therefore only be assessed based on the hypothetical value that they would bring.

2.3 Research Quality

The quality of the conducted research is an important factor to the actual validity of the results of the study, according to Höst et al (2006). A high level of validity can be achieved by thoroughly substantiating the conclusions drawn, making sure that the study is addressing the actual problem or phenomenon it is set to investigate and by producing general results. In accordance with this mindset, Lincoln and Guba (1985) came up with four principles to determine the trustworthiness of qualitative research. These aspects are: credibility, transferability, dependability and confirmability and will be analyzed below. Besides acknowledging these four aspects, Tobin and Begley (2004) points out that the quality of the research also depends on the self-reflection of the researchers, which permeates the whole process of this research.

The credibility of a study is determined by the degree of which the researchers, the participants of the study and the readers think the context matches the results of the research. To ensure credibility, researchers can use various methods, including both data and researcher triangulation. Both have been applied in the making of this thesis. By considering a wide array of secondary and primary sources of information, multiple viewpoints have been taken into account. Also, recurrent sessions with the research supervisors from both E.ON and Lund University have ensured that the research has stayed relevant and factual.

Transferability refers to the level of generalization of the results in a border context than that of the study. Although the transferability of this thesis is partly limited, due to company specific and geographical constraints, it is increased by the addition of experiences from other Swedish energy companies. Also, the conclusions drawn regarding carbon accounting, barriers, and methods for assessing the carbon impact of investments are not exclusive to a certain industry and can be used by other companies in the same situation as E.ON. However, since the discussion is heavily based on insights from within the case company, the reader must themselves interpret the results and conclusions from their own context before applying them.

Dependability translates to how consistent and repeatable the results of the study are. To assure that the dependability is high, the research should be logically conducted, easy to trace, and clearly documented. This, in combination with a public presentation and discussion together with supervisors and other students at the institution strengthens the dependability of this thesis.

Confirmability refers to how well the researchers derive their conclusions from data, and not from personal bias. This means that it should be evident how conclusions are drawn, and that methodological and analytic choices are motivated. It is achieved when all three priorly described aspects are fulfilled. In this thesis, the recurrent supervision and feedback sessions and the validation gained through the workshop and interviews reduces the occurrence of bias.

2.4 Generative Artificial Intelligence

In this thesis, generative artificial intelligence (AI) in the form of ChatGPT and Sana AI have been used with two main purposes. The primary way in which generative AI has been used is as a brainstorming tool for ideation. Secondly, the tools have been utilized in order to synthesize notes from the interviews conducted in the making of this thesis. This process consisted of first feeding the AI model with the transcripts from the interviews. The result was not always perfect which meant the categorized versions of the transcripts had to be read through and altered if needed. Then, the individual documents were merged into one and the insights were categorized again using the generative AI. Also, generative AI has been utilized to process the writer's own text as a tool for editing and language check. A typical prompt that was feeded to the AI was: “Please proofread this text and point out errors and provide suggestions for improvements.”. While being an incredible tool for completing and helping with these types of tasks, it is important to remember the limitations of generative AI. For example, the University of Southern California (2024) states that it has been reported that generative AI tools hallucinate information, making things up without basing them on factual information. The answers presented can therefore be wrong, even if the large language model seems to back them up with source material. Also, ChatGPT is trained on a vast volume of data, some being outdated which means it can

produce outdated answers. Keeping these things in mind, the information gained from using generative AI has been cross checked with actual sources before using it in the making of this thesis. Nevertheless, the generative AI tools have provided significant improvements in effectiveness when looking for specific information, generating ideas and helping with processing text.

3 Theory

This section provides a comprehensive review of the literature relevant to the key concepts and models explored in this thesis. Firstly the fundamental principles of carbon accounting and sustainability reporting are defined and discussed. Thereafter, various theories and models regarding climate impact assessment, which includes frameworks for carbon emissions calculation and internal carbon pricing strategies are presented. Additionally, change management and regulatory and voluntary standards that affect corporate sustainability practices are explained.

3.1 Carbon accounting

Carbon accounting makes it possible for companies to calculate, quantify and understand their direct and indirect carbon emissions. As a result, companies are able to report on their climate impact, which also provides an opportunity to evaluate carbon heavy activities, contribute to climate-improving measures and reach net zero emissions (Normative, 2023)

The research field of carbon accounting emerged when the carbon emissions trading market was established as a result of the Kyoto Protocol (He et al. 2021). Today, carbon accounting is defined as the process of measuring how much carbon dioxide equivalents (CO_2e) an organization emits (Normative, 2023). In order to calculate emissions effectively two sets of data are needed: business data and emission factors. Business data is related to specific business activities and can be either spend data or activity data. Spend-based data refers to how much capital was spent on a certain good or a service, whereas activity-based data refers to information regarding the activities of the organization, such as how many liters of fuel or kilograms of a certain material was bought. Emissions factors, on the other hand, specify the

GHG emissions quantity that corresponds to a given unit of business data (Normative, 2023)

When calculating the carbon emissions of a product, service, activity or organization, four different methods can be used (WRI, wbcsd, 2013):

1) Spend-based method: The emissions are calculated by multiplying the economic value of the purchased services and goods with the emission factors, such as the industry average, and average emissions per unit of the good or service.
2) Average-data method: The emissions are calculated by multiplying data, such as the mass of a purchased good, with the emission factors, such as the industry average, and average emissions per unit of the good or service.
3) Supplier-specific method: This method requires the reporting company to collect data directly from their suppliers, which means that this method is more specific than the spend-based and average-data methods.
4) Hybrid method: The hybrid method involves using supplier-specific data when possible, and using spend-based and average-data- methods to estimate the rest.

3.2 Carbon disclosure

Among the literature published on carbon accounting, carbon disclosure is the most studied (He et al. 2021). Carbon disclosure refers to when a corporation communicates their environmental sustainability (Fernando, 2023), and can be done through a variety of different channels such as government agencies, annual reports, and sustainability or corporate social responsibility reports (He et al. 2021). Companies can also choose to disclose their GHG emissions through voluntary disclosure initiatives such as CDP (Huggins et al., 2011), a non-profit organization that has the largest environmental database in the world (CDP, 2022).

3.2.1 Factors that motivate carbon disclosure

There are a variety of different factors explaining a company's tendency to disclose its true position regarding their carbon emissions (He et al,

2021). A corporation's carbon disclosure is motivated by external pressures such as social, economic, regulatory and financial market factors, as well as firm internal factors (He et al, 2021).

3.2.1.1 Economic factors

Economic factors that influence a company's choice to disclose their carbon emissions relate to carbon charges, carbon fees, carbon taxes and emission trading schemes. Due to the growing economic consequence of carbon emissions, corporations are incentivized to disclose on these matters in order to mitigate the risk of increased operating costs. One example is the implementation of the European Union's Emissions Trading System (ETS). Under this system, companies exceeding their allocated carbon emission limits must purchase additional emission permits on the carbon market (Luo et al. 2012).

Additional economic factors that can drive a company to disclose their carbon emissions is their operating environment. Companies operating in smaller size markets with higher concentration and greater substitutability, are more inclined to share their response from voluntary disclosure initiatives such as CDP survey. This is due to the lower entry barriers that characterize these markets, as well as the heightened pressure on the operational efficiency of the firm in question (He et al., 2021).

3.2.1.2 Regulatory factors

Governments play a major role in motivating firms to disclose their carbon emissions (Stoddart et al., 2012). Over time, they have implemented various market-based and non-market-based policies to encourage companies to reduce their GHG emissions (He et al., 2021). One example is the effect of the Kyoto Protocol, where studies have shown that companies with headquarters in countries that have ratified the protocol, are more inclined to disclose carbon-related information (Hahn et al., 2015). Furthermore, it has also been shown that firms operating in carbon-intensive sectors, which are covered by higher regulatory pressure, also disclose their emissions to a higher degree (He et al., 2021). Besides governments, non-governmental organizations such as CDP can provide guidance and positively

influence the credibility and degree of information provided in the carbon disclosure (He et al., 2021). Examples of regulations and policies, that facilitate carbon disclosure, can be seen in section 3.2.2 *Regulations and Policies*.

3.2.1.3 Social factors

Social factors refer to the pressure that is created by the public's opinion. The growing awareness of climate change leads to a societal demand for carbon reduction and transparency. If a company ignores its social responsibility and is reluctant to share information about their carbon performance, it risks conveying that the firm in question does not take the climate change issue seriously, or lacks strategies aimed at mitigating carbon risks and emissions (Luo et al., 2012).

3.2.1.4 Financial market factors

The financial market factors arise from the pressure created by investors and shareholders. This is driven by the fact that they want to understand the climate-related risks and opportunities associated with their investment (He et al., 2021).

3.2.1.5 Firm internal factors

A range of firm internal factors affect a company's choice to disclose their GHG emissions. For example, studies have shown that higher corporate governance quality and firm profitability are associated with increased carbon disclosure. Disclosure can also be affected by managers' attitudes towards carbon issues as well as if the company has an environmental management system in place. Firms with an environmental management system are more likely to disclose, since they often communicate their environmental efforts to stakeholders, and because the preparation cost for carbon disclosure is significantly lower with such a system (He et al., 2021).

3.2.2 Regulations and Policies

3.2.2.1 Greenhouse Gas Protocol & Greenhouse Gas Scopes

The Greenhouse Gas Protocol provides standards, guidance and tools that help countries and businesses to measure and manage GHG emissions. The first edition of the GHG-protocol's Corporate Standard was published in 2001 (Greenhouse Gas Protocol, n.d a) and served to provide requirements and guidance for companies and other organizations that aimed to implement a corporate-level GHG emissions inventory (Greenhouse Gas Protocol, n.d b). Today, the GHG-protocol is the most established and widely used GHG accounting framework in the world. Since 2001 it has been updated to include additional guidance on how emissions from electricity and other energy purchases can be measured, and how companies can account for emissions from their whole value-chain (Greenhouse Gas Protocol, n.d a).

The GHG-protocol Corporate Standard divides GHG emissions into three categories: Scope 1, Scope 2 and Scope 3. This is done for GHG accounting and reporting purposes, as well as to improve transparency and provide utility for different types of organizations where climate policies and business goals can differ (WRI, wbcsd, 2004). The scopes are described below and can be seen in relation to the reporting company in figure 3.1 (WRI, wbcsd, 2004).

1) **Scope 1**: Scope 1 includes direct GHG emissions that occur from sources that are owned or controlled by the company such as company facilities and company vehicles.
2) **Scope 2**: Scope 2 accounts for GHG emissions from the generation of purchased electricity, steam, heating & cooling for own use.
3) **Scope 3**: Scope 3 are the indirect emissions from upstream and downstream-activities of the company. Indirect upstream activities can for example be purchased services and goods, capital goods, fuel and energy related activities, transportation and distribution, waste generated in operations and business travel. Indirect downstream activities can for example be transportation and distribution, processing of sold products, use of sold products, end-of-life treatment of sold products, leased assets, franchises and investments.

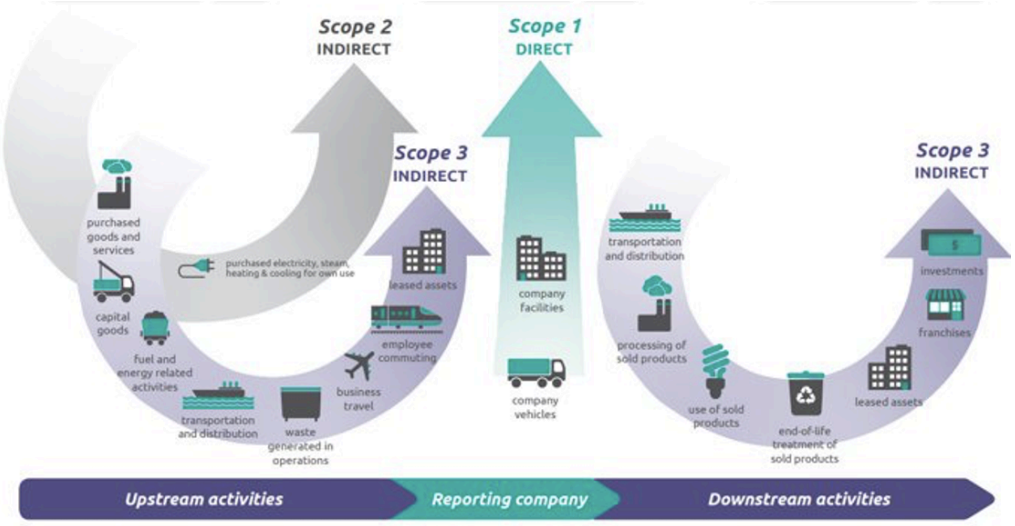


*Figure 3.1: The scopes in relation to the reporting company (*WRI, wbcsd, 2013).

3.2.2.2 European Union Taxonomy

The EU Taxonomy is a classification tool that is used to identify environmentally sustainable investments through defining how an economic activity can be aligned with an environmental objective (Regeringskansliet, 2020; CDP, 2023). In order for an economic activity to be classified as environmentally sustainable, it must contribute significantly to one or more of the six established environmental objectives, which are the following (CDP, 2023):

1. Climate mitigation
2. Climate change adaptation
3. The sustainable use and protection of water and marine resources
4. The transition to a circular economy
5. Pollution prevention and control
6. The protection and restoration of biodiversity and ecosystems

Europe was the first region to make Taxonomy disclosures mandatory for over 2000 large public companies and is the most important proposal in the EU's action plan for financing sustainable growth (CDP, 2023; PWC, n.d a). However, there are still uncertainties regarding how to interpret and utilize this Taxonomy data for decision-making since

the data only reveals a company's current and potential future alignment with the net-zero transition (CDP, 2023). Companies have different interpretations of the economic activity descriptions and use different methods to calculate the key performance indicators (KPIs), which are used for the Taxonomy reporting, resulting in interpretation and comparison difficulties (McClellan et al., 2023). Furthermore, companies should establish effective internal mechanisms for environmental, social and governance (ESG) data to meet the requirements of sustainability reporting, particularly in response to legislation such as the EU Taxonomy and CSRD (McClellan et al., 2023).

3.2.2.3 Corporate Sustainability Reporting Directive

CSRD is an EU-directive which ensures that large companies, as well as listed small to medium sized enterprises are required to report on sustainability (European Commission, n.d) such as GHG emissions, employee well-being, and diversity and inclusion (Anthesis, 2023). CSRD aims to broaden the integration of companies into a unified sustainability reporting system, making reporting more consistent and sustainability efforts comparable between companies. With the mandatory disclosure standard, CSRD will also ensure that the sustainability information has high quality and encourage companies to identify and address sustainability impacts, risks, and opportunities (Anthesis, 2023). Therefore it can work as a valuable insight-tool for companies to create new internal functions or develop a transition plan to reach net zero emissions (PWC, n.d b).

Companies covered by the CSRD will have to report according to European sustainability Reporting Standards (ESRS). The ESRS state the specifics of how sustainability information should be reported and works as the roadmap for compliance with the CSRD (Anthesis, 2023)

3.2.2.4 European Union Greens Claims Directive

It is currently difficult for consumers to know whether environmental performance labels on products are reliable, or even verified. Consequently, consumers can be misled, and companies can give the false impression that a product, or service, is environmentally sound through greenwashing (European Commission, n.d b). In the beginning

of 2023, the European Commission put forward a proposal for a directive on green claims in order to address this issue to protect consumers and the environment (Ragonnaud, 2023). The proposed new law, the Green Claims Directive, would require companies to verify their environmental labels through a third party, guaranteeing that the claims are credible and trustworthy (European Commission, n.d b). Furthermore, the directive would require companies to communicate their claims in a certain way, and introduce new and stricter rules on environmental labeling schemes (Ragonnaud, 2023).

While the EU Green Claims directive has not been adopted yet, it would make green claims reliable, comparable and verifiable across the EU. This would contribute to creating a circular and green EU economy, and create a level playing field for businesses striving to increase the environmental performance of their products (European Commission, n.d b).

3.3 Strategic motives of carbon reduction

To understand the rationale for voluntarily implementing carbon reduction initiatives into an organization, the view of GHG reduction must not be looked at as a phenomenon completely driven by social or regulatory pressure. Instead, carbon reduction can be viewed as a strategic issue driven by the market and the desire for firms to create a competitive advantage (Hoffman, 2005). Although there is a large variation in motives described by past research, three categories are more recurring and prominent in the literature. These categories are: effects on financial performance, risk mitigation and preparing for regulation.

3.3.1 Effects on financial performance

A prominent area of research is on the impact of a firm's financial performance, where a positive linkage to carbon performance can be seen. In a review of articles relevant to the topic, Sitompul et al (2023) shows that more than half of the research articles reviewed concludes that carbon reduction efforts positively correlates to increased financial performance. For example, investments into sustainable projects tend

to not only reduce emissions, but also generate observable financial benefits (He et al., 2017). It can be said that if CO_2 emissions continue to increase, it will have a negative effect on profitability. With this in mind, it is implied that CO_2 mitigating behavior and practices are worthwhile for companies that aim to improve their profitability (Tuesta et al., 2020). This aligns well with the findings of Trinks et al (2020) who show that higher carbon efficiency in processes lead to higher profitability and less systematic risk. Although carbon performance has a dominantly positive impact on corporate financial performance, it can have a negative effect on short term return on assets and the firm valuation. When accounting for the long term on the other hand, it is shown to have a positive impact (Ganda, 2022).

Carbon reduction programmes have a better payoff in companies with superior carbon performance. While it can be profitable to reap low-hanging fruits with simple initiatives, less sustainably developed organizations are prone to more risk in the eyes of investors, if they choose to pursue overly ambitious sustainability work. Improved climate policies in companies may translate to a competitive advantage only if they resonate with the expectations of its stakeholders. Hence, managers need to stay up to date with the business climate and thoroughly investigate the expectations of its stakeholders before deciding on carbon mitigating strategies. Some companies might find it financially beneficial to adopt a proactive climate strategy while others may be better off working reactively until business uncertainty is lower (Lewandowski, 2017).

3.3.2 Risk mitigation

Besides financial benefits, carbon management strategies can serve as a tool for risk mitigating. As touched upon in the paragraph above, a higher level of carbon performance can be associated with lower systematic risk of a company's stock. This might be attributed to the linkage between carbon efficient production which often implies operational efficiency benefits as well as contributing to reduced uncertainty associated with potential future regulation. For every 10%-points increase in carbon efficiency, the systematic risk drops by approximately 0.4% on average (Trinks et al., 2020). A similar study shows that stock returns for high-emitting companies are more sensitive to economy-wide fluctuations than those of low-emitting

firms. Therefore the transition for businesses into a less carbon-dependent environment contributes to financial risk across all different industries, a risk that investors require a premium to carry. Even if the effect is observed throughout all industries, the premium is more noticeable in sectors who are more sensitive to carbon related risks, such as carbon intensive industries, EU-countries and industries exposed to carbon pricing regulations. Consequently, emission reduction might be an effective risk mitigation strategy (Trinks et al., 2017).

Another interesting aspect is presented by Ala-Purkkunen and Roth (2023) who have investigated how Sustainability-Linked Bonds (SLBs) are affected by the sustainability efforts of the issuing firm. SLBs differ from other sustainable bonds in that the capital raised is not earmarked for sustainable development projects. Instead, the terms of the instrument are linked to the performance on pre-defined sustainability goals, such as the mitigation of GHG emissions. On the one hand, they conclude that more ambitious GHG associated goals imply a higher spread in the yield of the bond, meaning the bond holds a higher risk. On the other hand the researchers show that the companies that have a higher ESG score are associated with having a lower yield spread. The implications of this is that the firms who receive a high ESG score will have to pay less for borrowed capital, which in turn comes with a lower risk.

3.3.3 Preparing for regulation

In order to manage a firm in the current business- and political climate, company leaders must be up to date on regulatory standards not only on a regional level, but nationally and internationally as well. Voluntary carbon reducing efforts is one way of preparing for the rapid changes in the regulatory terrain (Hoffman, 2005). Regulations can be in the form of stricter energy efficiency requirements, new or increased carbon prices and more extensive carbon disclosure obligations (Radicle, 2023). Since 2017, Sweden has had the long term goal of having zero net GHG-emissions by 2045. This means reducing emissions by 75% by 2040, compared to 1990 emission levels (Naturvårdsverket, n.d). However, in early 2024 the EU commission presented a EU-covering goal of reducing emissions by 90% in the year 2040 (Regeringskansliet, 2024). The increase of 15%-points insinuates

an increase in ambition from regulators and will force companies to follow.

One way in which regulators directly influence businesses' climate efforts is by the use of ETS's. In the last couple of years, the European ETS market has seen an increase in volatility, and between September 2021 and February 2024, prices have alternated between €60 and €100 per tonne of CO_2, see figure 3.2. Fluctuating prices might impose unexpected costs for emitting companies, and firms who wish to project the cost of emissions onto their customers have to stay ahead of the changes in ETS rates (Sandbag, 2024)

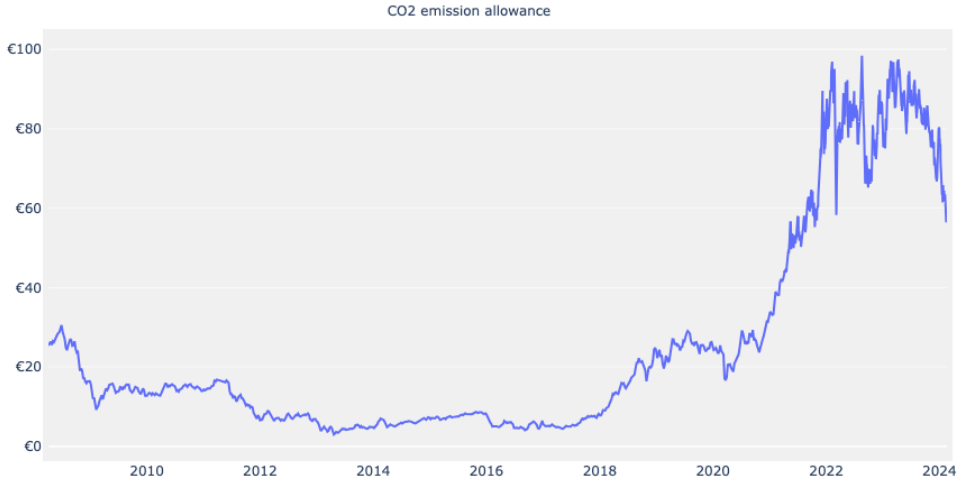


Figure 3.2: ETS rates from 2009 until present (Sandbag, 2024)

Apart from being able to come up with a quick response, firms who are in the forefront of carbon management can more easily find ways to influence what the emerging standards might actually be. The emergence of new emission laws shifts the dynamics on the market which can create new opportunities for the actors who are most prepared and able to adapt. This is particularly true for markets who are already subject to climate reduction goals and regulation. Here, competitive advantages can occur for those who can influence the making of the standards. If, for example, a market decides to implement an ETS-scheme which is heavily based upon a particular

firm's internal trading programme, the firm would not have to adapt their operation to the new scheme while competitors have to. Thus, the firm will receive a competitive advantage due to the new regulations (Hoffman, 2005).

3.4 Carbon assessment methods

Based on the reviewed literature, two methods have been identified as frequently described and prominent in the studied literature. These are the carbon emissions ratio and internal carbon prices, including shadow prices and internal carbon fees and will be described in the following sections.

3.4.1 Carbon emissions ratio

Carbon emissions ratios (CERs) are commonly used by companies for representing climate data. CERs can be defined as the emissions produced per unit of economic output or physical activity, and results in a ratio that normalizes the company's total GHG emissions by a chosen metric. A physical input is useful for comparing similar products or businesses and is often an important factor of the production process, such as kilowatt hours or kilograms of produced material. An economical denominator can simplify the comparison of different products, processes and business units. Both have the advantages of enabling comparison and analysis of performance over time as well as establishing a relationship between data that is otherwise unrelated. Not only can the indicator be used in a comparable sense between alternatives, but also as a way of analyzing historical changes and trends. A downwards pointing trend translates to a positive improvement in the carbon performance of the firm (WRI, wsbcd, 2004).

There are a multitude of normalization factors that the CER can be based upon, such as: units of product, number of employees of the project or business unit, size (for example square meters of area) along with monetary measures such as cost of investment, or capital employed into the project (GRI, 2016). The choice of denominator directly affects the usability of the metric. An economically based indicator benefits the comparison between different products and

projects, but is not as suitable for comparisons over time due to the fact that fluctuations in price may skew the result. For example, if the company produces a higher quantity of products, but at the same price as before, the total emissions created will increase but there would not be a change in the CER. Therefore it is important not to exclusively measure the CER without complementing it with the total calculated GHG emissions of the firm. (Zhao et al., 2012).

3.4.1.1 Putting the ratio into perspective

According to Zhao et al. a current issue with representation of carbon data is the visual presentation of the information. To overcome this hurdle, they present a five step scale in the form of an inverted triangle, see figure 3.3. The aim with the inverted triangle is to easily categorize a calculated carbon emissions ratio into one of the five ranges: extremely low, low, medium, high, extremely high as well as assigning a color to the value for. Doing so facilitates understanding and application of the carbon emission information, for example in a purchasing or investment decision. The medium range, which also works as the baseline for comparison, is selected as the mean of the carbon emission intensity ratios of the items that are included in the comparison. The other 4 ranges are decided by adding or subtracting a number of standard deviations to the mean (Zhao et al. 2012).

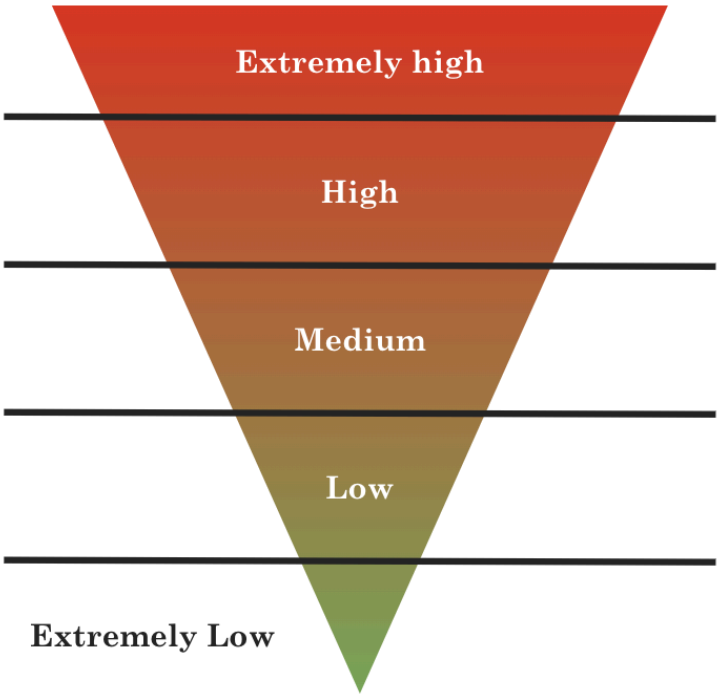


Figure 3.3: Adaptation of the inverted triangle framework (Zhao et al., 2012)

An important aspect of carbon emission indicators such as a CER is that they can not be any more accurate than the underlying life cycle assessment (LCA) data that they are based upon. Therefore, the quality of the data that the CER is based upon is the most crucial factor to its usefulness (Zhao et al., 2012).

3.4.1.2 Marginal abatement cost

If, instead of looking at the emitted CO2 due to every unit of spend, the equation for CER is inverted and presented as the cost of every unit of CO2 emitted, the result is the marginal abatement cost (MAC). It can shortly be defined as the cost of an initiative that will reduce GHG emissions by one tonne. For example, a company might install a heat pump to reduce their carbon footprint connected to heating. While the new investment will decrease their emissions and save them money by not requiring fuel other than electricity, the purchase, installation and operation of the pump has a cost. Dividing the total cost with the total

emissions mitigated gives the cost, per tonne of emissions not emitted. The MAC can be positive, where the investment has a negative impact on the companies financials, and negative for investments which insinuate an economical gain (The World Bank, 2023a).

By ranking the identified investment opportunities in ascending order in terms of their respective MAC a MAC-curve is created. The curve shows the MAC on the Y-axis and the cumulative abatement potential on the X-axis, and allows the company to easily visualize measures required to reach a certain level of carbon emissions reduction. The MAC-curve can also be used to prioritize investments, for example starting with the cheapest options until the budget is exhausted or the reduction goals are achieved. An example of a MAC-curve can be seen in figure 3.4 below (The World Bank, 2023a).

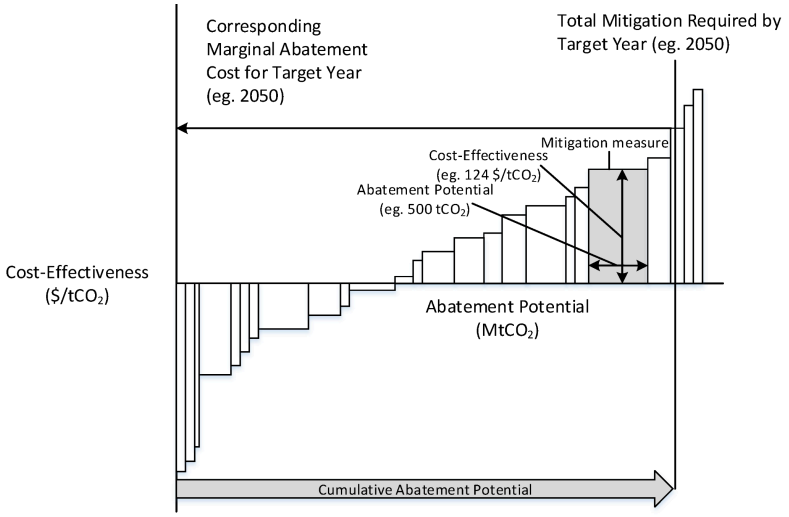


Figure 3.4: Example of an abatement curve (Ibrahim, Kennedy, 2024)

While the MAC-curve is a good way of structuring efforts, it does have some flaws. Firstly, the indicator focuses on marginal reductions of CO_2e emissions, and does not translate to the goals of achieving net zero emissions. Marginal improvement can be cost effective and have a good impact on emission levels in the short term, but it can also steer companies into choosing inefficient options and hinder them from making radical, but necessary changes in their businesses. Secondly,

carbon reducing initiatives can not be seen only as separate measures since they are dependent on each other. The reduction associated with the installation of a heat pump is dependent on the carbon intensity of the electricity. At the same time, the decarbonization of electricity is dependent on the demand and flexibility of usage, i. e the number of heat pumps. This presents a dilemma in what efforts to invest in since the cost of one option is connected to the implementation of the other (The World Bank, 2023a).

Since modern firms are including sustainability in their long term strategy, climate change policies cannot only be focused on marginal changes. Therefore, companies need to pursue ways to minimize the total cost of the transition to net zero, which accounts for different sectors and emerging technological development (The World Bank, 2023a).

3.4.2 Internal carbon pricing

Internal carbon pricing (ICP) is a method voluntarily used by firms to quantify the emissions caused by an investment into a financial measure. It can be used to influence decision making by steering investments toward low carbon alternatives as well as to mitigate risks affiliated with compliance to future regulations and direct carbon pricing systems imposed by governments, comparable to the European ETS (Institute for Climate Economics, 2016). Seeing that the public is holding companies increasingly accountable for slowing down climate change, ICP's are a way of proactively managing the firm's decarbonization and to highlight its position to investors, the general public and other stakeholders (Gorbach et al., 2022).

During 2022, out of the 8,402 companies reporting under the CDP, 15% had implemented an ICP and an additional 18% planned to do so in the near future (The World Bank, 2023b). Also, more than 50% of the world's largest 500 companies use some form of ICP method (Lehner et al., 2024). While there are many ways of implementing an ICP into an organization, the two most commonly used methods by large corporations are shadow prices and internal fees (The World Bank, 2023b), which will be explored further in this thesis.

3.4.2.1 Shadow prices

A shadow price, also referred to as a proxy price, refers to the action of assigning a fictitious, predefined price of the CO_2e generated by a certain investment. By doing so, firms have a way of assessing the sensitivity of the investment in regard to possible future external carbon prices. Due to the fact that shadow prices do not imply any actual transaction of monetary funds, the organization does not have to modify its day-to-day operations or count it as an additional cost of a business unit. By using shadow prices in a structured and continuous fashion the organization has a higher probability to invest in alternatives with lower carbon-intensity, leading to a reduction in overall carbon emissions and carbon associated risks. On the downside, since shadow prices are only accounted for in the investment process, it has no real effect on short term emissions (Gorbach et al., 2022).

According to The World Bank (2023b), the use of shadow prices is the most common practice, accounting for 68% of ICP's reported under the CDP. Contributing factors include the ease of implementation and its positive impact on the long term emission-intensity of a firm's investments (Gorbach et al., 2022). Shadow price levels range anywhere from less than €10 to over €130 per tonne CO_2e, and are often dependent on the regional legislation and external carbon prices in effect. According to multiple reports, the prices need to be in the range of at least €50 to €100, in real terms, by 2030 to be aligned with the Paris Agreement (The World Bank, 2023b).

3.4.2.2 Internal fees

In contrast to shadow prices, internal fees have a direct impact on both the current and future activities of the organization. Where shadow prices simply assign a fictitious price to the carbon emissions associated with an investment, internal fees require the investing business unit or department to pay this price to an internal fund inside of the organization. Due to the fact that internal fees impact the revenue of the different departments inside the company, it might be beneficial to use more than one price if departments have a large internal discrepancy in carbon-intensity. By doing so, the internal fees can be capped for entities that would have a hard time to carry the financial burden (Gorbach et al., 2022). Internal fees are often set at a lower

price level than shadow prices, ranging from €5 to €20 per tonne of CO_2e emitted (Carbon Credits, 2022).

The fund can be managed in different ways in either a centralized or a department specific manner. By using a centralized approach, the revenue collected can be used towards investing in company-wide emission reducing projects. The potential projects can be generated by an evaluation team, or by internal competitions where employees can submit ideas as to what the money should be spent on. Splitting the funds and giving them back to the different entities of the company gives them the opportunity to use their specific expertise to find the most effective investments. However, using such a repayment scheme might risk inviting departments to calculate their net carbon fee, i.e the difference between paid carbon fees and received funding from the internal carbon fee fund. This can contradict the purpose of the method in the first place. Hence, these have to be split up into two separate budget groups (Gorbach et al., 2022).

Advantages of implementing a system for internal fees include being able to hold departments accountable for their generated emissions, accessing a direct price signal for GHG emissions and driving cultural change inside of the organization (Institute for Climate Economics, 2016).

3.4.2.3 Implementation of ICP's

When implementing an ICP programme into the organization, it can be helpful to follow a predefined practise. One process, presented by the Institute for Climate Economics, is made up of the five steps (Institute for Climate Economics, 2016):

1. Getting started
2. Uniting people around the process
3. Defining the ICP programme
4. Implementation of the system
5. Evaluation of the ICP programme.

The approach, which is described below, has many similarities with other similar processes for the implementation of ICPs, such as those presented by Gorbach et al (2021) and CDP (2017).

1. Getting started

In order to effectively implement an ICP system, the expected value added of the tool needs to be evaluated. By calculating the current carbon footprint of the firm, identifying the main factors of emissions and determining what drivers of reduction already are in place or needs developing, goals can be set in line with a climate strategy. Doing this enables the organization to design a ICP programme also suited for their subsidiaries and helps these subsidiaries to adapt to the overall strategy. Important factors to consider in this step is the scope of application and what existing instruments have been implemented previously, to avoid any negative overlap caused by the new system (Institute for Climate Economics, 2016).

2. Uniting people around the project

Crucial for the success of the project is to incentivise people in the organization to get on board. Historically, commitment from senior management and the financial department have been key in the introduction of ICPs. One way of facilitating the implementation is by welding together a group, or steering committee, with actors from the departments most affected. Most times, such a group would include members of senior management, operational business units, environmental and financial functions and the communications division. Their job would initially be to identify risks and advantages of the ICP system, raising internal awareness and commitment. It would also include drawing up framework documents and proposals to enable decision making regarding the initiative. At a later stage, the role of the steering committee can be switched towards focusing on follow-up and assessment of the programme's effectiveness (Institute for Climate Economics, 2016).

3. Defining the ICP programme

The third step of the process aims to find the answer to the questions of which instrument to use and at what price. Getting the price level right is central to the effectiveness of the tool due to its ability to steer technology, R&D, financial decisions and investments. To find a

suitable price level, inspiration can be drawn from three areas: regulatory carbon pricing policies, existing internal carbon pricing initiatives and external pricing benchmarking. It is also worth considering if a single method and price should be defined, or if multiple methods and multiple prices are more beneficial. For example, a firm could use a combination of carbon fees for short term investments and projects, and shadow prices for long-term investments. Depending on the structure of the organization it may be valuable to implement different prices for the same tool, especially when there is a difference in the countries where the firm operates or between different departments' specific needs or processes. Additionally, KPIs should be introduced to facilitate future assessment of the programme. This could include the number of projects supported by the initiative, reductions in GHG due to the use of the tool or percentage of the companies emissions covered by ICPs (Institute for Climate Economics, 2016).

4. Implementation of the system

The implementation of an ICP system will often require changes in a number of internal documents that are used in day-to-day processes. The affected documents can either be identified by the steering committee, or, the responsibility can be put directly on the specific departments. Another important aspect of implementation is communication and training. For an ICP-initiative to be successful, it requires awareness throughout the organization as well as education for managers and teams that will be affected by the programme. By showcasing milestones early, with the support of senior management, it will enable the clear communication of goals and the strategic benefits of the ICP system (Institute for Climate Economics, 2016).

5. Evaluation of the ICP programme

The last stage of the process invites the firm to evaluate how, and if, the set goals were achieved. This assessment can lead to adjustments being made, in both price level and range of application, until a more satisfactory result is obtained. The effectiveness is decided by the quality of the KPIs defined in the third stage and the actual result of the implementation can best be measured over the long term (Institute for Climate Economics, 2016).

3.4.2.4 Barriers of implementation

There are certain barriers associated with implementing ICPs. These depend on aspects like the size of the firm, the decided price level, complications regarding the calculations of GHG emissions and the type of ICP method being used. While smaller firms will face difficulties with accessing the financial, technical and informational resources required, the complex organizational structure of larger corporations might pose bureaucratic issues when introducing such a tool.

Setting the right price for the ICP programme is a major challenge and highly impacts its potential influence. Prices similar to current external carbon prices fail to create a steering effect due to the price levels being too low. Additionally, the lack of climate data that is available poses a challenge when trying to calculate accurate emissions for the whole value chain of an investment (Gorbach et al., 2021).

Depending on the type of ICP, the firm faces different key challenges. A system of internal fees is expensive, time consuming to implement, calls for structural and administrative change and can be unfitting for some business units. While shadow prices are cheap to implement and require little to no change in the daily operations, fictitious prices can have a lesser impact and steering effect than intended (Lehner et al., 2024).

3.5 Change management

Change management is defined as the approach to dealing with organizational change such as transformation of an organization's internal processes, technologies or corporate culture (Lawton, Pratt, 2022). The landscape for businesses is constantly evolving and organizations must therefore meet a variety of challenges, for example, changes in technology, adaptation to new regulations or shifts in underlying economic trends (Miller, 2020). Therefore, the purpose of change management is to address these challenges by implementing strategies for effective change, controlling change and helping employees within the organization adapt to the change (Lawton, Pratt, 2022).

Approximately half of all organizational change initiatives are unsuccessful, underscoring the importance of an effective change management strategy (Miller, 2020). A successful change management strategy requires a deep understanding of the reasons behind the change and the specific areas that require modification. It is, among other things, essential to have a clear vision and to comprehend how the change impacts employees to ensure the transformation's success (PWC, n.d c). John P. Kotter, a former Harvard Business School professor, outlined eight critical success factors on how to manage change within an organization in the article *Leading Change: Why Transformation Efforts Fail* from 1995, which are still relevant today (Harvard Business Review, 2007). Therefore, the basis of change management theory will be grounded in Kotter's publication.

3.5.1 John P. Kotter's eight critical success factors

According to Kotter an organization's change initiative goes through a series of phases which usually can be very time consuming. The eight steps are the following (Kotter, 1995):

1. Establishing a sense of urgency
2. Forming a powerful guiding coalition
3. Creating a shared vision
4. Communicate the vision
5. Facilitate the new vision and remove obstacles
6. Plan for, and create short-term wins
7. Consolidate the improvements and produce more change
8. Institutionalize new approaches

Establishing a sense of urgency

Successful change initiatives often begin when some individuals within the organization recognize the status quo as unsustainable, grounded in for example the company's competitive situation, financial performance, market position or technological trends. To create urgency, the individuals who addressed the unsustainable status quo must help employees and top management recognize and understand

the need for change, for example through raising awareness of the various challenges or problems facing the organization. This step is essential since transformation programs usually require a lot of work, motivation and cooperation. According to Kotter, the urgency rate is high enough when 75% of a company's management is convinced that a change needs to be made (Kotter, 1995).

Forming a powerful guiding coalition

Typically, a transformation project begins with a small group of employees, gradually growing with more people as the change initiative grows. According to Kotter, it is essential to assemble a group with sufficient authority and competencies to lead the change effort effectively. Kotter also states that it is imperative to have support from the head of the organization if you are to be successful with the change effort, even if it is difficult to gain unanimous support from the whole senior management team. By having established a high sense of urgency it is easier to get support from the head of the organization and therefore create a guiding coalition (Kotter, 1995).

Create a shared vision

The next phase involves creating a vision to help direct the change effort. In this phase it is crucial that that guiding coalition creates a compelling vision of the future that is easy to communicate and resonates with stakeholders, whether they are customers, shareholders, or employees, depending on the type of change initiative. Initially, the vision should go beyond numbers and help clarify the direction in which the organization needs to go. Eventually, when the organization is ready, it is imperative to develop a realistic and strategic plan to achieve that vision (Kotter, 1995). The strategic plan can for example include elements such as strategic goals, KPIs, and the scope of the project (Miller, 2020).

Communicate the vision

When a clear vision has been developed it is important to try to use every possible forum to communicate the new vision in a credible way. Employees will not change their behavior unless they believe that the change initiative is useful. Therefore it is important the guiding coalition sets standards and tries to teach the new behavior required

for the transformation project to succeed. It is also very important that senior management and executives support the guiding coalition in this phase. This can be achieved by for example replacing the monotonous management meetings into exciting discussions regarding the transformation initiative and showing employees that top management acts according to the new vision in daily operations (Kotter, 1995).

Facilitate the new vision and remove obstacles

In order for the change initiative to be successful it is also important that the guiding coalition encourages a large number of employees to try new approaches and develop new ideas that aligns with the new vision. To facilitate this, it is important to get rid of obstacles that prevent the change effort such as job descriptions being too narrow, or managers that refuse to change and undermine most new initiatives (Kotter, 1995).

Plan for, and create short-term wins

Due to transformation projects' long timespan, there is a risk that the change initiative may lose momentum during the process. In order to mitigate this risk, it is important to visualize performance improvements of the change effort. According to Kotter, it is needed to show employees evidence of improvement within 12 to 24 months in order to keep the urgency level up. Without the commitment to produce short-term wins, employees risk losing motivation and give up on the change effort. Therefore it is important from a managerial perspective to establish clear goals, achieve the short-term objectives and recognize and reward the employees involved in the improvements through for example promotions or money (Kotter, 1995).

Consolidate the improvements and produce more change

It can be tempting to deem the change initiative as a success with the first clear performance improvement. However, this can be very dangerous for the transformation project since change takes time to sink into an organization and a premature victory celebration can lead to killing the momentum for future improvements. Therefore it is important that the leaders of the change initiative use the motivation and credibility created by the short-term wins to further improve on

systems, structures and policies that do not fit with the vision (Kotter, 1995).

Institutionalize new approaches

The eighth and final critical factor is about anchoring the changes in the company's culture. In this phase it becomes important to prevent a possible relapse into the prior status quo by clearly visualizing the connections between the change initiative and corporate success. In addition to showing how the new approaches have helped improve performance, it is also critical to ensure that the next generation of top management embodies the new approaches through leadership development. A poor succession decision can for example result in the transformation regression to the corporate state prior to the change (Kotter, 1995).

4 E.ON

This section provides an in-depth examination of E.ON, its organizational structure and its strategic positioning within the energy sector. E.ON's investment process is also briefly explained, highlighting the specific stages and decision gates. Additionally, E.ON's sustainability initiatives are described, emphasizing how the company integrates environmental considerations into its business strategies and operations.

4.1 Organizational structure and proposition

E.ON Sweden is part of the international energy group E.ON SE, with headquarters in Essen, Germany. Their business is made up of both energy infrastructure and innovative energy solutions and is split up into the three sub areas, Energy Networks (EN), Energy Infrastructure Solutions (EIS) and Energy Retail (ER). E.ON Sweden employs approximately 2100 people and delivers its services to more than a million customers made up of private homeowners and other companies (E.ON, 2024a). Within the business areas EIS and ER, E.ON Sweden sells energy in the form of electricity, district heating, cooling, gas and steam. They also offer solar energy solutions, charging infrastructure for electric vehicles, as well as storage and distribution of energy. These business areas also focus on innovation, sustainability and digitalization that enable customers to control their energy consumption and minimize their costs and climate emissions. Notably, EIS caters primarily to business clients, offering tailored solutions for their energy needs, while ER focuses on delivering personalized services to individual customers (E.ON, 2022).

E.ON Sweden's activities can be summarized into 6 main areas: energy efficiency, sustainable transport, renewable energy production, sales of electricity and gas, power grids and district heating (E.ON, 2024b). A

graphical representation of the business structure can be seen in figure 4.1 below.

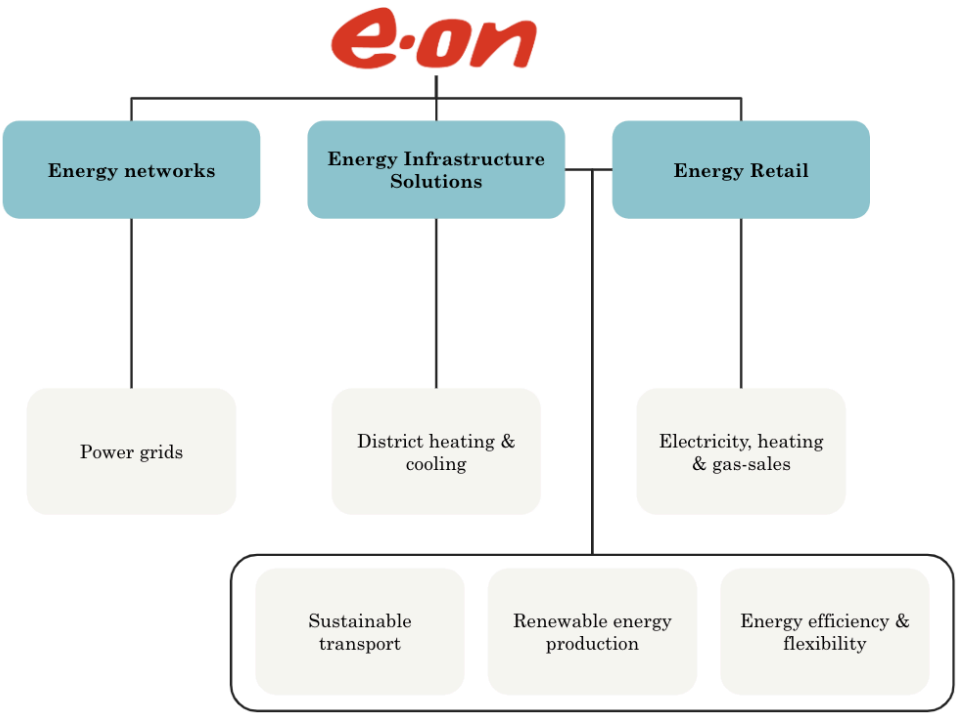


Figure 4.1: A representation of the structure of E.ON's major business areas

A large part of E.ON's development is made through investments in all of their business areas. As of right now, investments in district heating plays a significant role in EIS's growth as well as in the whole company's transition towards becoming climate neutral. This is due to the method being considered both energy efficient and produced with energy from mostly renewable and recovered sources. Although these attributes motivate the method, district heating still contributes to large emissions of CO2 as a consequence of burning waste. The main contributor to the emissions is the burning of plastics that have made their way into the residual waste which is used as fuel at the power plants (Naturvårdsverket, 2024). Due to these factors, E.ON believes that it is important to continue investing and put resources into developing their methods. Two types of projects central for district

heating are the construction of heating plants and the development of the heating distribution grid which involves excavating activities and installing new pipes to connect more customers to the heating grid (E.ON, 2024c). E.ON uses contractors to carry out the construction through the use of framework agreements. Besides investing in new projects, E.ON is also involved in a significant amount of reinvesting in already existing assets. Reinvesting activities include repairs, the exchanging of old boilers to more efficient alternatives and rerouting of existing distribution pipes, among others (Project Manager, E.ON, 2024). Moreover, by partnering with municipalities, customers and other parties E.ON plays a role in the development of a more sustainable society. By taking part in innovative energy initiatives, like the construction of a climate neutral office building in Hyllie, Malmö they contribute to speeding up the transition of society as a whole (E.ON, 2024d)

4.2 Investment process

The investment process within EIS and ER at E.ON, which is the focus of this thesis, is made up of three core elements: the strategic decision gate (Gate 1), the final investment decision (Gate 2) and the post completion audit (PCA). Gate 1 focuses on how the proposed investment fits into the strategic vision of the company, with emphasis on the nordic divisions strategy. Gate 2 assesses the investments financial viability and profitability. After the investment has been implemented or the project has been finalized, the PCA is carried out to identify lessons learned and help to improve the delivery of future projects (Internal E.ON documents, 2024).

Depending on the size of the investment, the decision mandate is assigned to different divisions. The larger the investment, the higher up in the organizational structure the mandate goes. The timeframe of investment decisions are also dependent on the size and type of project. Construction projects are generally larger investments and require a longer time horizon, up to ten years before being realized. District heating distribution projects on the other hand generally have a horizon of around six months.

4.2.1 Gate 1 - Strategic decision gate

Generally, all projects and investments go through Gate 1 before moving on to the subsequent stages of the process. To ensure that time, resources and monetary funds are not wasted on projects which are ill-aligned with company strategy, the decisions of Gate 1 are conducted as early as possible in the project time-line. Here, five deliverables are requires, which can be summarized into the list below:

1. A project description
2. A description of how the investment aligns with company strategy
3. A business case for the whole project with underlying assumptions
4. The proposed budget for costs and resources required until Gate 2
5. The timeline including planned activities, checkpoints and updates until Gate 2

The aspects which are assessed in Gate 1 are based on EONs three strategic pillars, Growth, Sustainability and Digitalization. Each of the strategic areas are broken down into more specific criteria, which are then evaluated in order to assess the projects fit to the strategy. The strategic areas and criteria can be seen in figure 4.2 below.

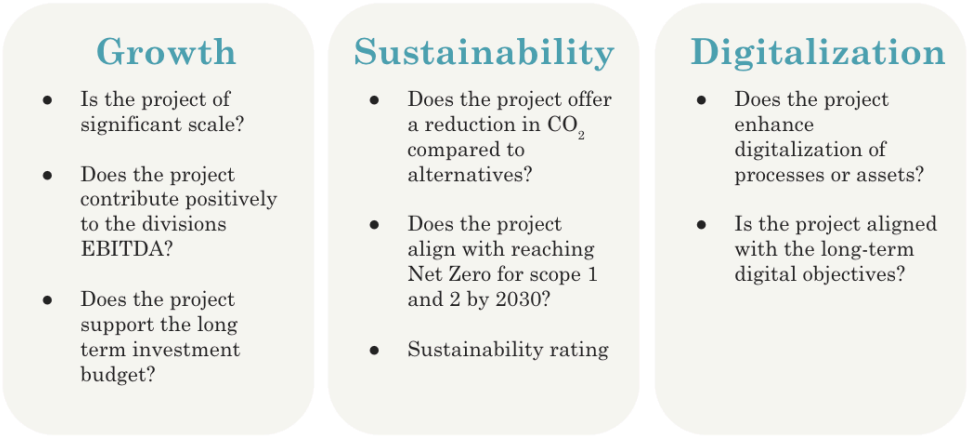


Figure 4.2: The three strategic pillars of E.ON

4.2.2 Gate 2 - Final decision gate

Gate 2 focuses on making sure that the investment is financially profitable as well as that the project can be carried out as planned. As in Gate 1, a request with deliverables is to be submitted for assessment. The following should be included in a request:

1. A project description with the legal setup of the project
2. How the project is aligned with company strategy (i.e the same as in Gate 1)
3. A thorough plan for the entire project, including profitability analysis and a statement of how the investment is budgeted for
4. The total budget for the project including contingencies and a break down into separate activities
5. The timeline including planned activities, checkpoints and updates until finalization
6. A risk-and-opportunity assessment as well as a sensitivity analysis
7. A description of the project organization and responsibilities

The financial evaluation consists of different methods of assessment. Analyzed parameters are the net present value (NPV) of the investment, the internal rate of return (IRR) and the payback time. For the project to be financially viable, the IRR must be above the pre-defined hurdle rate and the NPV must be positive. When an investment is cleared in Gate 2, the project can be started as planned, all binding contracts can be signed and purchase orders can be created. It is also required to report the expected financial return and expenditures of the project quarterly.

4.2.3 Post Completion Audit

After a project has been finalized, a mandatory PCA is to be conducted with the objective to analyze whether the investment met the projections of Gate 2. The analysis is based on discounted cash flows, with Gate 2 as the baseline. If any discrepancies occur, they are categorized as exogenous and endogenous factors, to help identify potential flaws and improvements. The PCA also includes a discussion

of lessons learned, and a reflection over estimated risks, in order to improve future projects.

4.3 Sustainability work

During 2017, E.ON adopted the climate goal *Helt Hundra 2025,* which specified that the organization will only sell renewable or recycled energy, and reduce their greenhouse GHG-emissions by 50% by 2025. Since 2017, E.ON has successfully reduced their climate emissions from *Sold Energy* by 39 % (E.ON, 2022). To accelerate the reduction of carbon emissions, the goal *Helt Hunda 2025* was, in 2021, replaced with the goal of achieving net zero emissions in their whole value chain by 2035 (E.ON, 2022).

E.ON began working towards the net zero goal in 2021 which meant broadening the extent of the emissions they are trying to eliminate. For example, the net zero goal also includes emissions from recycled energy and the emissions generated by the organization in the whole value chain (E.ON, 2022). The climate impact, and respective scope emissions of E.ON from 2017 to 2022 can be seen in figure 4.3.

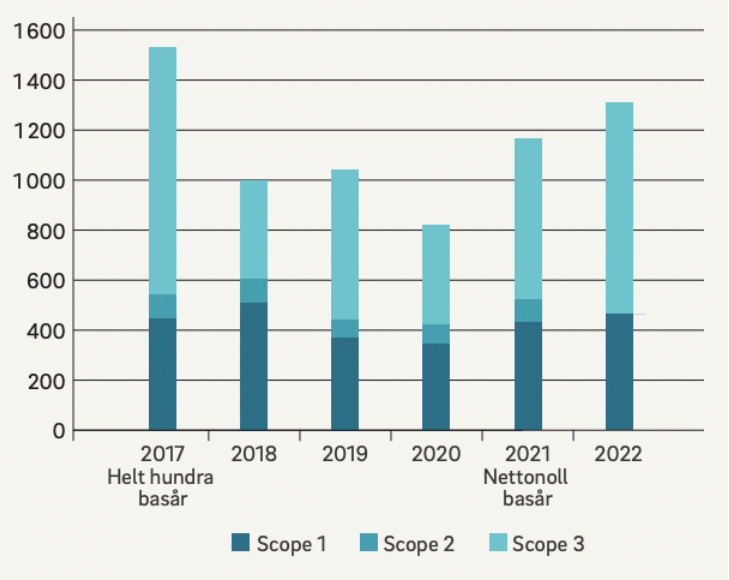


Figure 4.3. E.ON Sweden's climate impact 2017-2022 (k tonne CO_2e) (E.ON 2022).

During the period from 2021 to 2022, carbon emissions increased by 12%. This growth is due to the large investments in the energy grid as well as the rise in climate calculations linked to emissions, which now includes more categories than before as a result of the net zero goal. As depicted in figure 4.3, scope 1 and scope 3 emissions account for the majority of E.ON's emissions. For scope 1, energy and heat production plants account for the majority of emissions (E.ON, 2022). In scope 3, the categories that particularly affect the total emissions are upstream emissions from fuel and energy, and emissions from purchased products, services and capital goods (E.ON, 2022). Between 2021 and 2022, E.ON transitioned to using 100% renewable energy for the generation of electricity, steam, heating & cooling, for own use, effectively eliminating scope 2 emissions (E.ON, 2022), see figure 4.4.

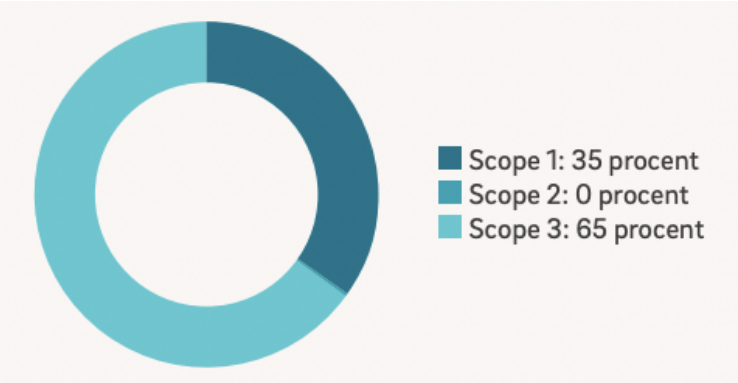


Figure 4.4. Distribution of E.ON Sweden's carbon emissions 2022 per scope (E.ON, 2022).

During 2022, E.ON's climate impact was 1313 ktonne CO_2e and the organization spent a lot of time gathering and mapping out emissions in order to ensure traceability in their value chain (E.ON, 2022). Going forward, E.ON is dedicated to continuing the collaborations with their suppliers in order to achieve a fossil-free value chain. Specifically, this implies that the emissions associated with investments in the combined heat and power, and district heating network needs to be mapped out (E.ON, 2022). As a result of E.ON's ambitious climate goals, they have hired more employees to work with sustainability issues over the years,

aiming to accelerate the pace of the necessary work in order to meet the net zero goal (E.ON, 2022).

When E.ON has been in discussions with their suppliers, in order to achieve a fossil-free value chain, they have realized that there is a high demand for information regarding E.ON's upstream emissions (Sustainability Controller, E.ON, 2024). This is due to the fact that downstream suppliers are experiencing significant pressure to provide climate-related information due to recent regulations such as CSRD and potential future regulation such as the Green Claims Directive (Sustainability Controller, E.ON). Therefore, the new employees who were hired to work with sustainability issues play a crucial support function to drive sustainability efforts and ensure that sustainability is a key aspect in all parts of the organization (E.ON, 2022).

4.3.1 SCRIM assessment

Considering the wide variation in E.ON's operations, a tool for assessing and comparing the different investment opportunities surfacing is in use. The tool is called SCRIM and is used to evaluate an investment from the five perspectives: standard and sustainable, credit, risk, internal rate of return, and MTP (E.ON, 2024e). Since the scope of this thesis is limited to climate assessment methods, only the standard and sustainable aspects of the SCRIM tool will be further described.

4.3.1.1 Standard and Sustainable

To assess the sustainable impact of the project, investment or product, a set of standard criteria have been developed. These criteria build heavily on the EU-taxonomy and are used to give the investment a rating of zero to three stars depending on how well it is aligned with the taxonomy, see figure 4.5.

Stars	Category	Taxonomy aligned
★★★	Fully sustainable solution	Yes (100%)
★★☆	Hybrid solution	Partially
★☆☆	Natural Gas solution	No
	Back up	
☆☆☆	Fossil solution	No

Figure 4.5: Adaptation of the three star rating system

Investments with a score lower than 2 stars need to prove a dynamic payback in the timeframe of the long term strategic goals or fulfill one of a number of other criteria. To have an effect on the economic performance of investments, the score has an impact on the hurdle rate used in the financial projections used to calculate profitability of the project. By doing so, E.ON hopes to steer investments toward more sustainable alternatives and favor those in line with their Net Zero by 2035 goals (E.ON, 2024e).

5 Results

This section presents the findings of the study, obtained from the comprehensive analysis of the data collected. Key insights gained from the internal and external interviews are summarized, highlighting the common themes and differences in perspectives regarding the integration of climate assessment tools in investment decision-making processes. Two new carbon assessment methods are also introduced based on these results. Thereafter, the results from the workshop are summarized, which provides valuable feedback on the proposed methods.

5.1 Findings from interviews

5.1.1 Findings from the internal interviews

Interviews were conducted with relevant employees from various divisions including sustainable procurement, project management, procurement, sustainability, and finance. The objective was to gather insights on ongoing sustainability initiatives, identify obstacles with the potential implementation of a climate assessment tool, and understand the diverse perspectives within different business areas regarding climate improvement initiatives. The interview guides for the different divisions can be found in appendix A. Through these interviews, five distinctive themes emerged regarding the potential implementation of a climate assessment tool. These were: barriers, important aspects, implementation strategies, current methodologies and facilitators.

5.1.1.1 Current methodologies

For some divisions, E.ON has started to collect sustainability data on a larger scale, mapping out and visualizing emissions. In order to do this,

they use an Excel-based calculation tool that incorporates both actual emissions obtained from suppliers and contractors, as well as estimated emissions based on standard parameters. Additionally, they use abatement cost analysis to identify what projects yield the highest emissions mitigation per unit of spend.

While these calculations are partly assumption-based and inherently uncertain, they provide valuable insights. Last year, the finance department estimated the cost of emissions reduction for EN through investment in compensation projects to get an understanding and the magnitude of their ambitious objectives. Furthermore, the sustainable procurement division has begun integrating sustainability considerations into their framework agreements, particularly focusing on reducing emissions within projects. This is due to the fact that the majority of E.ON's emissions come from scope 3, underscoring the need to focus on suppliers and product choices to mitigate these emissions. By collaborating closely with suppliers through contractual requirements to find green alternatives and solutions, they motivate their value chain to take a larger responsibility.

During the interview with sustainable procurement and the finance department, they were both in agreement that the next step involves utilizing the collected emission data to compare alternative solutions and translating emissions into monetary values, either by comparing to the cost of compensation projects or mechanisms like the European ETS. This will open up the discussion at E.ON further, motivating the exploration of alternatives to how they work with suppliers, project design, and contractor requirements. In addition, the sustainable procurement and finance department believes that this will make everyone in the organization conscious of sustainability and understand emissions associated with specific projects.

5.1.1.2 Important Aspects

During the interviews, important aspects regarding potential tools were explored. It was stated, specifically by the finance department, that in order to make a fair comparison between different projects or alternatives within the organization, the translation of CO_2 into financial terms could be helpful. Another noteworthy aspect raised by the finance, as well as the sustainability division, was the follow-up

process. If a climate assessment tool would be implemented, it was said that it would be important to use predetermined climate KPI's to ensure that the desired effect was achieved. Furthermore, it was also stated that it would be important to analyze the long-term effects of the tool to ensure that the invested capital aligns with E.ON's net zero goal.

An important aspect that was raised by the majority of the divisions was that a potential tool should be easily communicated, both in regards to how to use it and the positive effects it brings. Finally, the interviewees expressed the need for a tool which eases comparability between different alternatives, and shows what investments will have the greatest positive climate impact, so the organization can optimize its resources to mitigate emissions as efficiently as possible.

5.1.1.3 Implementation

When different aspects of implementation were discussed all of the interviewees agreed that a climate assessment tool should be integrated early in the investment process. An early estimate of an investment's climate impact, can for example be used to guide the decision in gate 1. Furthermore, an early climate impact assessment can be beneficial since it also can be used to compare to the actual outcome when evaluating the investment's climate impact at the end of the initiative or project.

The interviewed employees indicated that it would be useful to start with a climate assessment tool in pilot projects to test and gather knowledge within the organization. The sustainable procurement and procurement division suggested that it would be advantageous to start where there is a recurring need, for example in distribution projects for district heating, where there is better access to data from contractors and suppliers. By starting here, E.ON could work together and influence their suppliers to drive positive change. Therefore, all interviewees agreed that it is crucial to involve the procurement division, since they have direct contact with suppliers and contractors. Even if the finance department suggested focusing on integrating a climate assessment tool in larger projects, some interviewees from the procurement and sustainability division emphasized that small decisions and projects can not be ignored since these are the most

common and help build knowledge and awareness inside the organization.

The complexity of potential climate assessment tools was also discussed. The general perception was that simpler is better, and that even the smallest of changes can give positive effects. By starting with simpler tools, the methodology can be effectively integrated into the process. This sets a foundation that can be built upon by implementing more complex methods, in line with the organization's ambitions. It was also suggested by the finance and sustainability division that the assessment tool should be used to guide decisions to gradually shift towards alternatives with less climate impact, instead of a strict binary decision. This was motivated through the underlying knowledge barrier regarding climate data that exists in the organization. The sustainability and project management division meant that employees first need to understand and get used to handling climate data before informed decisions can be made regarding a certain alternative or investment.

When discussing the format of the tool, some interviewees from the procurement division suggested a business plan that calculated both the climate impact and the profitability of different alternatives. This could for example be achieved by including internal lists that combined CO_2 emissions with real prices or internal prices of carbon. Another idea, presented by the procurement and project management division, was to use standard climate parameters that could easily be linked to different actions or different types of projects in order to facilitate comparison based on their climate impact.

5.1.1.4 Facilitators

A key facilitator in moving towards a more climate neutral organization were the goals that were set for EN in 2023 regarding pilot projects. During the interview with the sustainable procurement division they stated that the goal was to execute six pilot projects linked to sustainability, and this could for example involve substituting fossil fuels with biofuels in a project. Currently, they are exploring how to construct a sustainable substation, integrating sustainability into all aspects of the station design. While it was said that not all of these pilots will be taken further directly, they are seen as valuable exercises

and build a foundation that will be built upon in future projects. In addition to the pilot goals, in 2024, an emission limit for EN was introduced, which meant that the sustainable procurement division has started to integrate sustainability requirements into all framework agreements. While the level of requirements may vary, the overall consensus among the interviewees was that this raises the bar regarding the company's climate ambitions.

As a result of these climate improving efforts, the sustainability division has received greater mandate and resources. For example, there have been decisions to hire more personnel, recognizing the need for data management related to climate data due to the increased volumes and regulations like CSRD. Besides this, E.ON has succeeded in engaging parts of the organization thanks to directives from top management. These efforts aim to reduce emissions and increase awareness and commitment, resulting in employees becoming more accustomed to working with climate data.

5.1.1.5 Barriers

An aspect that was raised and emphasized by the majority of the interviewed divisions were the barriers regarding implementation of a climate assessment tool, and the challenges associated with integrating sustainability into daily operations. As highlighted by the project management, procurement and finance department, during smaller projects, there is not sufficient time and resources to conduct an in-depth climate assessment of the specific investment in question. The sustainable procurement division stated that there therefore needs to be clear directives that enable employees to work with climate improving measures during projects. The sustainable procurement division also underscored that such directives empower functions further out in the organization, giving them more ownership and authority to push through their own ideas. While projects already have financial directives in the form of a budget, it was made clear by the sustainability department that it is also necessary to explain and motivate why a more costly and sustainable alternative should be chosen. On the same theme, questions such as who will bear the cost for increased project budgets and which compromises need to be made arose from all interviewed divisions.

Another identified obstacle is the knowledge gap regarding climate data in the organization. All divisions stated that understanding climate data and its implications is difficult, which makes it important to translate this to an understandable metric, for example financial terms as suggested by the finance and project management division. Consequently, the sustainability and procurement division underscored that educating and informing employees on how to interpret climate data is vital for the success of a climate assessment tool. However, project managers often lack the necessary tools to determine a specific decision's effect on the environment besides what is stated in the contract. In addition, the project management and procurement division said that the available data for a valid climate assessment is often insufficient, and can be difficult or time consuming to obtain. Although, all divisions were in agreement that it is better to start somewhere, even if there are uncertainties and limitations with the available data.

A notable barrier that was addressed by the sustainable procurement and procurement division was the traceability of upstream activities. Ensuring the accuracy of information several steps up the supply chain and verifying the benefits of new solutions pose significant challenges. Additionally, the lack of green alternatives on the market to achieve E.ON's net-zero goals is challenging according to the procurement division. Suppliers are at varying stages of sustainability maturity, with some being more advanced than others. During the interviews with the procurement division it was emphasized that customer's, such as E.ON, demands and investments are crucial in driving suppliers towards sustainability goals.

The final barrier that surfaced from interviews was the difficulties associated with change within the organization, such as requiring time and resources to drive through. To demonstrate the benefits of new methods, pilot projects or improved profitability can be used, as suggested by the sustainable procurement division. The majority of interviewees pointed out that it becomes important to demonstrate the benefits by first working with small changes and then translating the company's goals into concrete measures. However, it was also said that follow up and evaluation of the implemented changes would be necessary to ensure their benefits.

5.1.1.6 Summary of findings of internal interviews

Figure 5.1: Summary of findings from internal interviews

5.1.2 Findings from external interviews

The external interviews were conducted with three other Swedish energy companies. Like E.ON, these companies face challenges such as needing to contribute to the green energy transition, pressure from stakeholders both up- and down-stream, and the constant struggle of staying prepared for future directives and regulation. Company 1 was an especially interesting case due to them supervising a similar masters thesis in 2022. Therefore, hearing how they had evolved since then was of high relevance to this report. Unfortunately, Company 3 had not come too far in integrating sustainability into investment decisions, and was therefore deemed irrelevant for the results of this thesis. The findings from the discussions with Company 1 and Company 2 could be categorized into three main groups: Current methods of sustainability work, positive effects and motives and barriers.

5.1.2.1 Current methods of climate assessment

From the interviews with company 1, it was found that since 2022, they have designed and implemented a dummy-framework for assessing the climate impact of projects and investments. It is built on a number of comprehensive parameters that are not project specific, which means it can be applied to a wide range of investments and projects. The parameters, for example energy savings, are then translated into CO_2e with the use of estimated standard values. This value is then included in the material that is reviewed before deciding on what projects and investments the company should carry through. Besides using a dummy climate assessment tool, Company 1 has also been discussing the possibility of integrating an internal carbon price into their business. Such a method would grant them comparability and transparency by putting cost in relation to emissions. Although it sounds great, the implementation of an ICP would require them to have all calculations and data available for use, which is not the reality of today.

Company 2 also performs a sustainability assessment to guide decision making. To do so, the assessment is integrated into a framework consisting of three key areas. Firstly, projects must demonstrate market growth potential before proceeding to investment approval.

Secondly, competitiveness in the market is evaluated with an emphasis on finding unique selling points. Sustainability is the final criteria and measures are made to avoid any activities leading to Scope 1 emissions. On a yearly basis, Company 2 evaluates all of its current projects and investments, categorizing them into distinct buckets to determine if they will be granted more funding. If there are any doubts about one of the three key areas, the investment has to go through a more thorough, quantitative, assessment in order to clear out any uncertainties. Oftentimes, these uncertainties regard the CO_2 intensity of the investment, which is the preferred metric of climate impact.

Recently, Company 2 launched an initiative to explore internal carbon pricing as a method of translating CO_2 emissions into financial terms. The method in the pilot is shadow pricing and the project is still in its early phase. According to the interviewee, the complications of data governance and setting the right price must first be overcome in order for it to succeed.

Central to Company 2's sustainability strategy is the establishment of value chains for what they perceive as future-oriented products, or products that will help them achieve their net zero emissions targets. The goal of this strategy is to ensure access to essential resources such as low carbon steel, cement, and aviation fuel while fostering demand for these sustainable materials. Doing so helps with sharing costs, risks and revenues with the entire value chain. The interviewee emphasized the mutual benefit for suppliers in helping in the inevitable transition to sustainable practices.

When talking to company 2, it was evident that the key to this strategy is the imposition of requirements on suppliers, including fundamental sustainability standards such as a code of conduct. Furthermore, a points-based system that favors suppliers offering sustainable alternatives is in use. Additionally, Company 2 emphasizes maximizing the impact per investment unit, which they try to do by comparing abatement costs of various alternatives and projects. Through these multifaceted approaches, Company 2 aims to align its investments and operations with their sustainability goals while also ensuring value creation.

5.1.2.2 Positive effects and motives

According to Company 1, the implementation of a system to track CO2 emissions has yielded significant benefits. The recent thesis project played an important part in this regard, contributing to a heightened sustainability focus within the organization. This shift in perspective has resulted in the hiring of a dedicated sustainability specialist, marking a step towards integrating environmental considerations into the operations.

Moreover, the project has led to a notable increase in environmental awareness among staff. Currently, there is a limited understanding of the complexity of climate impact within the company. However, the introduction of the CO2 tracking system has compelled individuals to engage with these issues more regularly. For example, it has become evident to employees at Company 1 that one does not need to be an expert to grasp the basics of evaluating environmental impact, as simple calculations involving costs and emissions can provide valuable insights. These incremental steps have proven to be effective in speeding on improvements that have been in the pipeline. By starting with small-scale initiatives, Company 1 hopes to accelerate progress and address sustainability challenges that have long been on the agenda. Pilot projects help in this regard, by acting as valuable testing grounds which allow them to explore innovative solutions and gather helpful knowledge.

When discussing the same topic with Company 2 it was clear that the sustainability efforts hold significant implications for project teams. It grants benefits such as transparently revealing emissions data to as many stakeholders as possible, which impacts decision makers both directly and indirectly. Moreover, their approaches ensure that suppliers begin to prioritize sustainability efforts in response to Company 2 demands for green alternatives and sustainable practices. By integrating sustainability criteria into the procurement processes, they not only drive positive change within the supply chain but also reinforce the company's own commitment to environmental responsibility.

If Company 2 chooses to integrate internal prices for carbon, it makes climate impact even more concrete by being able to directly translate

the emissions into costs. However, reliance solely on shadow pricing also carries risks, particularly if the pricing is inaccurate. Despite this, one notable advantage is the ability to concentrate exclusively on CO_2 emissions, which is the most urgent matter today.

5.1.2.3 Barriers

One of the primary challenges encountered at Company 1 was the difficulty in making sustainability concepts understandable to all stakeholders. The general workforce often lacks the same level of knowledge as those directly involved in sustainability initiatives. To overcome this, a simplified and user-friendly approach was employed, utilizing the dummy-framework designed to be easily used and understood.

Another hurdle Company 1 faced was the dissonance between the organizational goals and the methods employed to achieve them. To bridge this gap, establishing KPIs was seen as essential in tracking progress and fostering legitimacy for the sustainability efforts. It also became evident from talking with Company 1 that commitment from top management was crucial for engaging the organization and aligning the different functions of the company to work together towards the same goal. Clear directives also grants a feeling of ownership to the departments of the organization and facilitates the integration of sustainable practices into the daily operations.

Lastly, Company 1 recognized the importance of having robust data and calculation methods in place before being able to be effective in a climate assessment. Due to the complexity of the value chain, with energy companies often being far downstream, it can be a challenge to collect the necessary data. Consequently, data governance is a vastly time consuming activity if done to best practice. The interviewee explained that maybe they made the mistake of being too meticulous and detail oriented when designing the standard parameters in the dummy model. Investing significant time and effort in something that has relatively small benefits for the end result.

Company 2 too, addressed the issue of accessing reliable data and ensuring its quality as critical factors. Questions such as whether suppliers utilized consistent calculation methods or whether the data

provided could be verified for accuracy was addressed. As indirect purchasers of materials, Company 2 often wields less influence in setting sustainability standards. Thus, ensuring the credibility of their partners' sustainability efforts is crucial to their success. Accordingly, Company 2 implemented a comprehensive screening process for partners to guarantee their commitment to sustainability and to prevent any exploitation of Company 2's reputation and brand.

Management of the gathered data poses additional challenges, as it demands significant resources and expertise. This is a capability that does not fully exist in the organization, and must be acquired. Another important factor is the difference in structure of the procurement department and the company as a whole. For example, transitioning from focusing solely on procurement costs to considering total cost of ownership was identified as a necessary shift in procedure.

5.1.2.4 Summary of findings from external interviews

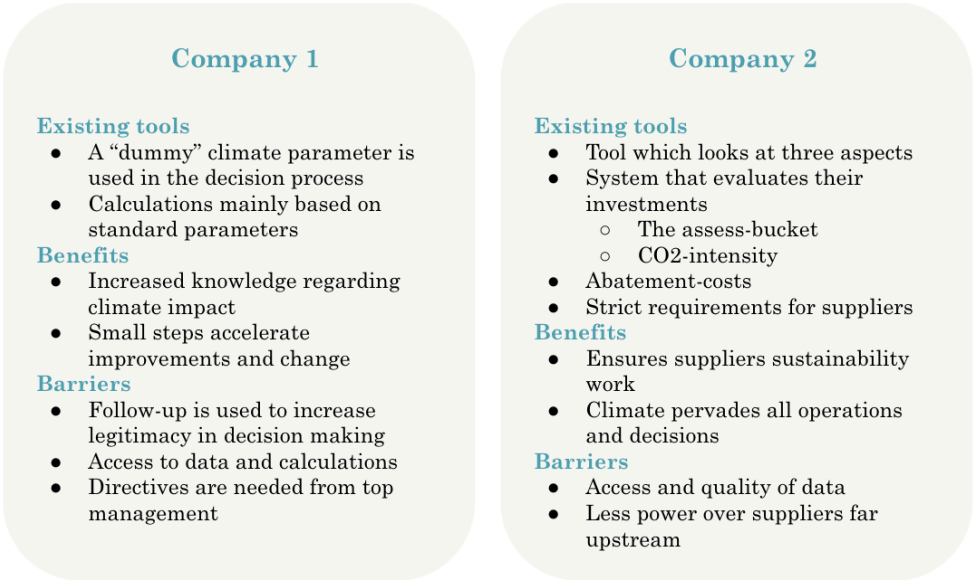


Figure 5.2: Summary of findings form external interviews

5.2 Additional carbon assessment tools

Based on the interviews, five potential tools of carbon assessment could be determined as suitable for implementation at E.ON. Among these methods, three were taken directly from the literature presented in chapter 3. These methods are the following, and will not be described further in this chapter:

- Internal Carbon Price, Shadow Price
- Internal Carbon Price, Carbon Fee
- Carbon Emissions Ratio

During the interviews, needs that could not be fulfilled with methods from the reviewed literature were expressed. Based on these needs, two additional methods for assessing carbon impact have been identified and concepts for how they could be designed have been created. The two methods are the Carbon emissions ratio scale and a qualitative checklist, which are described below.

5.2.1 Carbon emissions ratio scale

From the internal interviews, simplicity, comparability and visualization were pointed out as key aspects of an assessment tool. Also, the need for quantitative methods was expressed as high due to the desire to be able to compare emissions and climate impact on a portfolio level. Therefore, a carbon emissions ratio scale was designed as an adaptation of both the three star rating system currently in place in the SCRIM assessment at E.ON and the visualization of carbon data presented by Zhao (Zhao et al. 2012).

The method builds on calculating the carbon emissions ratio and categorizing it as red, yellow or green, depending on the climate impact. This can be beneficial as it puts the carbon emissions ratio in relation to a predefined scale which is determined internally at E.ON. While projects marked as green can be considered as “no brainers”, projects marked as yellow or red would need more thorough evaluation. Also, it gives E.ON a way of highlighting the climate impact of an investment

or project that is easily comprehensible and communicated. Moreover, interviewees expressed the desire for a method that nudges decision makers in the direction of investments with a lower climate impact rather than acting as a binary decision making tool. The carbon emissions scale can act as such a tool, guiding decisions on both project and portfolio level. By still carrying through red and yellow investments, the portfolio as a whole can be evaluated with the goal to drive the overall mix towards having a lower climate impact. By also assessing at portfolio level, it facilitates comparability and allows for follow up on a periodic basis.

Besides the direct effects of using a scale, the interviewees suggested that there can be indirect benefits as well. By ranking projects and investments in relation to each other, employees might feel a sense of competition, not wanting to accept that their projects are worse than others. Motivating them to work with emissions mitigating measures, and to bring down the number of yellow and red projects throughout the company.

However, implementing a carbon emissions ratio scale comes with challenges. Setting the levels of the scale right can be difficult and time consuming, but is crucial for success. Also, since the method is not meant to give decisionmakers a binary "go or no-go", it is not guaranteed to have as high of an impact as intended. Furthermore, since the tool builds directly on the carbon emissions ratio, the necessary data and calculations have to be in place for it to be effective. This means that data has to be gathered from suppliers, standard parameters have to be developed and a calculation tool, such as an excel model, has to be designed to ease usage.

5.2.2 Checklist

Another remark made by many of the interviewees was that even if quantitative methods are preferred to assess the climate impact of investments, they might not be suitable to implement on a project level. The lack of resources allocated to doing such an assessment and the lack of data and technical expertise in project teams, gives some the perception that it would not be feasible to do a more comprehensive climate impact assessment. Also, the three star rating, as part of the

SCRIM assessment currently in use, is not having enough steering impact on decision making due to not being challenging enough. This is mainly due to the assessment not being sufficiently detailed from a sustainability perspective. Therefore, a tool less resource- and calculations-heavy than the quantitative tools presented in this report, but more exhaustive than the current SCRIM assessment could potentially fill the gap. A qualitative tool in the form of a checklist has, together with the workshop attendees, been identified to be an alternative. By increasing the level of detail of the assessment to be more project specific than just considering EU-taxonomy compliance, a checklist can hopefully have a greater impact than the current method. For example, it can include questions about supplier's sustainability performance, if green alternatives have been explored or chosen, and what types of fuels have been used during the project.

A checklist would consist of a number of different questions or statements that the person filling it in would have to answer in order to assess the climate impact of climate improving actions made in the project. A point could thereafter be awarded from a positive answer on a question regarding climate improving measures. Preferably either the project manager or the projecteur would be the one responsible for answering the list with the help of the rest of the parties involved in the project, such as procurement. When the list has been filled in, a score can be calculated from summarizing the points received by the project by either using weights to emphasize certain questions more than others or by simply counting all the questions as one. To further keep down the complexity and increase the ease of use, a checklist can be tailored to different types of projects or departments of E.ON. If desirable, more aspects can be added to the list and irrelevant aspects can be removed, keeping the list up to date and as effective as possible.

To give such a checklist an economically steering effect, it can be linked to the hurdle rate used in investment appraisal and budgeting similarly as the three star rating currently is. Besides having an impact on the estimated profitability of the project, the main benefits of integrating a qualitative checklist are to build awareness, knowledge and to change the way E.ON works with emissions mitigation at project level. The process of filling in the list would force the different parties involved in a project to reflect over what measures are currently being made, and what measures can be made to decrease the emissions of the project.

Also, a list would highlight potential improvement areas, enable follow up and track progression.

A challenge associated with implementing a list into the working processes at E.ON is to balance the criteria to be as effective as possible. The criteria should be comprehensive enough to have the desired impact but simple enough to be easily filled out so the risk of the user getting stuck is held low. There is also the choice about what investments to include in the assessment. Starting with investments over a certain budget threshold could optimize the time and resources allocated. However, if the goal is to spread the method quickly in the organization, it can be wise to also include smaller investments, since these make up the majority. Lastly, since a checklist like this is meant to be qualitative, there is a risk of subjectivity based on who completes it. To mitigate this, there should be adequate documentation available to guide the user in the process of filling in the list. These have to answer frequent questions that might arise, give examples of what an answer could include, and show the user where additional information can be found.

5.3 Findings from workshop

After all of the internal interviews and those with similar energy companies had been conducted, a workshop was conducted with some of the stakeholders impacted by a potential assessment tool. The findings from the discussion part of the workshop have been categorized into the three main themes and will be presented below. The themes identified are: input on methods, important aspects of assessment tools and aspects of implementation. See appendix C for the material presented at the workshop.

5.2.1 Input on methods

In the discussions about potential climate assessment methodologies to be integrated into the investment process, the participants expressed a preference for carbon intensity as well as the alternative of using a carbon intensity scale in the form of a traffic light. Additionally, a qualitative tool such as a checklist built on similar logic as the already

used three star rating tool included in the SCRIM assessment was favored for its simplicity. Moreover, the participants were positive towards implementing a ranking system, e.g. a traffic light, for categorization of investments based on their climate impact. Such a system can assist in prioritizing investments for maximum impact and in evaluating the portfolio as a whole. By combining this with a quantitative metric, such as carbon intensity, it could create a sufficient basis for guiding decision-making towards more sustainable investment choices.

To use a quantitative tool, the problem regarding the availability and quality of data was brought up. A potential solution that was presented was the use of standard climate parameters, which could be established for the largest drivers of emissions in different types of projects. Important to note was the concern about the resource-intensive nature of creating these parameters and the issue of who would be responsible for doing so. Despite the concerns, the participants highlighted the value of initiating assessments with estimated values in order to kickstart the process, even if not yet perfect.

Similar concerns were expressed when evaluating the potential of more advanced climate assessment methods such as ICP's. Despite the benefits of using ICP's, the consensus was that the organization may not be ready to manage the complexities associated with these methods. Instead, a more gradual approach, with the focus on establishing simple yet effective practices that are easily expandable, was preferred.

5.2.2 Important aspects of assessment tools

When shifting focus to what aspects that were prioritized in an assessment tool user-friendliness, simplicity, and quantifiability was highlighted as the most important features. These qualities were picked due to their ability to facilitate implementation, ease the diffusion inside of the organization and enable clear decision-making. Central to the climate assessment methods is the notion that they should serve as guides rather than impose strict binary decisions. Instead of dictating choices, these assessments should nudge decision-making processes in the direction of sustainability, allowing for flexibility and adaptation to different contexts.

Quantifiability was seen as crucial for the success of the assessment tools due to the importance of numerical data in decision making as well as for follow up. Participants emphasized that quantitative approaches provide clarity, enable precise comparisons, and offer transparency regarding the financial implications of investments. In other words, by quantifying the emissions of an investment, stakeholders will know what the money that is spent on climate improvement measures actually result in. Also, by collecting emissions data in a structured way, it lays the foundation for more advanced methods to be implemented further down the line.

On the contrary, qualitative methods were prized for their ability to ensure a more holistic and comprehensive approach to the climate assessment. Participants recognized that qualitative approaches could lead to softer and more indirect change as well as have a greater impact on the practices used in day to day work. For example, if a project manager starts going through a checklist with questions regarding the climate impact of a project, it makes them aware of the issues at hand and how to impact them. Therefore the assessment engages employees to actively start trying to mitigate emissions. A representative from EN described how this has been a target of theirs and how smart project design, procurement and mitigation in the execution of a project can have large benefits.

The consensus among participants leaned towards advocating for a balanced integration of both quantitative and qualitative methodologies to achieve the desired outcome. For instance, they proposed the potential of creating and utilizing a qualitative checklist at the project level for its seeming ease of use and awareness raising, complemented by carbon intensity analysis at the portfolio level to enable comparison and follow up. Both methods could also have an integrated ranking system such as a traffic light based on the resulting values from the assessments, to further influence decision makers.

5.2.3 Aspects of implementation

An important takeaway from discussing how to succeed with implementation of new climate assessment tools was the need to align

the methods with the overall strategic goals of E.ON. The goal of having net zero emissions by 2035 is well known throughout the company and it is necessary that there is a clear understanding of how each initiative contributes to this target. The participants highlighted the broader objectives of climate assessments. They emphasized the importance of building awareness, fostering knowledge, and facilitating continuous learning throughout the organization. These subtle and indirect effects of a potential assessment tool were stressed along with the value of capitalizing on them.

To get the most out of the climate assessments, it was recommended to integrate it as early as possible in the investment process. This would allow for it to be part of the gate 1 decision. However, the participants acknowledged that a notable challenge lies in ensuring the availability of necessary input data.

5.2.4 Summary of findings from workshop

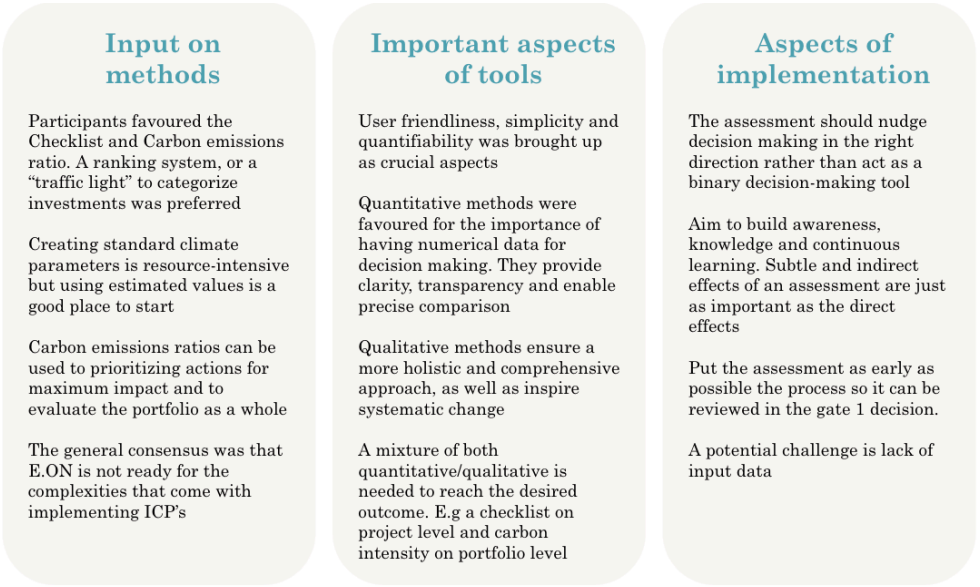


Figure 5.3: *Summary of findings from workshop*

The findings from the workshop alongside the information gathered from the interviews provides a solid foundation to start discussing the

results. By combining these insights with the theory described in chapters 3 and 4, the last two research questions can be answered. As a reminder, these two questions are formulated as follows:

R2: Which method(s) are best suited to provide an assessment of the climate impact of an energy company's investments?

R3: In what way(s) can climate impact be integrated as an aspect in the investment process of an energy company?

6 Discussion

This section discusses the findings presented in the previous section by interpreting and evaluating the implications of these results. The discussion also explores the practicality, effectiveness and potential limitations of the carbon assessment tools identified as most suitable for E.ON. Lastly, an implementation roadmap is presented to ease the integration of the recommended carbon assessment tools.

6.1 Summary of significant findings

To structure the discussion of this thesis, the significant findings have been summarized and categorized into the criteria deemed as most important when evaluating the applicability of the tools presented. For a summary of the main findings from the empirical research, on which the chosen aspects are based, see figure *5.1*, *5.2,* and *5.3.* From the discussions of the workshop, a couple of aspects of the assessment tools that were deemed extra important to the attendees surfaced. Due to the results of this discussion, the methods presented in this thesis will be evaluated on the following criteria: User friendliness, quantifiability, steering potential, feasibility and employee's opinions about the methods. The first four aspects are a direct reflection of what the workshop and interview attendees deemed to be the most critical for the success of implementation, while the criteria, employees' opinions have been added by the authors. Following is a further description of all five criteria.

User friendliness

It is crucial for the carbon assessment tool to be user-friendly and easy to use for several reasons. A user-friendly tool ensures that employees, who have different levels of expertise and work at various levels within the organization, can understand, access and utilize the tool in an

effective and time-efficient way. By making the tool easy to use, it also facilitates participation from more employees within the organization, resulting in continuous learning regarding sustainability. Furthermore, a user-friendly tool reduces the likelihood of human error and might make the assessment more accurate and enable clearer decision making. In contrast, if the tool is too complex, there is a risk that the tool may lead to errors in the carbon assessment procedure.

Another positive aspect of user-friendliness is that a tool that is intuitive and requires little to no predefined knowledge is more likely to be implemented by the organization. This resonates with one of the critical factors presented by Kotter, see section 3.5.1, namely *Communicating the Vision*. The change initiative in question is becoming more sustainable in order to meet the net zero goal for 2035. By integrating climate impact as a parameter in the investment procedure, the vision of achieving net zero emission becomes more tangible for all employees involved. With a user-friendly tool, the organization can easily communicate the vision and help clarify what needs to be done in order for the change initiative to be successful. If the tool is too complex or too difficult to navigate, there is a risk that employees will be resistant to using it, in other words, employees will not act on the new vision.

Quantifiability

Throughout the interviews, quantifiability was brought up as an recurring factor of importance when discussing potential climate assessment methods and its relevance was later verified in the workshop. Due to investment decisions being driven mainly by profitability and that the basis for appraisals are made up by numbers, enabling climate impact to be included in the same format is highly beneficial. It allows for comparability between financial and climate data as well as putting the two types into relation to one another. Consequently, a sense of magnitude of CO_2e emissions can spread throughout the organization and build knowledge to the point where employees can roughly estimate the emissions associated with a certain investment or activity. By doing so, it helps to integrate climate data into the investment process, as well as in smaller scale decision making and operational processes such as procurement and project management. This way, E.ON can institutionalize climate data in the

investment process in the same way that financial data already is, similar to what Kotter describes as a crucial factor of change.

Additionally, quantifying emissions and putting them in relation to invested capital, directly shows what the spend is actually amounting to, increasing transparency. This allows E.ON to easily communicate the benefits of investments into low carbon alternatives and highlight quick wins to further speed up the transition towards having net zero emissions. Moreover, quantifiability facilitates follow up and progress tracking, by enabling the introduction of KPI's connected to the emissions in different levels of the operation. These can be included in the post completion audit, PCA, currently in place to evaluate projects after completion. On portfolio level, comparisons can be done either by putting projects up against each other one on one, or by consolidating on one or more shared characteristics. These groups can then be audited in the same ways as the individual projects.

Steering potential

The goal of the carbon assessment tool is to steer E.ONs sustainability efforts in the right direction to achieve the net zero goal 2035. A carbon assessment tool can have direct effects such as guiding investment decisions by providing decision-makers with quantitative or qualitative data regarding the environmental impact of different investment options. These effects can be achieved at project level, portfolio level, or both. As stated in the interviews and the workshop, the direct effects are beneficial, especially since decision-makers can prioritize sustainable investments and steer capital towards projects with lower emissions.

However, during the interviews and the workshop, it was also stated that the indirect effects of a carbon assessment tool are just as important as the direct effects. The carbon assessment tool can for example contribute to indirect effects such as continuous learning regarding climate improving measures as well as increased sustainability awareness within the organization. Moreover, by implementing a carbon assessment tool in the investment procedure, E.ON demonstrates a commitment to sustainability and transparency, which can enhance engagement within the organization. This can in turn strengthen the relationship with stakeholders such as suppliers

who prioritize environmental considerations. As stated in section 3.2.1.3, *Social factors that motivate carbon disclosure,* the growing awareness of climate change leads to a demand for carbon reduction and transparency. By implementing a carbon assessment tool, E.ON shows that they take climate change issues seriously and have strategies aimed at mitigating carbon emissions.

Feasibility

Feasibility refers to evaluating how likely E.ON is to successfully implement the specific climate assessment tool into their investment process. Both internal and tool-specific facilitators and barriers have to be considered in order to fairly evaluate the methods. Also, feasibility was brought up numerous times in the interviews, often with a focus on barriers of implementation and is therefore considered an important aspect to the employees at E.ON. Besides surfacing in the interviews, the perspective has been mentioned multiple times in the literature studied. As pointed out in section *3.2.1 Factors That Motivate Carbon Disclosure* firm internal factors affect the success and feasibility of disclosure programmes. Especially, the presence of already existing carbon management systems can contribute to the likelihood of implementation. Due to the close connection of carbon disclosure and carbon management tools like those of a climate assessment, these factors should be kept in mind when evaluating the feasibility of their implementation. Furthermore, as described by Kotter in section *3.4.1 John P. Kotter's eight critical success factors* facilitating the new vision and removing obstacles is crucial for driving a change initiative. Hence, identifying and assessing the potential barriers is an important part of the implementation process.

Employee's opinions

An important perspective is that of those who will be impacted by the implementation of a new carbon assessment tool. Therefore, the opinions expressed about the different tools and their appeal to the employees consulted have to be considered. Also, the feedback on the specific methods presented in the workshop weighs heavily in the evaluation process.

6.2 Evaluation of methods

With the criteria mentioned in the previous section, a thorough evaluation of the methods can be carried out. To structure the evaluation, some methods have been clumped together into one. The CER and CER-scale will be assessed as one method as they are identical besides the addition of the visualizing scale element. The two ICP methods, shadow price and internal carbon fee, will also be assessed as one due to the underlying methods sharing great similarities. At the end of every section, a summarizing table can be found to give an overview of the discussed method, see tables 6.1, 6.2, and 6.3. For a side by side comparison of the three methods discussed, see table 6.4 in section *6.2.4, Side by side comparison of methods*.

6.2.1 Checklist

User friendliness

As described in section *5.2.2 Checklist*, one of the main benefits with a checklist is the flexibility of being able to choose what criteria should be included. This, in combination with tailoring the questions to the intended type of project or department increases the user friendliness of the tool. Also, such a checklist should come with enclosed documentation and guidelines to give examples, answers frequently asked questions and point the user towards the information needed when filling it in. Since the current three star rating in place has some similarities with the structure and function of how a checklist could be designed, employees are already somewhat used to the way it is applied. Altogether, a checklist is intended to be easy to navigate, without the user getting stuck or exhausted by the process. Limiting the answers to each question further improves the user friendliness, both to the employee filling in the list and to the recipient of the finished list.

Quantifiability

By design, the throughout checklist is not meant to quantify emissions and has no direct connection to the financials of the project. However, by applying a scoring system to the criteria in the list, a quantifiable metric can be produced. This can be done by either assigning the questions with different weights, or by weighing everything as equally

important, resulting in a metric that can be used for steering and visualization purposes.

Steering potential

One of the main reasons for E.ON to implement a qualitative tool such as a checklist is for the indirect and direct steering capabilities it would result in. The list would have an impact mostly on project level, where it would encourage the user to explore low carbon alternatives, evaluate the involved stakeholders including suppliers and contractors, and to implement climate improving measures when possible. Accordingly, this would lead to softer benefits such as building awareness and knowledge, and enabling continuous learning throughout the organization. Doing so can lead to the establishment of new, more effective working methods. By complementing the more direct steering effects of a quantitative tool with those of a checklist, a more holistic and comprehensive approach to assessing climate impact can be achieved.

Besides the indirect steering potential, a direct effect is the potential to nudge those involved in the project to choose alternatives with lower carbon impact. Also, since the list could be filled out before project realization, it is possible to include in the project appraisal material evaluated in gate 1, as part of the current SCRIM assessment. Doing so also allows the result of a checklist to be connected to the hurdle rate used in the project appraisal, similar to how the three star assessment is today. Hence, directly influencing decision makers and the projected profitability of the investment or project.

Feasibility

The application of a checklist does not rely on the collection of emissions data and complex climate calculations, increasing the feasibility of implementation. Due to the flexible design of the list, it can be gradually implemented in E.ON's business functions and more widely integrated over time. The flexible structure also enables for a simpler version of the list to be implemented at the start. This can later be extended to covering more criteria when feasible. Moreover, the fact that the SCRIM assessment is already in place further lowers the barrier of implementation. On the contrary, it is important to keep in mind that there have to be resources allocated into designing the actual

checklist that will be in use. This includes creating the criteria and guiding documentation as well as training the intended users in how the tool should be applied.

Employee's opinions

As a compliment to quantitative methods, employees at E.ON favored a checklist when asked during the workshop. Mainly, due to the fact that its user friendliness and simplicity was recognized as two important factors. They expressed the need for qualitative methods to ensure a holistic approach to the assessment. Also, the softer effects of implementing a checklist was considered as important as the more direct effects on decision making. The implementation of a checklist could contribute to a systematic change in the way that E.ON works with their projects and was therefore seen as a strength in comparison to other methods. This was especially evident in the interviews with project managers and procurement, who emphasized the need to actively explore options and alternatives in the project planning phase.

Table 6.1: Summary of checklist evaluation

Checklist				
User Friendliness	Quantifiability	Steering potential	Feasibility	Employee's opinions
Flexible in what criteria to include depending on type of project Well designed answer options & easy navigation prevents risk of getting stuck Similar to current system Documentation and guidelines required to facilitate use	Not intended for quantifying emissions Not naturally connected to financial data Scoring system allows for a quantifiable metric	Focuses on indirect steering and soft benefits, promoting new working methods Provides a more holistic approach on project level To be included in G1 appraisal documentation Can be directly connected to hurdle rate	Independent of emissions data or heavy calculation Simple structure, that can be gradually integrated Compatible with the SCRIM assessment currently in use Creating criteria, documentation and training material needed	Favored for simplicity and holistic approach Soft effects and potential for systemic change liked Project managers and procurement emphasized need to actively explore green options

6.2.2 Carbon Emissions Ratio-Scale

User friendliness

As mentioned in section *5.2.1 Carbon Emissions Ratio Scale*, the CER-scale categorizes projects, investments or parts of the portfolio into easily understandable "red", "yellow", or "green" zones, which facilitates comprehension and clear communication of carbon impact. Besides the intuitive categorization, it also visualizes the carbon emissions ratio, making complex climate data accessible to those at E.ON who are unfamiliar with it. Additionally, by utilizing standard parameters linked to the major carbon emission factors in the project or investment, carbon calculations become easier. This simplifies the process for employees using the tool by removing the necessity of accounting for small or unknown individual emissions within investments. Therefore the CER-scale is an easy way of navigating the climate impact of different initiatives.

Quantifiability

As expressed by interviewees at E.ON and the participants at the workshop, the need for a quantitative tool was highlighted. By having a quantitative climate assessment method, decision-makers are able to compare financial and climate data, as well as put the two in relation to each other. By choosing, for example, an economical denominator in the carbon emissions ratio, the CER-scale will provide a clear connection to financial data. Hence, showcasing the relationship between carbon emissions and spent capital for a specific project, investment or the portfolio as a whole. Furthermore, through the traffic-light scale, the quantifiability is easily visualized, making CO2-emissions more tangible regardless of who uses the tool. The traffic-light categorization also increases comparability between initiatives of different types or in different functions at E.ON.

Steering potential

The CER-scale will enable both direct and indirect positive effects in aiding E.ON to reach its net zero goal. It facilitates evaluation of a project's or portfolio's climate impact, specifically allowing for periodic follow-up. Projects categorized as "green" require no further evaluation, while those marked as "yellow" or "red" may need deeper assessment regarding their climate impact, contributing to a sense of competition

among employees to improve project ratings. Although "red" and "yellow" projects may be carried out, the portfolio as a whole can be evaluated with the goal to steer the overall mix towards having lower climate impact. Moreover, it enables comparability between financial and climate data, enhancing E.ON's understanding of emissions associated with specific investments.

Directly, the CER-scale guides investment decisions by providing decision-makers with quantitative data, visualized using the traffic light. Indirectly, it causes employees and decision-makers to question carbon-intensive projects, builds awareness of sustainability, and encourages steering away from "red" projects. Furthermore, as the market shifts towards carbon neutrality, E.ON can choose to evolve the scale, making it more difficult to mark a project as "green", ensuring alignment with changing sustainability goals and supplier capabilities.

Feasibility

Important aspects when determining the feasibility of the CER-scale is the accuracy of the underlying data upon which the carbon intensity ratio relies, and setting appropriate scale levels. In order to reach the desired outcome of the CER-scale, the creation of standardized parameters and the determination of scale-threshold levels will require time and effort which poses implementation difficulties. It is uncertain what resources are needed to create the standardized parameters and who would be responsible for doing so. However, since the CER-scale can be used both on project and portfolio level, it can be implemented in projects where climate data is most readily available.

Employee's opinions

Employees at E.ON were positive towards the CER-scale during the workshop, due to its quantifiability and suitability for both project-specific and portfolio-wide applications. They particularly appreciated its direct linkage to financial data and its capacity to visually represent carbon impact through the traffic-light categorization. Additionally, the ability of the CER-scale to offer climate impact distributions for E.ON's portfolios and projects, was expressed as advantageous from a follow-up perspective since it facilitates clear communication of carbon impact across various levels of the organization.

Table 6.2: Summary of CER-scale evaluation

CER-Scale				
User Friendliness	Quantifiability	Steering potential	Feasibility	Employee's opinions
Categorizes projects, investments, or portfolio's for easy understanding Simplifies complex climate data Utilizes standard parameters for easier calculations Easy-to-use tool for navigating climate impact of different initiatives	Relates financial data to climate data Showcases the relationship between carbon emissions and spent capital Visualizes quantifiability, making CO2-emissions tangible Increases comparability	Enables evaluation of project and portfolio climate impact Drives competition among employees to improve project rating Facilitates steering the overall portfolio mix towards lower climate impact Guides investment decisions Allows adaptation of the scale	Setting appropriate scale levels is crucial Creation of standardized parameters and determination of scale-threshold levels require time and effort Uncertainty regarding required resources Feasible for projects with available climate data	Appreciated its quantifiability and suitability for project-specific and portfolio-wide applications Visual representation of carbon impact is positive Advantageous that the CER-scale offers climate impact distributions for portfolios Useful for follow-up

6.2.3 Internal carbon pricing

User-friendliness

The internal carbon pricing methods including both shadow price and internal carbon fee can be seen as user friendly with regards to what the two methods represent, namely a clear connection between financial and climate data. In other words, it is easy for an employee at E.ON, regardless of their expertise, to understand a project's climate impact since it is translated into a financial measure.

While it is easy to understand the results of the tool, it can be difficult to utilize the tool in an effective and time-efficient way due to its complexity. As described in section 3.4.2, *Internal Carbon Pricing*, implementing such an initiative is time consuming and requires structural and administrative change. Additionally, the employees who utilize the tool will require training since setting the "correct" carbon price is not intuitive, but crucial for the success of the ICP-initiative. Moreover, due to the complexities regarding ICPs, the educating of affected E.ON managers and teams about the ICP-program will be required in order for it to be easier to use.

Quantifiability

The internal carbon pricing method is clearly connected to economic data as well as highly reliant on the quality of emissions data. It is used to quantify the CO_2 emissions and link them directly to the financials of the project or investment. Doing so would allow E.ON to include the potential costs of emissions in investment appraisals, budgets and its follow up procedure. By putting emissions in a more understandable perspective of costs or risk, it also facilitates comparison between the two factors. The translation into financial terms, helps create a sense of magnitude related to CO_2e emissions and builds knowledge throughout the organization. Furthermore, ICP's concrete representation of carbon emissions increases transparency in the investment process, and is easily communicated to those involved. Lastly, the quantifiability of ICP's allows for clear and easily understood KPIs that can be related to the financial metrics already in place at the company.

Steering potential

The internal carbon pricing methods provide a direct effect on the profitability of the investment decision, influencing decision-makers to invest in low-carbon alternatives. This showcases ICPs high steering potential, leading to an overall reduction in carbon emissions and carbon associated risks. However, as stated in section 3.4.2.1, *Shadow Price*s, shadow prices are only accounted for in the investment process and therefore have no direct effects on short term emissions. Due to only representing hypothetical costs, shadow prices are not guaranteed to have an impact on decision makers.

Internal fees on the other hand, have a direct impact on both the current and future activities of the organization, strengthening this method's steering potential compared to shadow prices. Through internal fees, the organization is able to hold departments accountable for their generated emissions and access a direct price signal for GHG emissions. Furthermore, through the internal fund, E.ON, can choose to invest in company-wide emission reducing projects, which also highlights this method's steering potential.

Feasibility

The quantitative nature of ICP's is well suited to be integrated in an investment process, provided that the foundation of climate data already exists and is readily available. This however, might pose problems for E.ON. In the interviews and workshop it was found that the current emissions data collected throughout the company is perhaps insufficient to form the basis for an ICP system. As covered in 3.4.2.4 barriers of implementation, implementing an ICP system based on internal carbon fees is costly, time consuming and requires structural and administrative efforts to be made. Besides this, there lies a challenge in setting the correct price, be it for the internal fee or the shadow price. Given its resource-intensive nature and critical role in the success of the ICP program, setting the price requires careful consideration. Failure to do so may result in the implemented ICP not effectively steering investment as intended. However, introducing an ICP in the form of a shadow price is not deemed entirely unfeasible when the required data is readily available and of high quality. Implementing internal carbon fees on the other hand are considered a more challenging task, requiring management of both emissions data and the internal fund. Therefore, the tool is not regarded as feasible at this moment, but might be a suitable expansion of methods implemented in the near future.

Employee's opinions

As expressed in the workshop, the general consensus of those consulted was that E.ON might not be ready for the implementation of complex ICP methods, despite their high steering potential. Furthermore the resources needed in creating and maintaining a functioning and successful ICP-programme was brought up as a major concern. It was mentioned that it can be a better strategy to start on a smaller scale with simpler methods, expanding when the organization is ready.

Table 6.3: Summary of ICP evaluation

ICPs				
User Friendliness	Quantifiability	Steering potential	Feasibility	Employee's opinions
Easy to understand since climate impact is translated into a financial measure Utilizing the tool effectively and efficiently can be challenging Will require training in order to set the "correct" carbon price Education is necessary to enhance usability	Quantifies CO2-emissions Links emissions data directly to economic data Allows inclusion of potential emission costs in investment appraisals, budgets, and follow-up Facilitates comparison Provides clear and easily understood KPIs related to existing financial metrics	Directly affects investment profitability High steering potential leads to overall reduction in carbon emissions and associated risks Internal fees have higher steering potential compared to shadow prices Through internal fund, E.ON can invest in company-wide emission-reducing projects	Current structure of climate data might be insufficient for ICP effectiveness Integration and setting the price and is resource intensive and crucial for success Shadow prices are considered as more feasible compared to an internal carbon fee ICP's deemed as more feasible for future integration	Workshop attendees suggests that E.ON may not be ready for complex ICP methods Concerns raised about the resources required for creating and maintaining a functioning ICP programme

6.2.4 Side by side comparison of methods

Table 6.4: Summary of carbon assessment methods

Summary of carbon assessment methods		
Checklist	**CER-scale**	**ICP methods**
User friendliness		
Flexible in what criteria to include Limited options for easy navigation Similar to current system Documentation and guidelines needed to assist user	Categorizes for easy understanding Simplifies more complex climate data Utilizes standard parameters for easier calculations Easy-to-use tool for navigating climate impact of different initiatives	Climate impact is translated into a financial measure Achieving efficiency can be challenging Requires effort to set the "correct" carbon price Education is necessary to enhance usability
Quantifiability		
Not intended for quantifying emissions Not naturally connected to financial data Scoring system allows for a quantifiable metric	Showcases the relationship between carbon emissions and spent capital Visualizes quantifiability, CO2-emissions made tangible Increases comparability	Quantifies CO2-emissions and links directly to financial data Facilitates comparison KPIs can be related to existing financial metrics
Steering potential		

Indirect steering and soft benefits Holistic approach on project level To be included in G1 appraisal documentation Can be directly connected to hurdle rate	Enables evaluation of project and portfolio climate impact Drives competition among employees to improve project rating Facilitates guidance and steering the overall portfolio mix towards lower climate impact	High steering potential leads to overall reduction in carbon emissions and associated risks Internal fees have higher steering potential compared to shadow prices Internal fund allows E.ON to invest in emission-mitigation projects
Feasibility		
Independent of emissions data or heavy calculation Simple structure Compatible with the SCRIM assessment Creating criteria, documentation and training material needed	Creation of standardized parameters and scale-thresholds require time and effort Uncertainty regarding required resources Feasible for projects with available climate data	Climate data might be insufficient for ICP effectiveness Integration and setting the price and is resource intensive and crucial for success Shadow prices are considered as more feasible compared to an internal carbon fee
Employee's opinions		
Favored for simplicity and holistic approach Soft effects and potential for systemic change Project managers and procurement emphasized need to actively explore green options	Quantifiability and suitability for project-specific and portfolio-wide applications favored Positive toward visualization of carbon impact Easy way of connecting financial and economic data	Workshop attendees suggests that E.ON may not be ready for complex ICP methods Concerns raised about the resources required for creating and maintaining a functioning ICP programme

6.2.5 Recommendation

Based on the evaluation outlined in section 6.2 Evaluation of methods and the comparison in table 6.4,the CER-scale in combination with the creation of a qualitative checklist stand out as the most relevant for implementation at E.ON, and other energy companies in similar positions. These methods align well with E.ON's internal capabilities and its current sustainability goals, making them feasible for integration. The complementary effects from creating and integrating both qualitative and quantitative methods can effectively fill existing gaps on both project and portfolio level, spanning short and long-term perspectives. By implementing the CER-scale and complementing it with a checklist to create awareness regarding the climate impact of investments, E.ON will be able to effectively steer investments toward lower emission alternatives while increasing transparency and knowledge of carbon emissions within the organization. These methods aim to guide decision-making while also offering clarity and accessibility for employees across the organization with varying levels of sustainability knowledge.

Presently, decision-makers at E.ON face challenges in making decisions solely based on sustainability aspects due to the necessity of considering other organizational interests such as profitability, growth, and associated risks. To effectively integrate the climate impact perspective into the investment process, it is important to initiate efforts by progressively visualizing, communicating, and educating the organization. By doing this, E.ON can give a gradually higher mandate to climate aspects, alongside its other organizational objectives.

While ICP methods have significant potential for steering towards sustainability goals, the complexities and challenges identified lowers the feasibility of success to a point where it is not worth pursuing at this time. However, these methods should not be ruled out for future implementation when the organization has the sufficient capabilities in place.

6.2.5.1 Checklist

Usage area

As outlined in section *6.2.1 Checklist*, a checklist is supposed to be designed in such a way that it can be utilized in various projects and departments, ensuring its versatility and adaptability. In terms of its integration, such a checklist should ideally be filled in before the project realization, which ensures that it is included in the project appraisal material assessed in gate 1. Preferably the list should be filled in by the project manager or projecteur since these employees have a good overview of the project and are connected to the different parties involved. When addressing how a checklist should be implemented, a versatile design facilitates gradual integration across E.ON's business functions, allowing for an iterative approach. Due to the adaptability of a checklist, the initial versions can be simple, as depicted in figure 6.1, which should not be mistaken for the final product. A key aspect of the effectiveness of a checklist lies in its potential ability to highlight areas where the organization needs to actively explore more green options.

To achieve the desired indirect effects of the tool establishing clear guidelines is essential. To enhance user experience and ease navigation, a comprehensive frequently asked questions section should be provided, addressing questions such as "How do I determine if the project aligns with EU-taxonomy?" and "Who should I contact internally for this information?". Furthermore, the implementation of a scoring system, with weights assigned to the questions, can provide additional guidance and steer decision-making in the future. This system can be directly linked to the hurdle rate if required, enhancing alignment with financial objectives and priorities.

Tool design

A first draft of how a checklist could be designed has been made in the form of an Excel file, with each question featuring a set of predefined alternatives. Additionally, a comment section is provided, allowing the user to elaborate on specific answers or flag questions deemed important for further discussion by decision-makers in gate 1. Examples of questions that can be used in the initial checklist can be seen in figure 6.1.

Checklist for distribution project

Project ID:	Project 123
Name of user:	Name Lastname
Employee ID:	Employee 123

Question	Answer	Comment
Is the project aligned with EU-taxonomy? (Fills criteria of the 3-star rating?)	1. Yes	
Have climate-improving alternatives been explored?	1. Yes	
Does the contractors climate goals (netzero) align with E.ON's?	1. Yes, for ALL suppliers / Contractors	
Is the emissions data associated with the project accessible?	1. Yes, for ALL activities / products	
Has the project been designed to minimize climate impact?	1. Yes, for ALL activities	
Has any materials been reused or repurposed for this project?	1. Yes, for the majority of materials	
Have the materials been substituted for greener alternatives?	2. Partly substituted	
Choice of fuel for machines	1. Fully carbon neutral (Electric)	
Has any other climate requirements been put into the contract?	1. Yes	

Figure 6.1: Dummy of checklist implemented in excel

6.2.5.2 Carbon Emissions Ratio-scale

Usage area

The primary usage area of the CER-scale is to visualize emissions data and showcase the relationship between carbon emissions and spent capital. The CER-scale will provide an understanding of a certain project's emissions before it is carried out and can therefore be used to steer the overall portfolio mix towards lower emissions.

In order to achieve the desired effects of the CER-scale, it is recommended to begin with projects where data has been collected or is readily available, preferably distribution projects. By using the already established spend categories and focusing on the largest emissions drivers in a project an estimate of a project's emissions can be obtained. By combining the knowledge of the sustainability and procurement division, the necessary data can be obtained either through the

suppliers or the use of standard parameters. As suppliers mature and acquire more emissions data, the accuracy and reliability of the CER-scale will increase. This collaborative approach strengthens the tool's relevance and builds a culture of awareness and knowledge-sharing within the organization.

Once the emissions from a project are estimated, they can be compared to the costs to calculate a ratio. Subsequently, the thresholds for the traffic light system can be established. This can be achieved by analyzing data from past similar projects, to identify cost patterns and establish a reasonable scale. Once thresholds for the traffic light scale are determined, the carbon intensity ratio can be visually represented providing a clear visualization of emissions distribution in the portfolio.

Tool design

The user interface for the CER-scale is made up of an excel file that the project manager or projecteur should be able to easily navigate. To increase user friendliness, the document is split up into three different parts, the dashboard, project sheets and data sheets. The Dashboard aims to give an overview as well as instructions to the user, the project sheets serve the purpose of actually calculating the carbon emissions ratio with input from the user and the data sheet contains all the necessary data to do so. The functionality and design of the dashboard and the project sheets are explained in more detail below.

As can be seen in figure 6.2, the dashboard contains three main elements. First is the instructions to the user, which explains how the document is to be used and what purpose is served. It also explains the color coding of the document to mitigate errors produced by filling in the wrong cells. The dashboard also contains an overview of the structure of the document, with a table of contents and clickable links for easy navigation. Lastly, the most important data points are presented visually for the project, with two graphs showing the total emissions generated and the distribution of these emissions by the largest categories. Also, the carbon emissions ratio of the project is presented as well as the categorization of the project in relation to the thresholds of the scale.

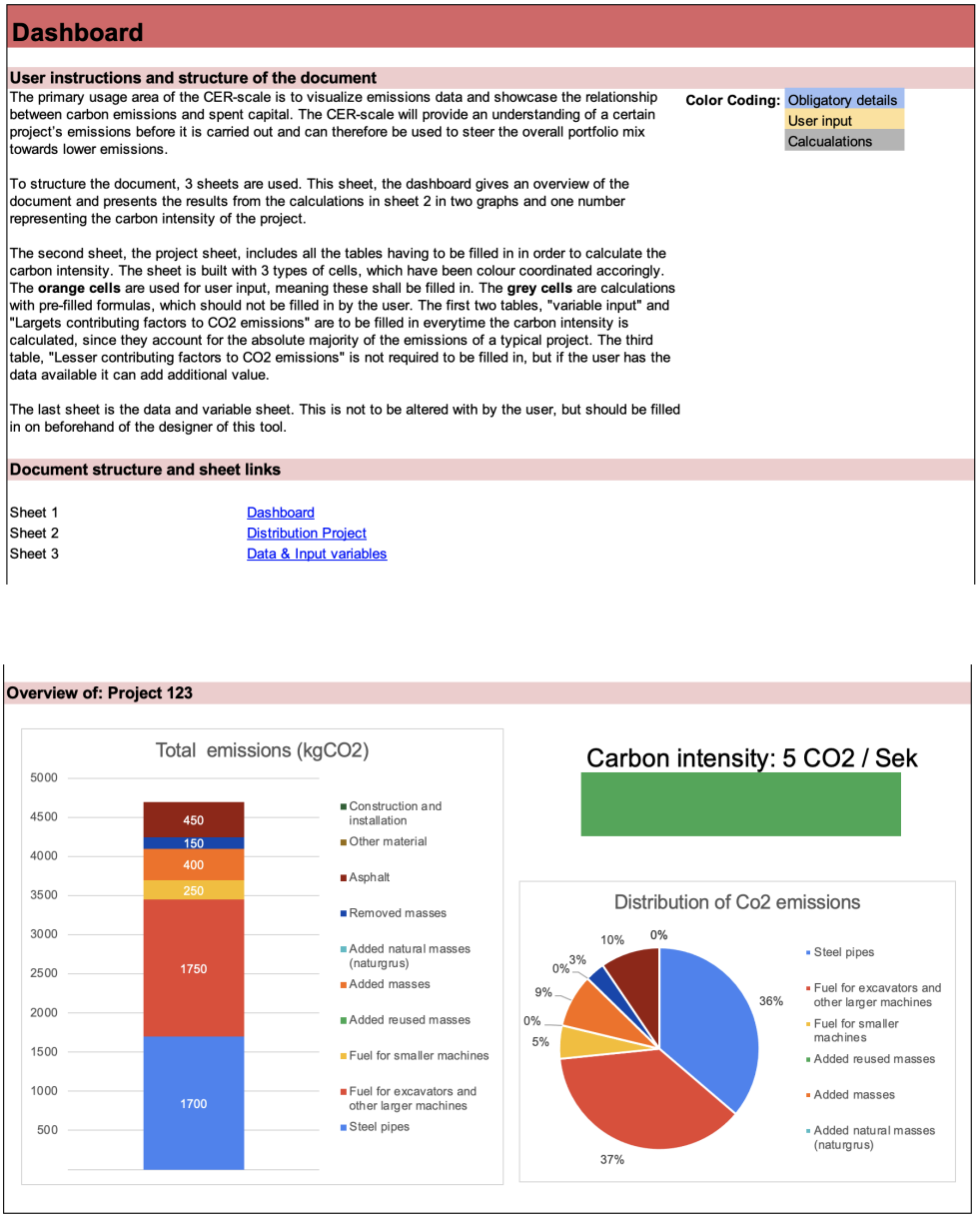
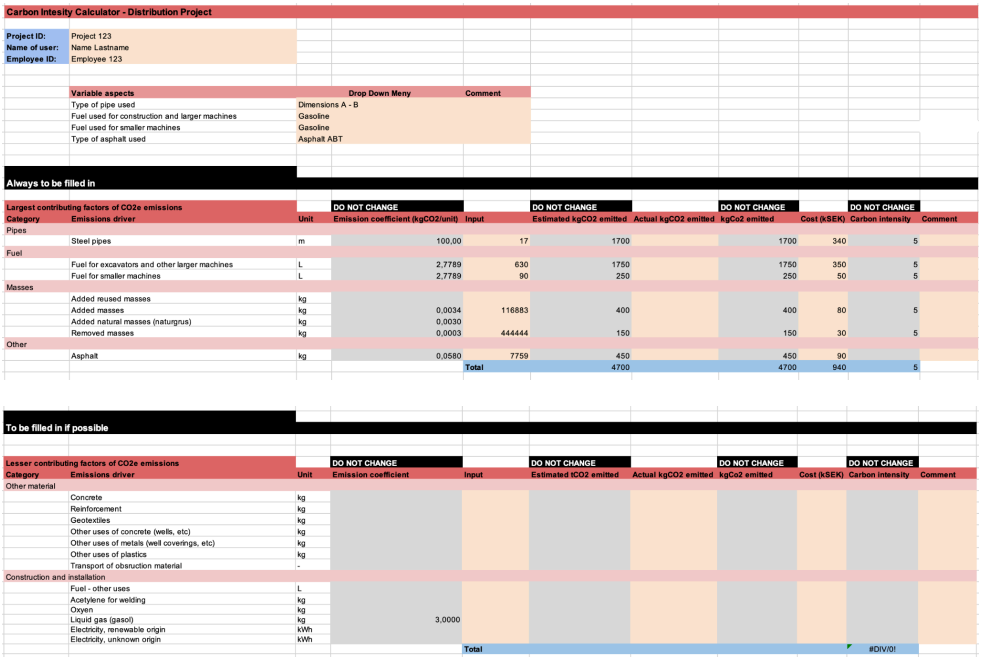


Figure 6.2: Dashboard overview of mock-up CER-scale tool

The project sheet is organized to make the processes of filling it in as easy and straightforward as possible, and can be seen in figure 6.3. First the user is met with drop down menus with a number of different choices. For example, it could be what fuel that is used by the

construction machines or what dimensions of pipe that is used in the project. Then, the user simply fills in the designated cells from the top down, starting with the parameters that are considered the most important from a carbon emissions perspective. The calculations are done automatically, and the results are presented on the dashboard.



Carbon Intesity Calculator - Distribution Project

Project ID:	Project 123
Name of user:	Name Lastname
Employee ID:	Employee 123

Variable aspects	Drop Down Meny	Comment
Type of pipe used	Dimensions A - B	
Fuel used for construction and larger machines	Gasoline	
Fuel used for smaller machines	Gasoline	
Type of asphalt used	Asphalt ABT	

Always to be filled in

Largest contributing factors of CO2e emissions			DO NOT CHANGE		DO NOT CHANGE		DO NOT CHANGE		DO NOT CHANGE	
Category	Emissions driver	Unit	Emission coefficient (kgCO2/unit)	Input	Estimated kgCO2 emitted	Actual kgCO2 emitted	kgCo2 emitted	Cost (kSEK)	Carbon intensity	Comment
Pipes										
	Steel pipes	m	100,00	17	1700		1700	340	5	
Fuel										
	Fuel for excavators and other larger machines	L	2,7789	630	1750		1750	350	5	
	Fuel for smaller machines	L	2,7789	90	250		250	50	5	
Masses										
	Added reused masses	kg								
	Added masses	kg	0,0034	116883	400		400	80	5	
	Added natural masses (naturgrus)	kg	0,0030							
	Removed masses	kg	0,0003	444444	150		150	30	5	
Other										
	Asphalt	kg	0,0580	7759	450		450	90		
				Total	4700		4700	940	5	

To be filled in if possible

Lesser contributing factors of CO2e emissions			DO NOT CHANGE		DO NOT CHANGE		DO NOT CHANGE		DO NOT CHANGE	
Category	Emissions driver	Unit	Emission coefficient	Input	Estimated tCO2 emitted	Actual kgCO2 emitted	kgCo2 emitted	Cost (kSEK)	Carbon intensity	Comment
Other material										
	Concrete	kg								
	Reinforcement	kg								
	Geotextiles	kg								
	Other uses of concrete (wells, etc)	kg								
	Other uses of metals (well coverings, etc)	kg								
	Other uses of plastics	kg								
	Transport of obsruction material	-								
Construction and installation										
	Fuel - other uses	L								
	Acetylene for welding	kg								
	Oxyen	kg								
	Liquid gas (gasol)	kg	3,0000							
	Electricity, renewable origin	kWh								
	Electricity, unknown origin	kWh								
				Total					#DIV/0!	

Figure 6.3: Project sheet of mock-up CER-scale tool with fictive numbers

6.3 Implementation

As mentioned in section *5.2.3 aspects of implementation*, the climate assessment tools need to align with the overall strategic goals of E.ON. One of the difficulties regarding integrating the climate assessment tools is the implementation process. The important aspects to consider when structuring the implementation process is grounded in change management theory. Besides change management theory, examples from section *3.4.2.3 Implementation of ICP's* has been used to guide the implementation of the climate assessment tools. The process presented by the institute of Climate Economics, is similar to Kotter's critical steps, highlighting the relevance of Kotter's framework. Therefore an adaptation of both methodologies is used to describe how E.ON can successfully implement the climate assessment tools. To ensure the

long-term implementation and development of climate improving measures in the investment procedure at E.ON, a roadmap has been created, see figure 6.4. This also serves the purpose of providing a more tangible action plan that can be used to support E.ON as well as other energy companies planning on integrating climate assessment tools in the investment process.

6.3.1 Implementation roadmap

In order to guide the long term implementation a roadmap has been designed to visualize and concretize the process. The roadmap is made up of five phases and is described below. A visual representation of the roadmap can be seen in figure 6.4.

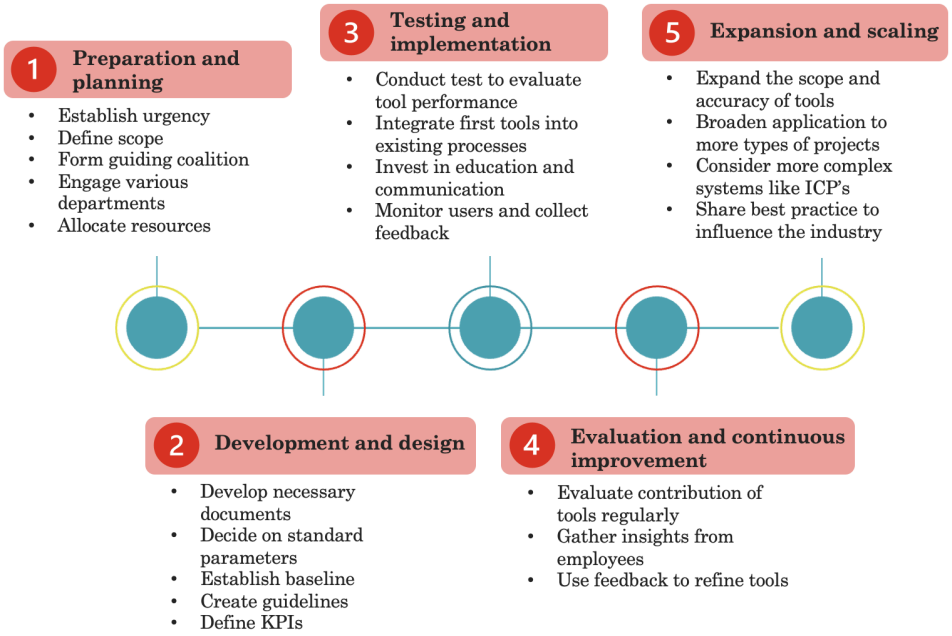


Figure 6.4: Roadmap of implementation of carbon assessment tools

Phase 1: Preparation and planning

Firstly, it is crucial that E.ON establishes a sense of urgency regarding the current need for change in the investment procedure. Through this master thesis, as well as E.ON's sustainability goals, awareness has

been raised among employees and top management regarding the need for an climate assessment tool. In addition, this thesis presents the challenges that the organization is facing, particularly regarding the expected value of implementing carbon assessment tools in the investment procedure.

The next step involves defining the scope of application for the tools. The scope of application must be clearly defined to avoid any overlap with existing processes and will provide a clearer mandate on who is, for example, responsible for developing the standard parameters for the CER-scale.

The success of the initiatives presented in this thesis partly relies on the formation of a powerful guiding coalition, as emphasized by Kotter. Typically, this group would include members from senior management, operational business units, as well as the sustainability, financial, and procurement departments. This ensures top-level support, as well as the inclusion of representatives with insight into the different processes and functions that will be impacted. Having established a high sense of urgency makes it easier to secure this support.

At E.ON, the procurement division plays a vital role in this process by ensuring that supplier data, especially regarding carbon emissions, is accessible through their relationships with the suppliers. E.ON has already begun doing so through the introduction of clear guidelines for the collection and reporting of carbon emissions data in procurement agreements. Also, the knowledge possessed by the sustainability department is imperative for the design of the carbon assessment tools and the creation of standard parameters which are to be used alongside supplier data. Furthermore, it is of great importance to make sure that the methods implemented suit those who will actually use them, and that the results are easily interpreted and translated into terms that decision makers can understand. Consequently, project managers, financial managers and investment controllers also have to be involved in the process. This engagement and cooperation of multiple departments enables the creation of a shared vision, in accordance with Kotter's methodology. Lastly, the allocation of necessary resources including employees, budget and time is vital to the success of the implementation.

Phase 2: Development and design

In phase two the tools need to be developed with detailed guidelines on how they should be used, as well as which KPIs should be used in order to assess the tools' impact. The KPIs could for example be the number of projects in which the tools are utilized, percentage of projects where more sustainable alternatives have been implemented, distribution of red or yellow projects in the portfolio, or the percentage of the projects emissions covered by the tools criteria or parameters. Furthermore, in the context of implementing both a checklist and the CER-scale, the creation of framework documents is crucial. To establish the thresholds for the CER-scale, 10-20 already executed projects can be analyzed. Specifically, this analysis will involve examining carbon emissions and correlating them with the corresponding financial aspects, such as material costs, within the project budgets. By doing so, a clear baseline can be established that effectively links carbon emissions to expenditure, providing a reliable relationship between carbon emissions and capital investment.

Moreover, it is vital to decide what standard parameters should be used for specific projects, or a specific portfolio, in terms of the CER-scale. Since emissions data may be insufficient, it is important that the standard parameters account for approximately 50-80% of the project's emissions, so the CER-scale provides an estimate that is reasonably reliable. This will ensure that the desired effects of the tool are achieved. Also, clear guidelines of how to utilize a checklist for different projects need to be established. Naturally, the questions provided in such a checklist will differ depending on the project/investment. By clearly defining what questions will be used for different projects, and how employees should utilize the tool with the help of, for example, a frequently asked questions document, the desired effects of the tool can be ensured. Furthermore, if the questions are to be weighted so a quantitative score can be derived from a checklist, these should be decided upon in this stage.

Thereafter the organization is ready to conduct pilot tests to evaluate the tools' performance in real-world scenarios, and gather feedback for improvement and refinement.

Phase 3: Testing and implementation

The actual implementation of the CER-scale and checklist will require the addition of new tasks and documents in the current investment or project appraisal process at E.ON. To make sure the change is not overwhelming for the organization, a gradual approach using pilots can be used by starting with projects where E.ON currently has the most knowledge of climate impact. As substantial work has already been done within distribution projects this is deemed a suitable place to start the implementation. The gradual approach is also applicable to the tools themselves. As simplicity is favored at the start of implementation, the tools should not be too complex. This ensures that the tools become part of the standard procedures for evaluating new projects and investments.

By starting on a smaller scale, E.ON has the opportunity to showcase the strategic benefits of the tools early by securing quick wins, in accordance with Kotter. By demonstrating that the tools can perform well in real world scenarios it increases support throughout the organization. Showcasing the early milestones also helps in communicating the vision and raising awareness which facilitates further sustainability efforts and encourages employees to become involved.

Effective implementation of the carbon assessment tools is dependent on education and communication. Departments at E.ON who will be impacted by the tools should understand the operational aspects as well as the strategic vision behind the new tools and processes being introduced. A key component of the educational effort is training and it is essential to teach employees at E.ON how to use the new tools properly. This involves setting clear standards and guidelines that are supported by all stakeholders involved. The education might come in the form of training sessions, workshops or documentation that can stand on its own. Moreover, communication plays a key role as it is important to articulate the vision behind the changes clearly across the organization. This ensures that everyone from top management to operational teams understands and supports the initiative, even if it increases the workload for these teams.

During the testing and implementation phase it is also important to monitor the use of the tools and collect feedback from users to identify any challenges or areas for improvement. The feedback allows for evaluation of the tools so that necessary adjustments can be made.

Phase 4: Evaluation and continuous improvement

In phase 4 the effectiveness of the tools, and if they contribute to climate improving measures in the investment procedure, need to be assessed. The goal with using a checklist is to identify areas for exploring low-carbon options and increase carbon emissions awareness within E.ON, particularly in the investment process. For the CER-scale, the goal is to visualize project-, or portfolio-related carbon emissions and tie them to financial data in a reliable way.

The evaluation relies on the quality of KPIs defined in the third stage. Besides KPIs, the evaluation should also include feedback from employees who have utilized the tools. Gathering employee feedback is crucial since it will provide valuable in-sights regarding the tools' practicality, usability, and effectiveness in their daily work routines. The feedback can be obtained through group discussions, surveys or interviews. Understanding employees' experiences will help the guiding coalition in refining and optimizing the tools. Additionally, by involving employees in the evaluation process will foster a sense of ownership and engagement, as they will feel that their opinions are valued and considered. This increases the likelihood of active tool usage, thereby ensuring a successful implementation. Furthermore, the feedback will highlight employees' opinions regarding the challenges and barriers they encounter while using the tools, which will be valuable for identifying areas of improvement. As a result, employees may suggest innovative ideas or functionalities that were not initially considered, making the tools more robust and valuable for the organization.

The evaluation should be conducted on a monthly, quarterly or a yearly basis. If the tools successfully achieve the goals, the guiding coalition needs to showcase this within the organization. By demonstrating the tools' positive impacts, the guiding coalition can further integrate the tools in the organization, in accordance with Kotter's final critical step, *institutionalize new approaches.*

Phase 5: Expansion and scaling

When the tools have been fully accepted and the assessment process has matured enough, the tools can be expanded upon by increasing scope and complexity. In the case of a checklist this would mean adding more, and in some cases more comprehensive criteria. In the case of the CER-scale it would mean developing more accurate standard parameters, covering more of the generated emissions of the project, and integrating actual supplier data into the calculations. Also, once the tools are well-established and proven effective, E.ON can consider scaling them up to include more projects and departments. Additionally, E.ON can start exploring the possibility of integrating more sophisticated tools such as Internal Carbon Pricing (ICP) once the organization is ready to handle more complex systems. Lastly, the organization should share insights and best practices with other companies and stakeholders, potentially influencing broader industry practices.

7 Conclusions

This section provides answers to the research questions, reflecting on the theoretical and empirical insights gained through the study. Furthermore, the practical implications for E.ON are discussed, highlighting how the recommended carbon assessment tools can be integrated into the company's investment processes to enhance sustainability outcomes. Additionally, broader implications for the energy sector are discussed, as well as how the insights from this thesis can influence policy-making and regulations. Lastly, the limitations of the study are addressed and areas for future research are presented.

7.1 Answering the research questions

This section provides conclusions to the research questions posed in the start of this thesis, based on the findings and discussions presented in the preceding chapters.

***R1**: What theories and tools exist to evaluate a company's climate efforts based on investments?*

From the research and the interviews with multiple Swedish energy companies, a variety of methods for evaluating a company's climate efforts could be identified. The research identified several key theories such as carbon accounting and carbon disclosure practices. Carbon accounting enables companies to quantify and manage their carbon emissions, allowing for more effective evaluation of carbon impact. Similarly, carbon disclosure practices require firms to report their emissions to stakeholders, enhancing both accountability and transparency. Furthermore, the research also highlights quantitative tools such as a carbon emissions ratio, and internal carbon pricing methods such as shadow price and internal carbon fee. These tools aim

to connect financial and emissions data which allow companies to make informed decisions that align with their sustainability goals.

***R2**: Which method(s) are best suited to provide an assessment of the climate impact of an energy company's investments?*

Based on the analysis of E.ON and other Swedish energy companies, the Carbon Emissions Ratio (CER) Scale emerged as the most suitable method for providing an assessment of the climate impact of an energy company's investments. The CER-Scale helps in categorizing investments based on their carbon intensity, which simplifies the understanding and communication of carbon impact. A qualitative checklist offers a qualitative assessment that complements the quantitative data by promoting broader sustainability considerations within project management and investment decisions. The combination of these tools provides a holistic methodology to assess the climate impact of investments which can be further developed when the level of maturity is sufficient.

***R3**: In what way(s) can climate impact be integrated as an aspect in the investment process of an energy company?*

Climate impact can be integrated into the investment process of an energy company by embedding carbon assessment tools into the decision-making framework. A checklist in combination with the CER-scale ensures that climate considerations are factored into the early stages of project planning and investment decisions, thereby aligning financial strategies with environmental sustainability goals.

To facilitate the implementation, a five step road map has been developed to suit the needs of E.ON but can also be of use for other energy companies in a similar position. The five steps are, and can be seen in figure 7.1:

- Phase 1: Preparation and planning
- Phase 2: Development and design
- Phase 3: Testing and implementation
- Phase 4: Evaluation and continuous improvement

- Phase 5: Expansion and scaling

Additionally, the road map emphasizes continuous education and adaptation of these tools to help in refining the processes and ensuring that they remain effective as the company's sustainability targets evolve.

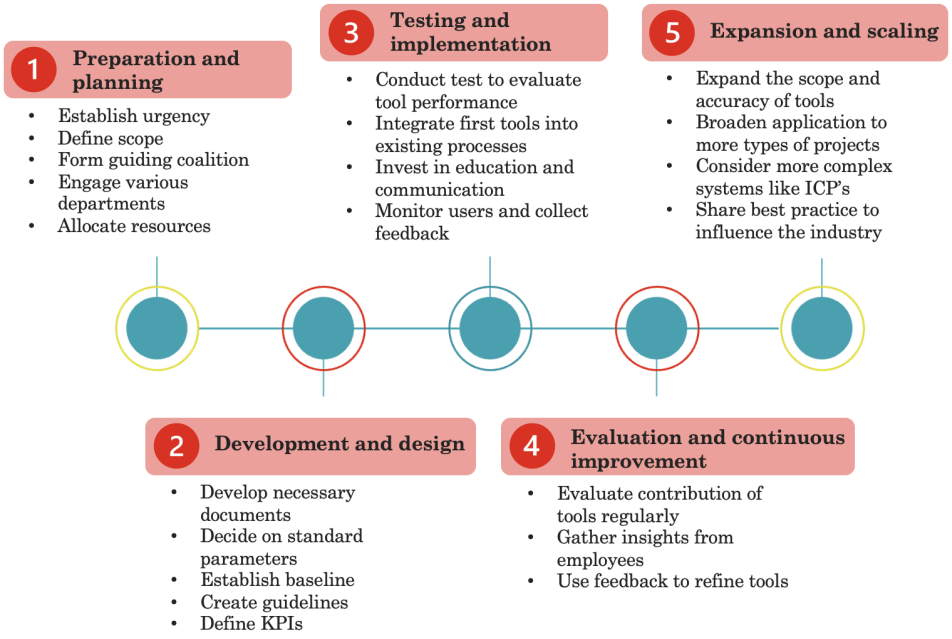


Figure 7.1: Roadmap of implementation of carbon assessment tools

7.2 Implications of the study

The implications of the study in the thesis primarily revolve around the integration of climate assessment tools in investment processes within energy companies, specifically E.ON, and the broader impact on policy makers and other energy companies.

7.2.1 Implications for E.ON and Similar Energy Companies

The thesis suggests that the integration of climate assessment tools, such as the CER-scale and a checklist can help companies make more

informed decisions that align with their sustainability goals. Furthermore, the adaptation of such tools can enhance a company's sustainability reputation, potentially attracting more customers and partners interested in greener solutions. By adopting these climate assessment tools, E.ON also sets a benchmark in the energy sector, incentivizing other companies to do the same and thereby increasing the overall sustainability of the industry.

As evident from the results and discussion of this master thesis, not all climate assessment tools are suitable for integration within an energy company's investment procedure. Two crucial factors which determine what type of tools should, and can be implemented, are the climate data available and the maturity of the sustainability functions of the company. A company that does not have the knowledge of conducting carbon calculations, or the resources to do so, will experience difficulties when trying to implement quantitative methods such as a carbon emissions ratio or internal carbon pricing. Therefore a simpler approach should be considered, such as introducing a checklist to build sustainability awareness within the organization.

Moreover, the success of carbon assessment tools relies significantly on the implementation process. This implies that energy companies who are planning on implementing carbon assessment tools need to demonstrate a willingness to allocate resources towards climate improvement measures. Consequently, effecting change within an organization poses considerable challenges, demanding engagement of various internal divisions, as well as support from top management. Therefore, a concise and efficient plan is required. This implies that other energy companies considering similar plans must anticipate significant time and resource investments.

7.2.2 Implications for external stakeholders and policy makers

One of the most apparent takeaways from this research is that the quality of the available emissions data greatly affects the effectiveness of a climate impact assessment. Therefore, policy makers should further incentivize companies to collect and share data related to GHG emissions throughout their value chain. Doing so would build a more

solid base for climate assessment tools to be implemented on, speeding up the mitigation of GHG emissions from investments. To enable companies to do so, supplier involvement is a crucial activity. Additionally, it has become evident that many companies want to do more than what is imposed upon them but have a hard time in motivating sustainable investments that have a negative short term impact on profitability. To counteract this, policymakers can create supportive incentives for companies that proactively integrate sustainability into their business plans, for example by implementing tools for the climate assessment of investments.

Moreover, clear reporting and assessment of climate impact will provide external stakeholders such as investors or potential patterns with more information. This can allow them to make more educated decisions regarding where to allocate resources, favoring those with strong sustainability credentials.

7.3 Limitations

The overall scope of this thesis is rather large, covering theories and tools to evaluate a company's climate efforts based on investments, an analysis of what tools are most suitable for the case company and also how to best implement these tools for the case company. Having a broad scope on the first research question risks making the analysis lack in depth. However, the analysis conducted for the two last research questions focused mostly on a single case company. With the insights from other Swedish energy companies, E.ON was analyzed, for which detailed results could be found and conclusions could be drawn. Still, this approach has resulted in a relatively narrow physical scope for the thesis. By concentrating solely on the energy sector, the potential for generalizing the findings to other industries may be limited. Additionally, as the study exclusively involves companies operating within Sweden, the applicability of the findings may not naturally extend to different regulatory and cultural contexts.

Furthermore, there is a gap in the third party opinions that part of the result is built upon. This is the result of not being able to conduct expert interviews and could impact the depth of the qualitative insights

and data collected. Consequently, the robustness of the results are affected. Nonetheless, the inclusion of the interviews with the three additional energy companies aims to give a sufficient compliment to perspective gained from the previous research and E.ON. Lastly, the dependability of the study could be questioned since a large part of the analysis has been based on interviews with the case company itself. Therefore, the results might be skewed to the biases of these people and it is difficult to ensure that the same results would have been obtained if other members had been interviewed.

7.4 Contributions to research and future research

This master thesis contributes to the research field of carbon assessment tools by presenting a more detailed analysis of the obstacles of implementing carbon reduction methods. While there are limited articles and case studies that explore the specifics of carbon assessment tools and their organizational implementation, this thesis introduces and elaborates on five distinct tools. The thesis not only identifies and describes these tools but also provides a practical implementation guide for two specific tools: the Carbon Emissions Ratio (CER) scale and a checklist. By applying these tools within the context of an energy company, the thesis offers a tangible, real-world application that can serve as a model for other organizations aiming to improve their investment transparency in terms of carbon impact.

Moreover, this study enhances the research field by demonstrating how companies can build awareness of carbon impact within their organization. It explores theoretical frameworks and applies them to a real-life scenario, a method previously limited primarily to internal carbon pricing methods. By extending the application of these frameworks, together with change management principles, to other carbon assessment tools, the thesis broadens the scope of potential organizational strategies for carbon management.

Given the limitations outlined in the previous sections, future research would be beneficial since it could further enhance the understanding and the effectiveness of carbon assessment tools in various

organizational contexts. Extending the research to include a variety of industries and geographical areas would help in generalizing the findings and adapting the tools to different regulatory and operational contexts, thereby broadening their usability and enhancing their applicability.

There is also a need for detailed research focused on developing specific frameworks for implementing carbon assessment tools. Refining existing methodologies, could increase their applicability across different organizations, making them more versatile and effective. Alongside this, investigating how companies throughout the entire value chain can collaborate could enhance transparency about carbon emissions. Such collaboration has the potential to lead to the development of more impactful assessment tools.

Lastly, there is a need for research into carbon accounting practices. This includes exploring and improving data collection methods, and developing integration strategies that align with organizational sustainability goals. Such innovations could revolutionize the way companies approach carbon accounting, leading to more effective sustainability practices.

7.5 Concluding remarks

As outlined in the first chapter, there is a critical need for robust measures to mitigate the effects of climate change, underscoring the urgency for companies to adopt sustainable practices. While this thesis has concentrated on the exploration and integration of carbon assessment tools into the investment procedure at E.ON, it is important to acknowledge that this approach, although necessary, is not sufficient on its own to combat the broader issue of global warming.

The insights obtained from this study may assist E.ON and similar companies in building awareness about their climate impact and initiating steps to mitigate carbon emissions. By integrating carbon assessment tools into their investment procedures, these companies can make more informed decisions that align with their sustainability goals, particularly their ambitions to achieve net zero emissions.

However, achieving net zero emissions is a complex challenge that goes beyond the adoption of carbon assessment tools.

Achieving net zero emissions will also require significant shifts in corporate culture, stakeholder engagement, regulatory compliance, consumer behavior and market dynamics. Therefore, while the implementation of carbon assessment tools is a crucial step towards limiting carbon emissions, it should be viewed as part of a broader, more comprehensive strategy to ensure a sustainable future.

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Appendix A – Internal interview guides

In the internal interviews, a handful of questions were asked at the beginning or end of each interview. To avoid repetition, these questions are presented in this segment and can be considered to be included in all the internal interviews.

Initial Questions:

- Is it okay if we record this conversation?
- Would you like to tell us a bit more about yourself and your role here at E.ON

General Questions:

- What comes to mind when we say "tools for sustainable investments"?
- What do you think such a tool can contribute?
- What do you think could be problematic about integrating a sustainability tool into the investment process?
- What do you think are important aspects when such a tool is designed?
- How do you think such a tool can be best integrated/implemented at E.ON?
- Is there anything you think we have forgotten to ask that you would like to talk more about?

Internal interview 1 - Sustainability controller

Sustainability at E.ON:

- What types of sustainability data do you collect today?
    - How do you collect the data?
    - Is there any activity/department for which you do not calculate carbon emissions, or lack data?
- What types of climate calculations are you currently working with?
    - What does the process look like?
    - Who performs the calculations?
    - Does it differ for different departments, scopes?
    - What are your ambitions when it comes to climate calculations?
- Who drives the sustainability work at E.ON?
- Who is involved in the decision-making?
- How much organizational work do you think is required within EON to achieve your sustainability goals?
- We have read some about the concept of carbon accounting, is that something you have heard of?

EU Taxonomy:

- How do the new EU directives, such as CSRD, affect E.ON?
- How does it affect your work as a sustainability controller?

Internal interview 2 - Senior financial controller

Investment process:

- What types of investments do you handle?
- What criteria do you assess your investments based on?
    - For example, profitability, net present value analysis, payback, climate impact, strategic alignment.
- Is climate impact used as a criterion today?
- Describe the steps of the investment process and the decisions made at each step.
    - Does it vary depending on the department?
- Which different actors influence the decision-making process?
- Amanda briefly mentioned that you have a program called Antura, how is this being used in the process today?

- What are the advantages/disadvantages of this program?
- What is the process for providing feedback on made investments?

Internal interview 3 - Senior investment and digitalization controller

Investment process:

- What types of investments do you handle?
- What criteria do you assess your investments against?
    - For example, profitability, net present value analysis, pay-back, climate impact, strategic alignment
    - Standard and Sustainable? (3 stars)
- Is climate impact used as a criterion today?
- Who in the decision-making process is responsible for conducting a climate assessment?
- At what stage of the investment process do you think a sustainability assessment can be integrated, in gate 1 or gate 2?
- What does the feedback process look like for investments made with regard to sustainability?

Internal interview 4 - Project manager

Investment process:

- What types of projects/investments do you work with?
- What criteria do you assess your investments based on in a project?
    - For example, profitability, net present value analysis, payback, climate impact, strategic alignment.
    - Standard and Sustainable? (3 stars)
- Is climate impact used as a criterion today?
- Who in the project is responsible for conducting a climate assessment?
    - Does it run through you as the project manager?
- At which stage of the investment process do you believe a sustainability assessment can be integrated, in gate 1 or gate 2?
- What does the feedback process regarding made investments look like considering sustainability?

    - How would you like it to be?

Internal interview 5 - Project manager

Investment process:

- What types of projects do you work with?
- What criteria do you assess your investments based on in a project?
    - For example, profitability, net present value analysis, payback, climate impact, strategic alignment.
    - Standard and Sustainable? (3 stars)
- Is climate impact used as a criterion today?
- Who in the project is responsible for conducting a climate assessment? Does it go through you as the project manager?
- At which stage of the investment process do you believe a sustainability assessment can be integrated, in gate 1 or gate 2?
- What does the feedback process regarding made investments look like considering sustainability?
    - How would you like it to be?
- We spoke with your colleague who showed us how to incorporate effects into Antura, and there one could possibly have a metric to measure/monitor climate impact.
    - What do you think about that?
    - Are there other ways that could be better?

Internal interview 6 - Global category manager

Procurement process:

- What types of procurement/acquisition do you work with?
- What criteria do you assess your investments/procurements based on in a project?
    - For example, price, location, supplier relationship, climate impact, strategic alignment.
    - Standard and Sustainable? (3 stars)
- Is climate impact used as a criterion today? If not, how do you think climate impact could have been integrated into the procurement process?

- Do you think it would be possible to request CO2 data from suppliers, for example, emissions per meter of distribution pipe in a quote?
- Who is responsible for conducting a climate assessment?
    - Does your role have a part of the responsibility in this?
- What does the feedback process look like regarding sustainability considerations?
    - How would you like it to be?
- How do you think your work would be changed if a tool to evaluate projects and investments from a climate perspective had been implemented?

Internal interview 7 - Sustainable procurement manager

Sustainable investments at E.ON:

- What types of investments do you manage?
- What criteria do you assess your investments based on?
    - Is climate impact used as a criterion today?
    - Standard and Sustainable? (3 stars)
- Who in the decision-making process is responsible for conducting a climate assessment?
- At which stage of the investment process do you believe climate assessment can be integrated?
- Should all individual investments be evaluated or should the portfolio be looked at as a whole?
- We've heard that your division has carried out various pilot projects, would you like to tell us more about these?
- What does the feedback process look like for these projects?

Internal interview 8 - Senior investment controller

Investments at E.ON:

- What types of investments do you handle?

- What criteria do you assess your investments based on?
    - Is climate impact used as a criterion today?
    - Standard and Sustainable? (3 stars)
- What methods are used to determine climate impact?
- Who in the decision-making process is responsible for conducting a climate assessment?
- At which stage of the investment process do you believe climate assessment can be integrated?
- Should all individual investments be evaluated or should the portfolio be looked at as a whole?
- We've heard that your division has carried out various pilot projects, would you like to tell us more about these?
- How do you balance sustainability/climate impact within CAPEX governance?
- What does the feedback process look like for these projects?

Appendix B – External interview guides

External interview 1 - Company 1

Initial Questions:

- Would you like to tell us a bit more about yourself and your role at Company 1?

Previous Thesis Work:

- How has the work done in the thesis previously conducted affected your company?
- Has it had an effect on daily operations?
- Has it sparked discussions within the company or highlighted any issues?
- Has it provided a mandate to push for change?
- Has it had other impacts?
- Have you implemented any of the methods presented in the work?
- If yes:
    - Which methods have you implemented and how far have you progressed with them?
    - How have you proceeded and who within the organization has been involved?
    - What have been the biggest challenges?
- If no:
    - Why not?
    - What have been the biggest barriers?
    - Do you plan to implement anything in the future?

Generally about Investments at Company 1:

- What criteria do you currently assess your investments against in a project?
    - For example, profitability, net present value analysis, pay-back, climate impact, strategic alignment
    - To what extent is climate impact used as a criterion today?
- What is the difference between Scope 1 and Scope 3 investments?
- What does the feedback process look like for investments made with regard to sustainability?
    - How would you like it to be?
    - What factors would be important to include in such an evaluation?

External interview 2 - Company 2

Initial Questions:

- Would you like to tell us a bit more about yourself and your role at Company 2?

General about Investments at Company 2:

- What criteria do you currently assess your investments against in a project?
    - For example, profitability, net present value analysis, pay-back, climate impact, strategic alignment
- Does the assessment differ between different types of investments?
- What is the difference between Scope 1 and Scope 3 investments?
- Who decides which investments are to be made?
    - Does this apply to all investments or only selected ones?
    - How is this division made?

CO2 Emissions as a Criterion:

- How do you calculate emissions associated with an investment?
    - Have you explored different methods for this?
    - What are the difficulties with this?
    - Is it difficult to obtain climate data?
    - Who performs the climate evaluation (creates the basis)?

    -
- What does the feedback process look like for investments made with regard to climate impact?
    - How would it ideally look?
    - What factors would be important to include in such an evaluation?

Internal Carbon Pricing:

- Does Vattenfall use an internal price on carbon dioxide?
- If yes:
    - Can you describe how ICP is used at Vattenfall?
      Are shadow prices or internal CO2 fees used, or another method?
    - What system boundaries are used (Scope 1, 2, 3)?
    - How far have you come with the implementation of ICP?
    - How has the implementation been?
    - Have you hired new people to work with this?
    - Are there other resources you have needed?
    - How has the initiative been received in the organization?
    - What challenges have you seen so far with the implementation?
    - If you could redo something during the implementation, what would it be?
    - Are there scenarios where you cannot let the new price resulting from the ICP rule apply?
    - Did you consider any alternatives to ICP when you explored whether to introduce the measure?
    - Is ICP also used for monitoring projects and at the organizational level or just in investment decisions?

External interview 3 - Company 3

Initial Questions:

- Would you like to tell us a bit more about yourself and your role at Company 3?

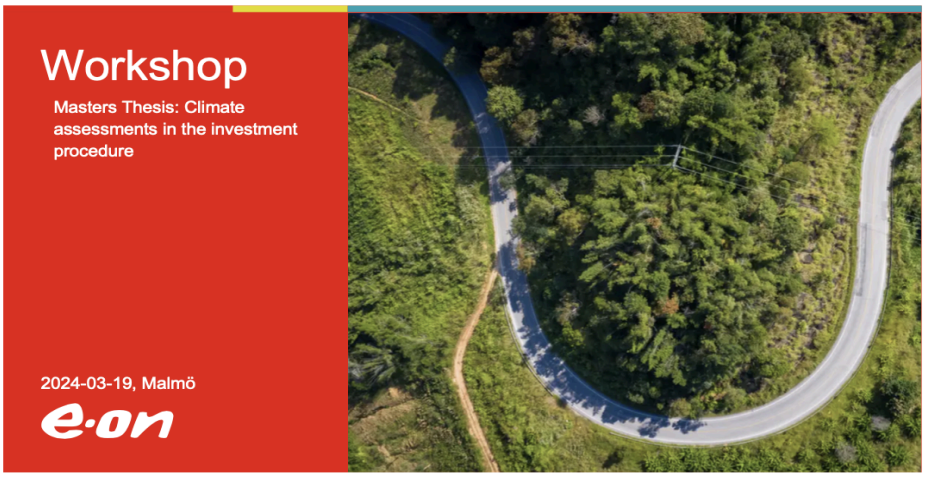
General about Investments at Company 3:

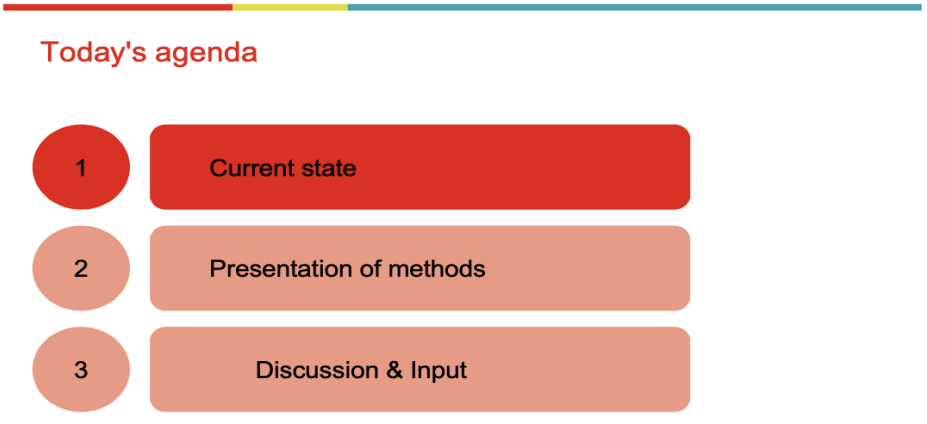
- What criteria do you currently assess your investments against in a project?
    - For example, profitability, net present value analysis, pay-back, climate impact, strategic alignment
- Does the assessment differ between different types of investments?
- What is the difference between Scope 1 and Scope 3 investments?
- Who decides which investments are to be made?
    - Does this apply to all investments or only selected ones?
    - How is this division made?

CO2 Emissions as a Criterion:

- Do you calculate emissions associated with an investment?
    - Have you explored different methods for this?
    - What are the difficulties with this?
    - Is it difficult to obtain climate data?
    - Who performs or could perform the climate evaluation (creates the basis)?
- What does the feedback process look like for investments made with regard to climate impact?
    - What aspects are considered?
    - How would it ideally look?
    - What factors would be important to include in such an evaluation?

Appendix C – Workshop material





Current state

Today's meeting

Literature review

- Carbon emissions reporting
- Climate accounting methods
- Decision making tools
- Change management

Workshop: Tools

- Present and validate findings
- Gather insights

Final presentation

- Recommendation of tools and implementation plan
- Road map

Interviews

- Internal
  - EIS
  - Navirum
  - Energy Networks
- External
  - Experts
  - Energy companies

Implementation Plan

- Iterate and evaluate alternatives
- Develop implementation plan for climate assessment tools

Interviews

Internal

Interviews have been conducted at EIS, Navirum and Energy Networks.

Divisions Interviewed are:

- Sustainability
- Procurement
- Finance
- Energy Networks:
  Sustainable Procurement
  Finance

External

To gain insights from other firms and experts, external interviews have been conducted with:

- Vattenfall
- Öresundskraft
- Jönköping Energi
- Upcoming: Susanne Arvidsson (Associate professor at Lund University)

Main findings from EIS/Navirum split into 3 common themes

Important aspects

Comparability
- CO_2 → financial terms
- Collect a solid base of data
- Actively explore and create alternatives

Complexity
- Simplicity is preferred to ease implementation

Benefits
- Visualizes the effects of climate actions
- Accustoms people to work with climate data and engages them to do more

Implementation

Where in the process?
- Before, or in Gate 1

Where to start
- Recurring needs and high impact
- Critical to involve procurement division

Format
- Pilot projects
- Standard parameters

Follow-up
- Define clear KPIs that can easily be evaluated

Barriers

Resources
- There is not enough time and resources
- Who will carry the cost of climate improving measures?

Data/knowledge
- Not enough climate data
- Difficult to interpret climate data

Managing change
- Show advantages to facilitate change
- Clear directives are needed

Findings from Energy Networks

Current methodologies

Current methods
- Gather data and visualize emissions per project
- Both real and estimated emissions factors
- Abatement cost: SEK/CO_2

Working closely with suppliers
- Requirements in the framework agreements
- Finding green alternatives

Next steps
- Compare CO_2 impact of alternative solutions
- Translate into monetary terms – ETS?
- Start with biggest impact areas

Facilitators

Pilot projects
- Goal to implement 6 pilots in 2023
- Building a sustainable station

Engage the whole organization
- Emissions limit for all of Energy Networks
- Sustainability requirements in all procurements

Positive effects
- Sustainability receives greater mandates and resources
- Will hire a new employee to the sustainability department
- Accustoms to working with climate data

Barriers

Uncertainty
- Traceability of upstream emissions
- How to assure actual benefits?

Resources
- How to balance availability, capacity, profitability and sustainability with limited resources?
- Not enough alternatives on the market

Directives
- Have to come from top management
- To give ownership and greater mandate to procurement

Main findings from external interviews

Öresundskraft

Existing tools
- A "dummy" climate parameter is used in the decision process
- Based on "typical values"

Benefits
- Increased knowledge regarding climate impact
- Small steps accelerate improvements and change

Barriers
- Follow-up to create legitimacy in decision making
- Access to data and calculations
- Directives are needed from top management

Vattenfall

Existing tools
- Tool which looks at three aspects
- System that evaluates their investments
  - The assess-bucket
  - CO2-intensity
- Abatement-costs
- Strict requirements for suppliers

Benefits
- Ensures suppliers sustainability work
- Climate pervades all operations and decisions

Barriers
- Access and quality of data
- Less power over suppliers far upstream

Today's agenda

1. Current state
2. Presentation of methods
3. Discussion & Input

Overview of climate assessment tools

Shadow Price	Carbon Fee	Carbon Emission Ratio	Scale - Carbon Emission Ratio	Checklist (3-star rating)

Internal Carbon Pricing Methods (ICP)

Internal Carbon Price - Shadow Price

Description	Usage area	Advantages	Challenges
Hypothetical price of carbon emissions e.g. 1000 Sek per tonne of CO_2e Lets the user put a price on carbon into e.g. project budgeting The most common ICP method At least €50-100 per tCO_2e by 2030*	Financial decision making such as investment appraisal, project planning and budgeting Sensitivity analysis for the risk/cost of actual external carbon prices	Comparative metric between investments and projects Requires little change in day-to-day operations Promotes low-carbon alternatives Easily communicated Easily implemented	Difficult to set the perfect price Does not necessarily have an impact decision making No short term benefits

*Source: The world Bank

Example of Shadow Price - Suez

- In 2016, Suez incorporated an internal carbon price into the business plans of its investment projects, based on pricing trends taken from domestic and/or European regulations (e.g. €30 per tCO2 e in the European Union in 2030). To also include the expenditure of their R&D department, Suez implemented a second shadow price, with a significantly higher level. This was done to ensure that future projects was steered in the direction of low carbon alternatives.
- The programme is one of many initiatives to create visible and foreseeable price signals for carbon over the long-term, encourage the development of circular economy solutions and promote innovative climate financing in the waste management sector.
- In order to raise awareness among the groups employees and customers, Suez systematically calculated the "carbon goodwill" attached to its solutions to highlight their climate efficiency.

Source: Institute for Climate Economics

Internal carbon price - Carbon fee $

Description	Usage area	Advantages	Challenges
Actual price on carbon emissions e.g. 1000 Sek per tonne of CO_2e Costs are paid to an internal fund inside the organization The fund can be used to invest in sustainable projects Commonly €5-20 per tCO_2e*	Financial decision making such as investment appraisal, project planning and budgeting Enables effective and transparent reporting	Has direct impact on investment decisions Promotes low-carbon alternatives Creates funding for company-wide or department specific, sustainability projects e.g. pilots Easily communicated	Difficult to set a reasonable price More complex to implement, system needs to be set up Might disfavour departments with naturally higher carbon intensity Risk of misallocation of resources

*Source: Carbon Credtis

Example of Carbon Fee: Société Générale

- In 2011, the french bank Societe Generale launched its internal Carbon Fee program, charging its business units €10 per tCO_2e on a yearly basis. The tax enables teams to gain awareness of the carbon impact of their day-to-day behaviour, encourages them to reduce their impact, and provides decision-making guidance
- Between 2013 and 2016, the fund redistributed €3.1m per year to a total of 119 initiatives. This lead to a decrease of 4700 tCO_2e per year (i.e. 1.4% of the group's emissions) and recurring average savings of €30 million per year for the group
- The proceeds from the internal carbon tax are redistributed via the company's "Environmental Efficiency Awards", which reward sustainable initiatives. The amount of each award can cover up to 100% of implementation costs (up to a limit of €200,000 per initiative), thereby providing an additional budget for implementing new reduction initiatives

Source: Institute for Climate Economics

Carbon Emissions Ratio ÷

Description	Usage area	Advantages	Challenges
Represents carbon emissions per unit of economic or physical output: CO_2 / X Examples of denominators: - Capital employed - Turnover - KwH Widely used in sustainability reporting	Follow up and evaluation of business units or E.ON as a whole Comparison between Investments / projects / business units	SImplifies comparison between activities or periods of time Widely used for follow up of the whole organization Easy to understand Easy to communicate Easy to implement	Based on historical data, difficult to translate into future impact Capital employed as denominator disfavours cheap solutions Turnover as denominator increases sensibility to price fluctuations

Carbon Emissions Ratio - Scale

Description	Usage area	Advantages	Challenges
Puts the Carbon Emissions Ratio in relation to a predefined scale Investments categorized as red, yellow and green Red and yellow projects would need more thorough evaluation	Highlighting the climate impact of investments / projects in decision making Separate “no brainers” from projects that need more thorough evaluation	Puts the climate impact in relation to an established baseline Motivates further assessment of carbon intensive investments / projects Easy to understand Easy to implement	Difficult to define levels of the scale and requires periodic re-assessment Does not necessarily have a impact on decision making Builds upon the Carbon Emissions Ratio

Checklist - (Based on 3-star rating)

Description	Usage area	Advantages	Challenges
A checklist based on the already used 3-star rating Can be detailed for specific types of projects or have a wider appliance Can be linked to hurdle rate to penalize less sustainable projects	Same usage area as 3-star rating, Identify Climate impact to guide decision-making Follow up and progress tracking Filled out by the project manager	Flexible: more aspects can be added to broaden focus, for example biodiversity Highlights potential improvement areas Easy to use Easy to implement	Risk of subjective assessment due to qualitative criteria No direct connection to financial figures All investments or those over a certain threshold, e.g >10M?

Example: Potential checklist for a distribution project

Is the project aligned with EU-taxonomy? (Fills criteria of the 3-star rating?)	Yes		No
Have climate-improving alternatives been explored?	Yes		No
Does the contractors climate goals (netzero) align with E.ON's?	Yes, for ALL Suppliers / Contractors	Yes, for SOME Suppliers / Contractors	No
Is the emissions data associated with the project accessible?	Yes, for ALL activities / products	Yes, for >50% of activities / products	Only for <50% of activities / products
Has the project been designed to minimize climate impact?	Yes, for ALL activities	Yes, for >50% of the activities	Only for <50% of activities
Choice of materials	Fully substituted	Partly substituted	Traditional
Choice of fuel for machines	Fully carbon neutral (Electric)	Partly carbon neutral (Biofuel)	Traditional
Has any other climate requirements been put into the contract?	Yes		No

Can be made in excel to automate score from pre-defined alternatives

Should come with guiding documents

Coffee break and leg stretcher!

Today's agenda

1. Current state
2. Presentation of methods
3. Discussion & Input

Discussion of climate quantitative assessment tools

Shadow Price	Carbon Fee	Carbon Emission Ratio	Scale - Carbon Emission Ratio	Checklist (3-star rating)
Hypothetical price of carbon emissions e.g. **1000 Sek per tonne of CO_2e**	**Actual price** of carbon emissions e.g. **1000 Sek per tonne of CO_2e**	Represents carbon emissions **per unit** of economic or physical output	Puts the Carbon Emissions Ratio **in relation to a predefined scale**	**Qualitative checklist** that scores projects based on **sustainability impact**

Discussion of quantitative tools

General Input

- What should be accomplished with a climate assessment in the investment process?
- How should you prioritize user-friendliness, accuracy, or efficiency in a tool? How might this impact their adoption within the organization?

Tool specific

- What are the pros & cons of the presented tools? What are the specific features of the tool that contributes to its effectiveness / in-effectiveness?
- What challenges will employees encounter while using the different tools, and how might these challenges be addressed in the implementation process?

Implementation

- What resources or support will be necessary to effectively implement and maintain these tools over the long term?
- What suggestions do you have regarding the integration of these tools into E.ON's existing workflow and processes?

Discussion of qualitative assessment tool

Shadow Price	Carbon Fee	Carbon Emission Ratio	Scale - Carbon Emission Ratio	Checklist (3-star rating)
				
Hypothetical price of carbon emissions e.g. **1000 Sek per tonne of CO_2e**	**Actual price** of carbon emissions e.g. **1000 Sek per tonne of CO_2e**	Represents carbon emissions **per unit** of economic or physical output	Puts the Carbon Emissions Ratio **in relation to a predefined scale**	**Qualitative checklist** that scores projects based on **sustainability impact**

Discussion of qualitative tool

Tool specific

- What are the pros & cons of the presented tool? What are the specific features of the tool that contributes to its effectiveness / in-effectiveness?
- What challenges will employees encounter while using the tool, and how might these challenges be addressed in the implementation process?
- Should a weighted or point based system be used? How shall the points / weights be determined?
- What projects are the most suitable to start with? Where would a checklist have the most impact?
    - Who will be responsible for filling out the checklist?

Implementation

- What resources or support will be necessary to effectively implement and maintain these tools over the long term?
- What suggestions do you have regarding the integration of these tools into E.ON's existing workflow and processes?
- How should the checklist be presented? Excel? Word document? Other?