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A solution for pollution

A case study of how carbon accounting is performed and influenced by its intended use

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Abstract

With consideration to the rising demand for sustainability reporting and transparency in the documentation of environmental progress, this thesis provides an in-depth investigation of the carbon accounting process. To answer how carbon accounting is performed and how the design of the process is influenced by its different areas of use, a qualitative interview-based case study has been performed at a Swedish construction company. The analysis is based on a framework developed through a combination of the ideas by Kazemian et al. (2022) and Bowen and Wittneben (2011), structuring the findings according to the different phases of the process and providing an analysis assessing its functionality. The findings show that the accuracy of results is valued highly internally in the company and among external stakeholders, resulting in a trade-off dilemma between focusing on providing accurate information and focusing on efforts to reduce emissions. Furthermore, the findings show that a challenge that needs consideration is the acquisition of comparable results across firms, an ideal that still needs to be realised.

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Keywords: carbon accounting, data collection, comparability, accuracy

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1. Introduction

1.1 Background

As the climate crisis is becoming increasingly urgent to address, and as people are becoming increasingly aware of these environmental issues, companies are expected to contribute by making their businesses more sustainable. Companies are not just legally obliged to adhere to these expectations to a certain extent but are also pressured by stakeholders other than the governments in the countries in which they operate (Gibassier and Schaltegger, 2015).

Sustainability reports as a common practice emerged mainly in the 1990s after companies became increasingly aware of their environmental impacts (Contrafatto, 2015). In 1995, the World Business Council on Sustainable Development was formed and constructed the Global Reporting Initiative (GRI), which aims to set guidelines for performing sustainability reporting (Pitrakkos and Maroun, 2020). Initiatives such as this significantly increased non-financial reporting worldwide (Pitrakkos and Maroun, 2020). These reports have been refined over the years to include more and more aspects, such as greenhouse gas emissions and water usage (Contrafatto, 2015). The trend has, in recent years, given birth to the term "carbon accounting", which can be defined as the collection and reporting of data on a company's greenhouse gas emissions throughout its entire value chain (Kazemian et al., 2022). In some cases, this also involves assigning these emissions a monetary value and cost (Kazemian et al., 2022).

The construction industry has a significant impact on the environment, and in 2018 the construction and operation of buildings were responsible for 40% of carbon dioxide emissions from energy-use worldwide (Bowen and Wittneben, 2011). To investigate further how this vital industry accounts for their emissions, this study will perform a case study of one Swedish construction company, which will be referred to as "Gemstone" for confidentiality reasons.

1.2 Purpose and Research Question

It has been found that there is a positive correlation between carbon reporting and carbon performance (Kazemian et al., 2022), making the practice a good development in sustainability reporting from an environmental perspective. However, there are different views of what carbon

accounting entails conceptually. Ascui and Lovell (2011) mention five different and contesting frameworks, each with the purpose of describing what carbon accounting is and how it should be carried out. Each framework defines specific terms and boundaries, leaving room for uncertainty around the definition and interpretation of this practice (Ascui and Lovell, 2011). A more recent study also showed that there are different approaches to the scope of the practice, as some companies apply carbon accounting only to specific projects or processes in their operations. In contrast, other companies include their entire value chain in the calculations (Kazemian et al., 2022).

As previous research indicates a prevailing uncertainty around the definition of carbon accounting as a concept and as a practice, and as there are different views on the extent to which it should be applied to the activities of a company, it seems relevant to investigate further *how* companies perform carbon accounting. Furthermore, bearing in mind the current sustainability trend and demand from different stakeholders on sustainable business performance, the second purpose of this paper is to explore how carbon accounting is used internally within the organization and externally in relationships with different stakeholders. Gibassier and Schaltegger (2015) mention that different stakeholders have different expectations and needs of carbon accounting, making it necessary for companies to consider different objectives concerning the use of the emissions report. This brings forward the research question that this paper aims to answer:

How do companies perform carbon accounting, and how does the intended use of the results influence this process?

1.3 Contribution

We contribute to this research field with an additional case study of a company performing carbon accounting to add a further example of what the process can entail from a Swedish corporate perspective. As mentioned in the previous section, there are seemingly significant discrepancies in the current research field on carbon accounting. There are differences in how the term is interpreted and what should be included in the data collection for carbon accounting. Our contribution is especially relevant because of the environmentally impactful industry it studies.

We add to pre-existing knowledge about carbon accounting by highlighting its current main challenges and what guidance might be needed to maximize the utility of the process. To extend the contribution further, we include the perspective of how carbon accounting is influenced by the intended use of the results produced in the process. As mentioned, companies have been known to adapt their accounting practices according to different stakeholder needs. Our study contributes insight into how different areas of use influence carbon accounting.

2. Theory and Literary Review

2.1 Introduction to the process of accounting for emissions

This section aims to provide context for the field of carbon accounting, clarifying how it emerged and what requirements exist for the practice in Sweden both as a result of national legislation and as a result of membership in the European Union.

2.1.1 Carbon Markets

To understand the concept of carbon accounting, the carbon markets must first be introduced for contextual understanding, as their emergence was a considerable contribution to the quantification and reporting of greenhouse gas emissions (Engels, 2009). There are different types of carbon markets. However, a common approach is “cap-and-trade” (MacKenzie, 2009). This idea originates from the Nobel Laureate Ronald Coase and entails that companies are granted specific rights to emit greenhouse gases from their operations (MacKenzie, 2009). These rights represent a specific volume, and the idea is that the system will put a cap on the total amount of emitted gases from the companies participating in that specific carbon market (MacKenzie, 2009). The trading aspect comes into play when a company either emits less or more than what their rights allow them to, as they can, in that case, trade these rights with another company (MacKenzie, 2009). Suppose they need to buy additional emission rights. In that case, this becomes a direct cost for the company, and using your rights becomes an opportunity cost as these could have otherwise been sold (MacKenzie, 2009). Through this system, greenhouse gasses are consequently given a monetary value that can and should be accounted for.

The current carbon markets have their starting point in the emergence of sulphur trading in the United States in 1995 (MacKenzie, 2009). The sulphur trading system reduced emissions considerably and was considered an enormous success (MacKenzie, 2009). Not much later, in 1997, came the second significant development for the carbon markets: the Kyoto Protocol (MacKenzie, 2009). It included several industrialized countries that agreed to reduce their greenhouse gas emissions by different percentages until the commitment period in 2008-2012 (MacKenzie, 2009). The protocol was structured according to the cap-and-trade approach, enabling countries to buy and sell emission rights with each other (MacKenzie, 2009).

The European Union Emissions Trading Scheme (EU ETS), introduced at the beginning of 2005, was an additional and extensive advancement for carbon markets (MacKenzie, 2009). Abandoning their initial idea of harmonized carbon taxes across member states, the EU opted for introducing a carbon market with a cap-and-trade system (MacKenzie, 2009).

2.1.2 National Legislation

According to the Swedish law for annual reporting (“Årsredovisningslagen” in Swedish), it is mandatory to produce a sustainability report for companies that have, on average, exceeded 250 employees, have a balance sheet larger than 175 million Swedish SEK and have a net sales figure exceeding 350 million SEK over the last two accounting years (Finansinspektionen, 2022). The sustainability report demanded from companies fulfilling the above criteria should include a display of relevant environmental, social and governance (ESG) factors for their business operations and should also consider the risks related to sustainability that they are subject to. This law also states that all relevant companies should comply with the requirements of the EU Taxonomy and perform their sustainability reporting following these directives (Finansinspektionen, 2022).

On the first of January 2022, additional requirements of climate declarations were introduced for the construction of new real estate (Boverket, 2021). This can be referred to as the Climate Declaration Law (“Klimatdeklarationslagen” in Swedish) and concerns calculations and reports of the climate impact of the building process and must be submitted by companies in the sector

to the Swedish Ministry responsible for the construction of the real estate, called Boverket. The building process that should be accounted for involves the extraction of raw materials, construction of building products, the work at the construction sites and all transportation connected. To compile this information, the companies need data on materials used, type of energy and amount of energy used, which is referred to as a resource compilation (Boverket, 2022).

2.1.3 The EU Taxonomy

In the last few years, there has been a significant increase in the number of indexes and classification systems around sustainability, creating issues with the comparability and verifiability of firms (Schütze and Stede, 2021). Therefore, the European Union initiated the EU Taxonomy to ensure a level playing field for companies using sustainability as leverage for business purposes (Envoria, 2022). The EU Taxonomy intends to create equal competition and legal certainty for all companies operating in the EU member states (Envoria, 2022). Essentially, this involves regulations and a framework for when a company can be classified as sustainable or environmentally friendly, ensuring fairness when a company receives more investors or other favourable conditions because of sustainability (Envoria, 2022). The framework provided by the EU Taxonomy includes six environmental objectives: [1] Climate change mitigation, [2] Climate change adaptation, [3] Sustainable use and protection of water and marine resources, [4] Transition to a circular economy, [5] Pollution prevention and control and [6] Protection and restoration of biodiversity and ecosystems (Envoria, 2022). A company receives a sustainable classification by the EU Taxonomy when contributing to one criterion while not harming any other criteria.

The core idea of the EU Taxonomy is that an increased obligation for transparency in the communication of non-financial information will encourage the private sector to make sustainable investments and decisions for their company, as they will be awarded a universal classification (Schütze and Stede, 2021). Furthermore, the EU Taxonomy can be used to evaluate an entire company and a potential investment decision to see whether it meets the standards.

2.1.4 The Green House Gas Protocol

As has been made clear, there exist significant discrepancies in how firms approach defining, calculating, and reporting greenhouse gas emissions. In order to create a standard for how to perform this practice, the World Resource Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) formed the Greenhouse Gas Protocol (Pitrakkos and Maroun, 2020). The first version of the GHG Protocol was published in 2001 and was updated most recently in 2015. The GHG Protocol has established structured frameworks to be used globally, in both private and public sectors, to measure and manage greenhouse gases (WBCSD and WRI, 2015). By dividing emissions into three scopes based on whether they are direct or indirect, the GHG Protocol has created a structure that increases transparency and provides utility for different types of organizations and goals. Scope 1 incorporates emissions from sources owned or controlled by the company, such as vehicles, combustion in boilers or chemical production (WBCSD and WRI, 2015). Scope 2 covers emissions from the electricity that the company is purchasing and consuming, therefore often originating from the production sites of the used electricity. Finally, scope 3 incorporates all other indirect emissions by the company, such as from the production of the materials that the company is buying, transportation of the fuels they have purchased and the emissions resulting from the usage of the products or services that the company is selling (WBCSD and WRI, 2015).

2.2 Previous Research

This section aims to provide information about the results that have already been displayed in previous research on carbon accounting and what conclusions have been drawn from that. The following section thus identifies how companies have previously approached carbon accounting, their methods, and how they have defined the process.

2.2.1 Understanding carbon accounting

According to Bowen and Wittneben (2011), carbon accounting is defined as the measurement, collection, and communication of data conveying carbon emissions. Carbon dioxide emissions are similar to other accounting items in that they are quantifiable but different in that they are not assigned a monetary value unless the relevant organization is a member of a carbon market.

Ascui and Lovell (2011) clarify that the word “carbon” in combination with the word “accounting” broadens the definition of the term to include not only carbon dioxide, as the term itself might imply, but other greenhouse gasses as well. According to the study by Ascui and Lovell (2011), the differing and sometimes partly conflicting definitions of carbon accounting can be understood through framing. They argue that carbon accounting can be framed, viewed, and understood in five different ways depending on what type of actor makes the definition.

The first one of their frames, physical carbon accounting, views the practice in a scientific sense as a physical measurement (Ascui and Lovell, 2011). The second frame, political carbon accounting, produces regulations and methods for this process that are politically acceptable, which causes them to shift focus away from physical measurement towards the surveillance and the report part at national levels. The third frame, the market-enabling carbon accounting, focuses on the perspective of carbon markets, the trading possibilities of different emission rights and that these should be the regulatory tools for approaching calculations and reports of emissions. The fourth frame, the financial carbon accounting, focuses on the monetary value consequently assigned to emissions due to being a part of one of these carbon markets, viewing carbon as an item for the financial reports. Finally, the fifth and last frame, the social/environmental carbon accounting, considers the broader context of environmental and social accounting, recognizing that the carbon footprint originates from the ecological footprint. This broader term incorporates more aspects without which comparability in carbon accounting can be compromised (Ascui and Lovell, 2011).

2.2.2 Performing Carbon Accounting

Gibassier and Schaltegger (2015) divide carbon accounting into three different versions: organizational carbon accounting, product carbon accounting and project accounting.

Organizational carbon accounting measures a company's carbon emissions as a legal entity and sets reduction targets. The GHG Protocol is the most widely used standard for organization carbon accounting. Although there are others to choose from, all approaches incorporate direct and indirect emissions according to the three scopes (Gibassier and Schaltegger, 2015). Product carbon accounting is based on a life cycle assessment approach (LCA) that measures carbon emissions for each product. This approach is used internally in design processes to make optimal

choices and externally to obtain eco-labels to communicate to consumers. Mainly two methods are used for this purpose: the Publicly Available Specification (PAS) 2050 from the British Standards Institute and the Product Life Cycle Standard from the GHG Protocol Initiative. Lastly, project accounting is a form of carbon accounting that focuses on calculating carbon emissions for a particular project, either to offset this or to calculate emission impact or reductions of performing a specific investment (Gibassier and Schaltegger, 2015). Most firms perform organizational carbon accounting as it is widely incorporated into legislation worldwide. However, consumer-oriented companies perform product carbon accounting for internal decision-making processes (Gibassier and Schaltegger, 2015).

Another aspect to consider when approaching emissions reporting is how to account for emissions of different greenhouse gases in a way that makes these quantifications comparable in terms of their impact on global warming (MacKenzie, 2009). The Intergovernmental Panel on Climate Change (IPCC) was created in 1988 by the World Meteorological Organization and the United Nations Environmental Program and tasked with producing scientific knowledge about climate change (MacKenzie, 2009). To address the issue of comparability of the climate impact of different greenhouse gases, the IPCC introduced the Global Warming Potential (GWP). This index enables the performance of this task. The GWP depends on several factors, such as the lifetime of the gas in the atmosphere, its molecular weight and the relevant period representing when the climate effects are of concern. The index is calculated with a mathematical formula. However, the IPCC provides estimates for several greenhouse gases and conventionally, these estimates translate all emissions into carbon dioxide to make the calculations more comparable (MacKenzie, 2009).

Maree Vesty et al. (2015) explore the carbon accounting process further in their study of an Australian water utility. This company use carbon accounting results in investment decisions by assigning a monetary value to emissions, thereby balancing the evaluation of a project with an environmental perspective. This company had developed a Sustainability Assessment Scorecard (SAS), a tool for performance measurement that included three categories for their most relevant performance indicators: "Financial", "Social", and "Environmental". Under the "Environmental" category, greenhouse gases were calculated as physical units and then assigned to one of the

three scopes. The "Social" aspect was not numerical but described the social implications of emissions, such as risks, reputation and the trade-off between the cost and benefit of reduction efforts. In the "Financial" section, the physical units of greenhouse gases were converted to an accounting number. When evaluating different decisions, this monetary cost could be considered in net present value (NPV) calculations. To evaluate whether a project should be undertaken, the measures from the SAS model are considered using multi-criteria analysis (MCA). The MCA regulates the NPV calculation by including the qualitative aspects of sustainability and local risk factors to obtain a more inclusive representation of the project's value (Maree Vesty et al., 2015). Since the company operates a water utility, its primary emissions come from the energy usage of the pumps. Therefore, when quantifying their carbon emissions, this process is their area of focus, and the quantification includes a few steps before reaching a specific number. Firstly, they decide on the project's limits so that only the relevant emissions can be extracted. Secondly, the accountants had clear and available information on the energy use by the pumps, measured in megawatt hours. They could proceed by using an emissions factor to convert the energy measurement. The emissions factor was 1.22 and came from the state's source, enabling the company to calculate the carbon equivalent units of their energy consumption. This number could then be multiplied by the cost of carbon to be readily insertable in the NPV calculations (Maree Vesty et al., 2015).

In a study of how cities account for their emissions, Mia et al. (2019) find that an essential aspect of carbon accounting is ensuring there is no time gap between collecting the emissions data and including it in a report. They found the time gap to be an issue for many of the cities they studied and argued that this results in outdated information that is no longer applicable. Furthermore, a crucial part of counting carbon is that it is done according to a standardized method to create comparability between different actors (Mia et al., 2019). The study found that the cities approached the emissions calculations in several ways, using standards from different organizations that could provide different aggregate amounts. They also mention that some decided to exclude scope 3 emissions entirely, leaving out a large portion of them. The reason for the exclusion of scope 3, according to their findings, was that the cities in question lacked the capabilities needed, as they found these calculations to be overly complex (Mia et al., 2019). Finally, the study mentions that sustainability indicators constitute a robust approach to solving

the issue of comparability but states that there needs to be more adequate indicators for this purpose that are well-established and globally standardized.

Georg and Justesen (2017) explore the calculative process in carbon accounting and the tools needed in a case study of a building project classified as “green”. The company of focus in the study calculates its energy uses based on an already existing tool provided by the government, consisting of an algorithm. As they performed the calculations in the design phase of the building, the purpose was not to account for the emissions of construction but rather the emissions from operating the building. The calculations they performed included aspects such as transmission heat losses from walls, floors, ceilings and windows, as well as the energy use of ventilation, heating and lighting.

2.2.3 Using carbon accounting

Corporate reporting is an essential tool for a company to communicate with their stakeholders, with sustainability reports being no exception. Brennan and Merkl-Davies (2014) found that in environmental conflicts, it is crucial to gain support from key stakeholders, more so than having excess financial resources to apply as a measure. This support is, in turn, dependent on the perceived legitimacy of the communication from the company.

Kazemian et al. (2022) find various motivations for companies to collect carbon data in their study. For example, a majority of the respondents to their survey (62%) used emissions data for decision-making, and a majority (54%) used it to control costs and carbon-related activities. In addition, about half of the respondents found the results of the carbon accounting useful in their work, and the same portion of people mentioned that the company they worked at included the entire value chain in the calculations, as opposed to other companies that only considered certain parts of their operations.

A study by Gibassier and Schaltegger (2015) sheds light on the partially conflicting objectives of carbon accounting, depending on if it is performed for internal or external purposes. The study mentions that the internal use of carbon accounting might benefit from calculating emissions of products sold at a particular site since sales figures are a standard performance measurement of

managers. However, the GHG Protocol is structured to measure emissions based on where products were produced and not sold, creating difficulties in the internal use of the information. The study further mentions that the design of the carbon accounting process is influenced by what stakeholders are considered. For example, if the process uses emissions data from an industry-wide database to account for the impact of their activities, this allows for comparability between firms (Gibassier and Schaltegger, 2015). However, using data directly from the supplier will create more accurate quantification results. Stakeholders such as investors and NGOs emphasise accuracy and often demand the use of the GHG Protocol. At the same time, management and employees often prefer a more agile approach that conveys their work structure.

2.3 Theoretical Framework

After reviewing the previous research, it becomes evident that the carbon accounting process includes several steps that can be divided into separate and distinct phases. A paper by Kazemian et al. (2022) draws upon these distinctions to separate the processes into three phases: collecting the data, interpreting the data, and reporting the data. In their study of how Australian high carbon emission industries perform carbon accounting, they base the design of the empirical part on these three phases, structuring their answers accordingly.

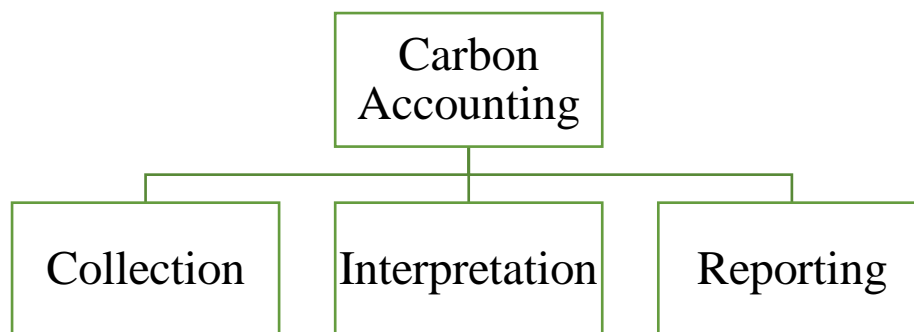


Figure 1. As shown by the graphical representation above, the three components of collecting, interpreting, and reporting the data constitute the overall carbon accounting process.

While this structure has been used before, further investigation is needed to obtain a more detailed and representable view of what these phases include. The case studies previously made,

such as the one by Kazemian et al. (2022), contribute with the perspective of one country or industry, which leaves room for more angles and examples to be added to acquire a holistic understanding of the process. We will define “data collection” as the process of finding data that can later form a basis for emissions calculation, such as obtaining information about energy consumption, fuel types, electricity use and so forth. We will define “interpreting” as the phase in which they convert the data they have collected into quantified carbon emissions and how they interpret different legislations and structures, such as the GHG Protocol, to distinguish what needs to be included where. Lastly, we will define “reporting” as the process of compiling the information into material that can be published and communicated around, which will include the restrictions that must be considered regarding different legislation. Additionally, as this paper includes the perspective of how the company uses carbon accounting information for internal and external purposes and how this might influence the design of the process, the framework above will be developed to include this idea. By extending the framework, we will investigate how the company’s use of its carbon accounting results affects how they approach its task and how this aspect expresses itself in the different phases of the overall process.

Furthermore, to guide the analysis of the empirical results, this paper will draw upon the following idea of Bowen and Wittneben (2011): *“A fully functioning carbon accounting system must be based on a measurement that is materially accurate, consistent over space and time, and incorporates data uncertainty.”* By this, they mean that the system should accurately represent what is emitted into the atmosphere and stay consistent with the help of equipment, procedures and verifications used. Furthermore, it must reflect uncertainty in calculations by including measurement to understand results correctly. Bowen and Wittneben (2011) further distinguish between three different fields of carbon accounting: “counting carbon”, “carbon accounting”, and “accountability for carbon”. In chronological order, these levels refer to the scientific effort to calculate emissions in a physical sense, the accounting practice of compiling and reporting on this data, and the broader governance aspect of developing accountability for this data to be used and compared. As mentioned, our study will provide insights into carbon accounting, and consequently, the concepts of “counting carbon” and “accountability for carbon” will not be further explored here. However, carbon accounting will be assessed according to their accuracy, consistency, and certainty theory.

This paper will draw on the ideas of Kazemian et al. (2022) and Bowen and Wittneben (2011) to create a combined framework suitable for our specific case study. The phases of carbon accounting used by Kazemian et al. (2022) will structure the empirical findings, and the three features that, according to Bowen and Wittneben (2011), are needed for this process to work correctly will be applied in the analysis of these findings. The figure below illustrates the framework that has been assembled based on these two different papers described above.

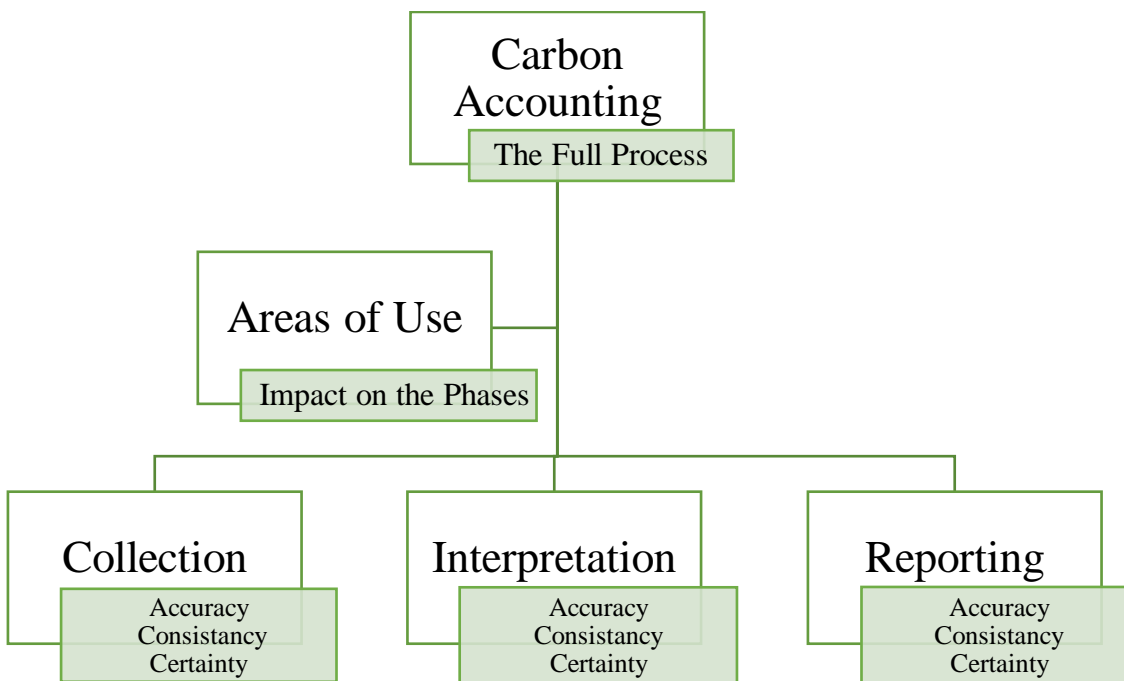


Figure 2. As shown by the second figure above, the theoretical framework used in this paper will be a combination of the theories presented by Kazemian et al (2022) and Bowen and Wittneben (2011). The figure illustrates the structure of carbon accounting divided into the three phases of collection, interpretation, and reporting, all influenced by the areas of use for the final results. Furthermore, the three phases will be evaluated according to three characteristics: accuracy, consistency, and certainty.

3. Method

3.1 Research Design

This paper takes an entirely qualitative approach to the research question through a case study of one Swedish company. The empirical material presented in a later section comes from interviews conducted at this company. These interviews all involved internal company representatives from different departments, from different hierarchical levels and with different tasks concerning the investigated process. The reason for conducting a qualitative study is the framing and complexity of the research question. As mentioned by Lee and Humphrey (2006), qualitative research methods are particularly well-suited when the aim is to explore the role of accounting in a specific social, historical, or organizational context. In this case, the purpose is to obtain information on the role of accounting in sustainability and emissions reporting and how this is connected to organizational performance evaluations. Therefore, the qualitative approach is suitable for this paper.

Furthermore, the specific format chosen in this case is the performance of a case study. It is often argued that more than a case study is needed to be sufficient ground to make a generalized conclusion readily applicable to a broader context since it is a detailed study of a solitary example (Ruddin, 2006). Generalizations as such are essential in a research context, both because of the inherent idea that research should seek out the truth and because of the concern for the practical implications of the research. While a case study can support some generalizations, the main idea is to provide a detailed illustration of the particular case, such that its unique features are made explicit (Ruddin, 2006).

Nonetheless, choosing a case that is as representable and generalizable as possible for an application to a broader context is essential. As the approaches to carbon accounting differ between companies primarily due to the legislation, they are subject to, we only considered Swedish companies to be able to provide insights into how this practice is performed in Sweden. Furthermore, Swedish and EU legislation demands sustainability reporting only from companies of a specific size in terms of employees and certain financial figures, which is why we also found it crucial to study a company of this size or larger. The bigger the company was, the more

representative the findings would be as they would likely have had pressures from many stakeholders to establish a well-developed system for carbon accounting. The company we ended up choosing is of substantial size and can therefore contribute with an insightful example.

3.2 Data Collection

3.2.1 Interviews

Interviews have long been a standard data-gathering instrument and the most common form in qualitative studies. However, interviews (and qualitative research in general) have also been under much scrutiny and criticism for lacking scientific rigour compared to quantitative research (Cope, 2014). This criticism mainly comes from the issue of subjectivity in interview settings. Therefore, several studies were read in preparation to avoid biases, subjectivity, and other common pitfalls of interviews. For example, in Kathryn Roulston's study from 2010, "Considering quality in qualitative interviewing," several lessons to conduct quality interviews could be drawn, with the main one being "learn how to ask questions in ways that participants may understand (e.g., conduct preliminary fieldwork to understand the cultural and linguistic norms used in the community)". This advice was heavily considered in preparation for the interviews as many studies and reports (most of which can be found in the literature review) were examined to have a solid understanding of the industry and concepts we were about to dive into.

Lincoln and Guba's study (1985) proposes the most common criteria to judge the quality of an interview. One of these criteria is the transferability of the content, i.e., how easy it is to transfer the findings to other contexts and individuals. According to a study by Lavee and Itzchakov (2021), one of the critical elements to ensure high transferability is good listening. Good listening has several psychological benefits, such as reduced defensiveness of the speaker and increased cognitive flexibility (Itzchakov et al., 2017). To ensure good listening, it was decided to always be two persons in every interview. Doing so increased the probability that at least one present interviewer upholds listening. It was also decided that one person always interviews without having to focus anything on note-taking or administrative details so that the interviewee could stay focused between two separate people while speaking. Lavee and Itzchakov (2021)

also propose, just like Roulston (2010), that to be a good listener, you also need to show the interviewer that you want to know, learn, and understand.

In the end, we conducted nine interviews. At the beginning of our process, we never set the number of interviews we wanted to perform but let the quality and content of the interviews guide how many we performed. However, after having performed the first five interviews, we already felt we had a lot of quality data and thus decided that nine interviews were enough to perform our analysis.

3.2.1.1 Administrative details (Interviews)

After gaining access to the company where we performed our case study, we consulted our contact person, the company's sustainability manager, regarding which persons they deemed most relevant for us to interview. Our contact person gave us access to the various people's email and informed them about their participation in the case study. We then proceeded to email the people deemed most relevant and scheduled interviews to be held either at the company office or online. In turn, our first interviews also guided which persons we interviewed later in the process. Finally, we let the interviewees suggest people that could be interesting for us to talk to, given their new-found knowledge of our research question and topic.

| Role in the company | Interview length | Meeting Format | Date |
|----------------------------|-------------------------|-----------------------|-------------|
| Sustainability Manager | 45 min | Physical | 2022-10-11 |
| Sustainability Team Member | 45 min | Physical | 2022-10-11 |
| Sustainability Team Member | 1 hour | Digital (Teams) | 2022-10-12 |
| Another Team Manager | 1 hour | Physical | 2022-10-18 |
| Sustainability Team Member | 1 hour | Digital (Teams) | 2022-10-25 |
| Chief Financial Officer | 1 hour | Physical | 2022-10-31 |
| Sustainability Team Member | 1 hour | Digital (Teams) | 2022-10-31 |
| Sustainability Team Member | 30 min | Digital (Teams) | 2022-11-25 |
| Sustainability Manager | 30 min | Digital (Teams) | 2022-11-29 |

Table 1. Interview Sample

In general, we saw little friction on the administrative side of the interviews thanks to the access the sustainability manager gave us. However, one point of concern is that some of our interviewees only performed the interview in response to a direct order from the sustainability manager and not out of interest to contribute. Since we have yet to learn what the communication looked like between our contact person and other interviewees and the fact that the sustainability manager was in a position of power, that might have affected our data. However, we should have noticed this in the actual interviews, but we never did.

We did have some slight issues scheduling interviews with top management. However, this was not due to an unwillingness to contribute and help but simply due to a lack of availability from persons in CXO positions.

3.2.1.2 Interview Guidelines

The interviews were conducted in a semi-structured way (See Appendix). The semi-structured format allowed for much flexibility regarding follow-up questions, which was vital for our data collection as we had little knowledge beforehand of which persons were involved in various processes. Some persons we believed to be heavily integrated into the carbon accounting process were not but were deeply rooted in other areas of interest to us. There are particular challenges surrounding semi-structured interviews, as mentioned in a study by Marginson (2004).

Marginson mentions the difficulties in making sense of and interpreting the answers received, continuously thinking of appropriate follow-up questions while maintaining a trajectory in line with our theoretical framework. However, as aforementioned, we were able to mitigate these issues by always having two persons present in every interview. While one person conducting the interview, mainly focusing on the pre-written questions, and ensuring that the interview stayed in line with our theoretical framework, the other person could think about follow-up questions that could enrich the data collection. Another important aspect of our interview guideline was that it was never allowed to remain static. Depending on answers and insights gained in earlier interviews, it was continuously updated and adapted. Some interesting follow-up questions in early interviews became a part of the pre-written questions, and certain pre-written questions were excluded as we noticed their lack of relevance.

Initially, our main intention was to conduct all interviews physically at the company office. However, some interviews ended up being online due to sickness and availability issues. However, we did not experience that a mix of physical/online interviews affected our data in any way.

All our interviews were recorded with a GDPR form being presented to the interviewee before the interview and starting every recording with the interviewee stating they accept being recorded. By recording the interviews, we could listen to interesting parts of a specific interview again to find new data points we might have missed. In a study by Rutakumwa et al. (2019), interviews with and without an audio recording are comparatively analysed. The critical point of the study is that the level of detail captured between interview note-taking and audio recording is generally equal. However, it puts a lot of pressure on a single individual to be a skilled note-taker with a strong memory. Another interesting point Rutakumwa et al. (2019) brought up is the idea of data trustworthiness. It is said that audio recordings increase the reliability of the data as personal biases from the interviewer are removed since they no longer “choose” what to note down or not. However, the existence of an audio recording device might also negatively affect the interviewee, making them more concerned about their answers as they know it is on tape. We actively tried to mitigate this issue by ensuring our interviewees knew that they could tell us to redact a particular statement at any given time, and we would note that down in the interview minutes. We thus never saw this issue as any significant problem.

All interviews were in English, even though most interviewees were native Swedish speakers. Even though conducting the interviews in Swedish would be more natural, the reason for doing that was due to the notion of trustworthiness. In Lincoln and Gruba's study (1985), they mention the reliability of the data as one of the critical indicators of quality in qualitative research. To ensure reliability in our data, we wanted to limit its exposure towards translation issues as much as possible, thus always having English as the default language in interviews. However, we communicated to all interviewees that we were okay with Swedish. If they felt stuck or could not express themselves adequately in English, they could resort to Swedish and translate it afterwards. As a result, our chosen method of language went well, and the amount of Swedish spoken during interviews was negligible.

3.2.1.3 Other interview challenges

In general, our interviews ran very smoothly. The only issue we had was the first two interviews which we scheduled to be 45 minutes long. However, since we did the interviews at the company office, much time was lost on things such as: finding the correct meeting room, grabbing coffee, friendly banter and, on top of that, the administrative things such as filling out the GDPR form and talking about how the interview will be conducted. This loss of time, combined with the fact that we did not know whether the person would have much knowledge about our topic and thus have little or nothing to say, put us in a strained position. The interviews still went well, but they could easily have gone wrong.

To reduce the risk of putting the interview in a stressful and forced situation, we increased the booked time we had with the interviewee to one hour and instead informed them it probably would not take that long. After we made that change, the rest of the interviews felt very smooth and natural. If we noticed an interviewee did not have extensive knowledge about our topic, we could conclude the interview after 45 minutes, and if the person did, we used the entire hour. Our two final concluding interviews were only scheduled to be 30 minutes long as we knew what specific questions we wanted to ask.

3.2.2 Document and report study

To further enrich our qualitative thesis, we also examined Gemstone's annual reports dating back five years and their quarterly reports from the current year. The report study mainly helped us get a sense of what Gemstone has been doing already and thus helped us design our questionnaire to become as efficient as possible. It also served as a way to "cross-check" our interviewee's answers to see how they aligned with the official statements in the annual reports.

3.3 Data Analysis

During the interviews, one of the interviewers took as extensive notes as possible to capture the main content of every single answer. The most important part about those notes was to capture, as truthfully as possible, the insights from every interviewee. Immediately after every interview, the notes were summarized and cleaned by the same person who took the notes to avoid any

misinterpretation between individuals. Very often, interviewees also touched upon topics that belonged in a different sub-question than the one asked. Hence, we also moved around notes to the correct sub-question to draw comparisons between the answers of different interviewees more easily.

When notes were unsatisfactory, which could happen for many reasons, we went back to our interview recording, listened to it, and took new notes. Per the recommendation of our supervisors, we did not fully transcribe our interviews, even though we had all of them recorded. Instead, we used the recordings to ensure the quality of the notes taken and note down the exact quotes of interviewees. The recordings thus served as a “safety blanket” on which we could always lean if we doubted what had been said.

The structure of section 4. Empirical Findings guided how we performed our data analysis. We structured our empirical findings based on our theoretical framework in section 2.3, and thus the data analysis was conducted systematically following that framework.

4. Empirical Findings

4.1 Background and introduction to Gemstone

This section will present the empirical findings obtained from the interviews and the observations from document studies. The section begins by displaying the findings concerning how different areas of use of the carbon accounting results influence the process overall before going into its three phases, as suggested by Kazemian et al. (2022): collection, interpretation and reporting. Gemstone is a Swedish construction company with businesses in several countries conducting different building projects. The company is listed on the Nasdaq Stockholm stock exchange and focuses on sustainability in its business operations. As the company is of sufficient size, it must report according to the EU Taxonomy, which primarily concerns the interpretation and reporting part of the studied process. While the intended purpose of the EU Taxonomy, as mentioned previously, is to use it as a universal classification system, the results showing compliance with the taxonomy criteria will be reported for the first time in the following annual report. Therefore, the taxonomy will not be discussed in the section on the intended use of

carbon accounting since its function as a classification system is yet to be explored. Additionally, Gemstone structures its carbon accounting according to the GHG Protocol, which mainly concerns the process's interpretation and reporting parts. For anonymity, more details about the company will not be disclosed.

4.2 The influence of intended use

The interviewees spoke of several ways in which the information from carbon accounting is used. Internally, it was mentioned by employee F that the sustainability team uses the information they develop themselves to improve their work with emission reductions. The results enable them to see where the primary emissions stem from, and they can consider these when developing new projects. Employee C further explained that internal use of the results extends to departments other than the sustainability team. They talked about how Gemstone has ambitious reduction targets for their emissions and that different KPIs displaying the current status of these goals are communicated across the organization to ensure that they are being realized and incorporated into business plans. Employee E concluded that they want to quantify the impact to optimize their processes from a sustainability perspective. This shows that using results for improvement purposes guides the practice towards obtaining as accurate data as possible.

Also, for internal use, employee A brought up how they perceive a need to include accounting results in the design and planning phase of the buildings to compare how different materials and shapes of the construction influence emissions. They also mention that they have started working with and hope to implement this in the future. This constitutes another clear example of how the use of the results influences the process itself.

The interviewees mention several sources of external use of carbon accounting as well. According to employee E, investors are the stakeholder most interested in their carbon accounting results. They add that the degree of interest can differ depending on the type of investor but is generally large and that sustainability results can have a slight impact on conditions of agreements with investors in favour of those who can show satisfactory results. An indication that the investors' interest in the area has influenced the carbon accounting was when employee D was asked why they decided to use the GHG Protocol for reporting on emissions,

and they said:

“It’s a standard that most companies use. It’s a standard that is familiar for a lot of people so it’s frequently used and then a lot of investors are familiar with this framework, so we think it’s a structured way we can use for reporting that will make the comparison between companies easier.”

- Employee D

According to employee D, the municipalities are another external stakeholder interested in the results of carbon accounting. They explain that this is due to the public procurement process that Gemstone must undertake to gain a contract allowing them to start a construction project. Employee D said that municipalities can have varying sustainability requirements depending on the site in question but that the vital part for them to obtain the contract lies in being better than industry peers.

4.3 Collection of carbon data

Employee D explained that their work is divided into different projects, as several construction sights are active simultaneously to build different kinds of buildings. Each project has a manager responsible for communicating specific data points when the project is finalized. This includes information such as fuel and energy consumption. This data is then handed to a person in the sustainability team that continues the process. As the company structures their carbon accounting according to the three scopes of the GHG Protocol, the emissions from the construction sites only cover part of the picture. Employee B further explained that they also consider emissions from the materials used in the building processes and that these are difficult to assign to specific projects since the emissions of the materials happen when they are produced, not when they are used on the construction sites, which can be a few years after the company purchased them. Employee D explained that it is also challenging to obtain accurate data from the supply chain:

“Also going backwards in the supply chain, we also see that there are assumptions made or standardized assumptions [...] used by a lot of people, but we rather want to have accurate data

for the materials that we really use. So that is also a challenge, to get the right data in the supply chain.”

- Employee D

Employee D expressed that they also use standardized data in their calculations to simplify the process. This data comes from buildings that Gemstone has constructed previously and that can be regarded as “standard buildings”. As stated by employee B:

“This year we have some example projects that we have measured the climate impact of the projects and then we just scale them up [...] from one project to all projects that have been finalized this year”

- Employee B

They then utilize this data as benchmark numbers for new projects they undertake to measure these emissions. However, the sustainability team will soon redo the standardized projects and improve the data points obtained by including more buildings in the standardized numbers, to make it more representable and accurate for future projects. Employee A mentioned that they use the salary system for some emissions that do not come from the building projects. This provides information on business trips that employees have been on and the mileage of company cars.

Employee B highlighted that how to collect data is also a question of interpretation in their industry, as the calculations should include emissions resulting from the future existence and use of the building. The emissions are considered for many years into the future, which makes it challenging to obtain exact numbers since it has yet to happen. Employee B further mentioned that a standardized way of approaching this does not currently exist.

“When you do a lifecycle analysis of a building [...] sometimes you calculate emissions on 50 years of operations as well of the building, and there aren’t really any standardized methods to do this.”

- Employee B

In general, most interviewees stressed that the data collection was the most challenging part of the process and the most crucial area for improvement. Employee E elaborated that automating the data collection is a crucial step forward since some parts are still handled manually.

Employee G further explained that the current system, where data is largely spread out and must be accessed from different sources, results in a time-consuming process of structuring this data, which takes time from conducting the actual reporting. As employee F summarizes the issue:

“Of course it’s really important to be able to do the climate calculation in a way that you really get the information there that you are looking for. But then that you don’t use too many resources to do it.”

- Employee F

However, the data collection process must not only become more efficient, but several interviewees also mention the importance of obtaining more accurate data. The balance between efficiency and accuracy must be found since employees emphasize that time and other resources cannot only be directed towards producing accurate results but must also be used for efforts towards the reduction of emissions. An issue raised by several employees was the perceived trade-off between focusing on making the carbon accounting calculations more exact and representative of reality and focusing on figuring out how to reduce emissions. One takes time away from the other.

“The journey of being more specific in the numbers that is something that is of course important but at the same time we also have to decrease the emissions so we are focusing on both sides here. “

- Employee D

4.4 Interpretation

Employee D gave insight into how the data points from the project managers concerning energy and fuel consumption are converted into quantified emissions:

“The projects report in cubic meters or litres fuel used and then we have to translate that to emissions. [...] we have 3D models of all buildings [...] so that model is then put into another program [...] and out [...] comes how many kilograms per square meter emissions.”

- Employee D

The team uses a data program in which the information from the sights can be inserted and converted to emissions using the standardized calculations mentioned earlier that have also been inserted into the program. They mention that there are substitutes for the program but with different efficiency. Employee B added that they utilize a climate data bank from Boverket, where information on climate data for different materials can be found. These are also inserted into the data program to aid the calculations, and overall the program thus provides a tool and a structure for the calculations that make them consistent over time. Furthermore, employee D explained that they consider not only carbon dioxide but other greenhouse gases, using emission factors that translate all emissions to carbon equivalents. It is a standard for companies to do that. Employee B explained that since the information comes from several places, they also use external consultants to interpret the data and obtain quantified results, which helps to provide certainty. One can also read in their annual report from 2021 that the emissions results from all different scopes have been reviewed by external parties, further contributing with certainty to the reported results. As mentioned in the previous section, it was also stated by several employees that they are looking into the possibility of performing these calculations already in the design phase to be able to alter the design of the buildings in order to proactively work with reducing emissions instead of calculating them when they have already happened.

A concern raised by several interviewees was that interpreting the data according to the three scopes was quite tricky. For example, employee D stated that the GHG Protocol is a standard amongst many companies, which, when adhered to, makes the results of carbon emissions more communicable and comparable between companies. However, the same employee further elaborated that most emissions come from scope 3, and it is difficult to determine what should be included within this scope.

“The problem is that almost all emissions from our company is within scope three and where to draw the line of the scope three emissions that’s the hard work I think and I think different companies do that in different ways, so the comparison isn’t that easy to make anyhow”

- Employee D

They further emphasised the perception of a high degree of subjectivity in interpreting these scopes, especially between industries which results in difficulties with representable inter-industry comparisons but extends to the intra-industry setting as well. Several employees mentioned that it would be helpful to see more industry-specific guidelines or standardisations from the GHG Protocol since the current definitions leave room for too many assumptions. As mentioned by employee D:

“It would be helpful if they would have more like specific tools or something. [...] We are really building something that will be there for quite long time ahead hopefully, and we are not sure how that will be used in 100 years”

- Employee D

Employee D further explained that the differences in assumptions between companies and industries make it difficult for investors to make a correct company analysis. Though there are classification systems companies can use to prove a certain standard of their reporting, there are different versions of these classifications, ultimately failing to ratify the issue. Employee 4 said that it creates a barrier for investors that lack deep knowledge of the topics of scopes and certifications to make informed choices about their investments.

As for the EU Taxonomy, it is mentioned that while the EU taxonomy has specific sections for different industries, including the construction industry, which explains which criteria must be met, it does not provide sufficient guidance towards how to interpret the criteria or perform calculations. Employee H shared the same view of the taxonomy and further explained that since it is the first year that companies are required to work with the EU taxonomy, there are no previous examples to look at, which in combination with the perceived lack of support from the EU in how to interpret the criteria practically results in ambiguity in their work. Employee B

explained that the taxonomy is vague and leaves room for interpretation and different assumptions.

“No one really knows how to interpret it and I think different people interpret it differently, and there’s not really anyone to ask within the EU how we’re supposed to interpret this, so it is very vague.”

- Employee B

Employee B said that the practical implication of the lack of guidance is that the taxonomy is interpreted mainly on a national level, based on national laws. Since national laws naturally differ between countries, the interpretations are different across the European Union. As for Sweden, they mention that the companies in their industry have collaborated and agreed to interpret according to the Climate Declaration Law since that is the national law in Sweden.

4.5 Reporting

When conducting the sustainability reporting part, Gemstone must naturally adhere to the legal obligations the company is subject to, including, for example, the Swedish law for annual reporting (“Årsredovisningslagen” in Swedish). However, several employees mentioned that this law had not affected their reporting procedure or design to a considerable extent, as stated by employee D:

“We have had all of that in our report previously so for us it was not really a change but more like we have to also make sure that our accountants say that we have made a sustainability report that is compliant with the law for annual reporting”

- Employee D

Another Swedish law that Gemstone must comply with is the Climate Declaration Law (“Klimatdeklarationslagen” in Swedish) from Boverket. Employee B stated:

“The Climate Declaration Law doesn’t say you have to lower you emissions at the moment you just have to show how big they are in each project, but the Climate Declaration Law at least sets a framework that everyone can use so we can compare building in between companies”

- Employee B

However, the same employee also shed light on how the Climate Declaration Law fails to include the building processes in its entirety. For example, it excludes relevant parts such as paintwork, surface materials and groundwork. Nonetheless, they mention that the instructions the CDL gives are quite straightforward and that they emphasize acquiring as specific data as possible, contributing to comparability within the industry. They further explain that the CDL includes a directive that incentivizes companies to obtain this data. This is because the lack of specific data on emissions forces a company to use generic values obtained by using average values on emissions data and then multiplying the average with a multiple of 1.25. Employee B explains that this calculation usually results in a more prominent emissions figure than a company would have obtained if they did find the specific data themselves. Thus, this creates an incentive in the industry to make an effort to obtain the needed data, which ultimately increases comparability. The positive aspects of the CDL were also endorsed by employee D, who explained that the CDL is still more of a harmonized and standardized framework than the GHG Protocol, which implies that the law does increase comparability between firms more than the voluntary initiative that is the GHG Protocol.

Employees agree that the regulation that has affected their sustainability reporting the most is the EU Taxonomy, which came into force on January 1st, 2022. Employee D expressed that it has significantly impacted their reporting and that the taxonomy puts the most pressure on them to perform carbon calculations. As the EU Taxonomy determines if a company is sustainable, Employee H explained that they need to evaluate the criteria from the taxonomy for every project they conduct in a year to see which ones are green or not. Ultimately this will not result in a simple yes- or no answer to whether Gemstone is sustainable or not, but instead in a percentage representing how large a portion of their business meets the sustainability requirements. Employee D explains that last year, 2021, was the first time that requirements came into force from the EU Taxonomy but that the demands were different than they are this

year in 2022. For 2021, companies needed to report their so-called “eligibility” with the taxonomy, meaning to what extent they could comply with the criteria at a maximum level since some parts of business operations cannot be compliant. For 2022, they will instead need to report their current level of “alignment” with the criteria, that is, how much of the percentage figure they reported able to reach requirements last year. Employee D mentioned that determining whether a project is sustainable according to the taxonomy involves submitting information from project managers concerning aspects such as energy use, material use and waste. Emissions must also be calculated, and the criteria for construction businesses state that these numbers should include all buildings finished in the relevant year which exceed 5000 square meters in size. As clarified by employee 8, this is more than what is demanded by Swedish legislation. Thus, the taxonomy affects carbon accounting by putting higher demands on it being submitted for more projects, which leads to an improving trend.

5. Analysis and Discussion

This section will analyse the empirical findings presented above with the help of the theoretical framework developed and explained previously in this paper. Out of the three criteria that should be in place in a fully functioning carbon accounting system (Bowen and Wittneben, 2011), accuracy was the most recurrent and prominent aspect among our empirical findings. While the two other framework criteria, consistency and certainty, will be touched upon throughout the analysis, we have chosen to focus on what we consider the two most important aspects of our findings. Consequently, the accuracy criteria will be the first focal point in the following analysis. The second focal point will extend the idea of a fully functioning carbon accounting system defined by Bowen and Wittneben (2011) by adding a fourth criterion: comparability. In this context, comparability refers not to the ability to replicate and compare results from one company over time, which is already capsuled by the criteria of consistency, but instead to create comparable results between firms. As our findings show that carbon accounting results are used in communication and relationships with external stakeholders, there is an external need and an internal company interest to ensure that companies are fairly compared with one another. This section will thus be divided according to what we consider our most relevant findings to discuss:

the trade-off between finding accurate data about emissions and retaining the focus on reducing these, as well as the need for comparable results to ensure just utilisation of carbon accounting.

5.1 Accuracy in carbon accounting: a trade-off between providing accurate results and reducing results

Out of the three criteria that should be in place in a fully functioning carbon accounting system (Bowen and Wittneben, 2011), accuracy was the most prominent aspect among our empirical findings. It is apparent in the literature (Kazemian et al., 2022; Mia et al., 2017) and our empirical findings that data collection is one of the most challenging aspects of carbon accounting. Almost every interviewee in our study mentioned the data collection as the most challenging part of the process, both because the data is difficult to extract and because the data is obtained from several different sources. The same perspective is mentioned in the study by Mia et al. (2017), which says that an important reason behind the exclusion of scope 3 calculations is the complexity of these calculations. The process could be challenging as the company needs to obtain information from their entire supply chain. However, Gemstone still performs the calculations to the best of its ability by attempting to acquire data directly from their suppliers. They emphasise that they aim to find the supply chain data instead of standardised measurements, contributing to the accuracy. However, Kazemian et al. (2022) suggest that only half of the companies in their study include the entire value chain in their calculation, which means that there are apparent differences in how companies approach supply chain emissions.

Several interviewees mentioned that the data collection process partially relies on standardized measurements of emissions from previous building projects, that they scale according to the size of a new building to find the emissions figure for that new building based on the old one. It is also mentioned that the EU Taxonomy recently introduced puts additional pressure on performing more calculations since a climate declaration, including emissions calculations, must be provided for all buildings of a certain size that are finished each year. While they also mention that they are improving these standardized models by including more buildings behind these numbers, some accuracy is potentially lost when using standardized numbers. However, the

trade-off mentioned by several employees, between focusing on reducing emissions and focusing on obtaining accurate data, is an aspect to consider before engaging in time-consuming calculations. Furthermore, the company has set ambitious reduction targets for their emissions, making the trade-off dilemma highly relevant. The method of using standardized models also has support in the previous literature, as Georg and Justesen (2017) mention that the company in their case study used an algorithm provided by the government to calculate their energy use. Additionally, standardized figures constitute a tool that provides consistency in calculations since emissions from the different projects are obtained with the same structured method. This is also a key characteristic of successful carbon accounting, according to Bowen and Wittneben (2011).

As mentioned in our interviews, a potential challenge to accuracy in the data is that the emissions from materials, and the use of these, are not always aligned in time. As explained in our empirical section, this can create questions about in which year or period the emissions from these materials should be included and whether that should be counted from when they were bought or used. The issue of time gaps in carbon accounting was also mentioned in the study by Mia et al. (2017). However, in their case, the cities did not seem to be making a conscious choice to include data in a specific year but were somewhat lagging in reporting, which is not the same case as with Gemstone (Mia et al., 2017). Regardless, the issue of what to calculate for a specific year remains, and better guidance could benefit the companies facing this challenge.

Considering the several external stakeholder relationships for which the interviewees said that carbon accounting results were beneficial, it is also crucial for the company to focus on accuracy. While stakeholders such as investors are perceived to care about the performance and progress that the emissions information can reflect, the legitimacy and accuracy of this information are likewise vital to them, as the study by Brennan and Merkl-Davies (2014) also shows. While Brennan and Merkl-Davies (2014) discuss the need for legitimacy more in the context of ensuring support through environmental conflicts, our study shows that it is not an obvious choice to focus time and resources on ensuring accuracy when that takes focus away from carbon reduction efforts that the investors also value. It becomes a complex trade-off to handle, but it remains clear that investors care about both carbon reduction and reporting accuracy, which results in a need for any company to find a balance between these.

5.2 Comparability in carbon accounting: an aid in ensuring just utilization of results

It is clear from the findings that Gemstone strives for comparability in carbon accounting, which affects their process due to the need to communicate the results externally. Several interviewees mentioned the importance of the emission results in conversations with investors, and the investor relationship was also a reason mentioned for reporting according to the three scopes. This supports the findings by Gibassier and Schaltegger (2015), which also state that investors demand the use of the GHG Protocol but that the comparability advantage of this structure is not in itself satisfactory since they also expect accuracy. Gemstone wants external communication understandable to investors since they are important stakeholders, and reporting according to the GHG Protocol becomes a part of ensuring that the company is comparable with others, enabling investors to make an informed decision. Our findings further show how comparability in this area is a key to obtaining as favourable funding as possible since investors often choose the top performers in areas they value, such as the environment.

Similarly, the interviewees also discussed how their performance concerning emissions is an essential factor in obtaining contracts from municipalities, allowing them to start a project. In addition, construction companies must participate in a public procurement process to obtain these contracts, making comparability essential once again if the municipality focuses on sustainable building projects. In obtaining contracts from municipalities, it is, therefore, more critical to perform well in relative terms rather than in absolute terms, which makes comparability a priority here.

Having understood the importance of comparable results, it is an issue that our findings show several challenges towards that goal. While Gemstone indeed uses the GHG Protocol for the reasons mentioned above, several concerns were raised concerning the interpretation of this initiative. It was mentioned that it is difficult to interpret what information should be reported in each scope and that scope 3 is complicated to define, leaving considerable room for interpretation on a company level for what should be included here. As mentioned, the paper by

Mia et al. (2017) also finds that companies approach the calculations for scope 3 differently, some even excluding them entirely as they are deemed too complicated to perform. This becomes problematic since the very purpose of the GHG Protocol is to provide structure and increase the transparency of emissions (Greenhouse Gas Protocol, 2015). Since our findings also clarify that most emissions come from scope 3, this constitutes an issue in the strive for comparable results. Our findings further show that an industry-wide tool to facilitate the interpretation of scopes is desired.

Another initiative mentioned in our findings that concerns this comparability issue is the EU Taxonomy. As Schütze and Stede (2021) mentioned, the fundamental idea behind the introduction of the EU Taxonomy was the creation of a universal classification system deeming a company as sustainable or not. Furthermore, it was intended to increase transparency and create more communicable results (Schütze and Stede, 2021). However, our findings show that this is not perceived to have been accomplished yet. Employees mention that the criteria are unclear and that even though they have collaborated in the industry to create aligned interpretations, considerable discrepancies remain that, in their view, will inhibit fair comparison between companies. Our findings further show that the vagueness of the EU Taxonomy has resulted in interpretations based on national laws, which creates differences between member states. As the intention was the creation of equality in competition for companies across the entire EU, the lacking comparability is an issue that needs attention.

A finding contributing to comparability is that Gemstone has a system for converting different greenhouse gases to carbon equivalents, which, as mentioned by MacKenzie (2009), provides more comparable results. Our findings show that Gemstone takes several greenhouse gases into account in their measurements, but in line with what MacKenzie (2009) suggests, they are all converted to carbon dioxide equivalents using emissions factors. Hence, the final results of their emissions are shown in units of carbon dioxide but represent several greenhouse gases, which increases comparability since it is also mentioned that it is a perceived standard among companies to structure results in this way.

Our findings also reveal that the need to consider future emissions of a finalized building constitutes an industry-specific comparability challenge. As discussed in the paper by Gibassier and Schaltegger from 2015, product carbon accounting usually involves a life cycle assessment showing the emissions of each product. Gemstone can be considered to perform organizational carbon accounting as they include their entire company's emissions in the final reporting. However, they can also be seen to conduct product carbon accounting since each construction project is calculated separately, including a LCA (Gibassier and Schaltegger, 2015). However, our findings show concerns among interviewees that different companies might conduct the LCA of the buildings according to different assumptions, making results less comparable.

A tool that contributes to comparability between companies and consistency within a company is the climate data provided by Boverket. Our findings show that when interpreting the collected data, Gemstone uses information from Boverket to assess the climate impact of the materials they use. This approach to carbon accounting is similar to the energy accounting method found in the case study by Georg and Justesen (2017), in which they used a premade government algorithm as the basis for calculation. In providing this data, Boverket supplies the industry with a tool that, if used by all, makes carbon accounting results more comparable. Furthermore, as Boverket requires the submission of climate declarations from construction companies, this provides further structure that can increase comparability within the industry, which our interviewees agree does. Our findings also show that the system created by Boverket, which requires companies failing to find their data to use average numbers multiplied with an amplifying multiple, can create further incentives to find the data themselves. This could be an essential incentive system for companies to find their emissions data since Mia et al. (2017) mention in their study that companies can exclude data entirely, which might become a less likely occurrence if there is apparent backlash from it. Additionally, Kazemian et al. (2022) study shows that about half of their respondents only performed carbon calculations for specific projects rather than the entirety of their operations. This initiative by Boverket might result in more calculations, which would be a positive development.

6. Conclusions and Summary

6.1 Summary

The prevailing ambiguity in interpreting what carbon accounting is and what it entails (Ascui and Lovell, 2011) leaves a need for more contributions to this research field. Furthermore, as companies need to consider different stakeholder needs and areas of use of the carbon accounting results they produce, this affects the process (Gibassier and Schaltegger (2015). Consequently, we designed this study intending to answer the following question: *How do companies perform carbon accounting and how does the intended use of the results influence this process?*

By conducting a case study at Gemstone, including interviews and document studies, a thorough analysis of how the operation is performed has been provided in this paper. Much of the previous literature focuses on how carbon accounting can be understood and conducted differently (e.g., Ascui and Lovell, 2011; Gibassier and Schaltegger, 2015; Bowen and Wittneben, 2011). We contribute to this literature with an additional example, showing what regulations must be considered for Swedish companies, what tools can be used to approach the task and what areas of use influence the design of the process. Voluntary initiatives such as the GHG Protocol and legislatively mandatory ones such as the EU Taxonomy and the Climate Declaration Law significantly affect Gemstone's reporting procedures. While they have tools such as data programs, standardized measurements, and consultants to their dispense, the most difficult parts of carbon accounting remain the assurance of accurate and efficient data collection and the assurance of final results that are comparable across companies. It is also clear that external stakeholders, primarily investors, are essential actors for which the reporting is aimed and adapted.

After having studied in detail how carbon accounting can be performed, we draw two main conclusions from our findings concerning challenges in carbon accounting: finding accurate data about emissions while retaining the focus on reducing these and creating comparable carbon accounting. Our main contribution to previous literature is that more guidance regarding

conducting the carbon accounting process and interpreting different regulations is needed from governmental bodies and individual organizations.

6.2 Limitations

We chose to do a single case study, and as mentioned in the method section, there are specific pros and cons in doing so. A single case study opens the possibility of making an in-depth analysis and thus increases the strength of our conclusions. However, a single case study also introduces the issue of reliability and validity. We know that our findings regarding Gemstone and how they approach carbon accounting might only apply to companies of some sizes and in some sectors. However, the rapid development of legislation surrounding carbon accounting and the growing awareness of issues surrounding carbon emissions affects all firms. Therefore, we still believe our findings can be used to understand companies' decisions regarding carbon accounting in a generalised way. The size of our chosen company and how invested they are in their carbon accounting practices further increase this belief.

Similar to performing a single-company case study, there are both pros and cons in doing interview-based research. We conducted our interviews in a semi-structured way, allowing for much flexibility in follow-up questions and increasing the possibility of finding new aspects. However, there are drawbacks, such as response bias and subjectivity in the interviewee's answers, as they might be affected by how they interpreted our question. Furthermore, qualitative data is often subject to subjectivity, which implies that conclusions drawn from the data could differ depending on the person doing the analysis. However, we managed to mitigate this subjectivity by utilising the fact that we were two persons. We did this by controlling that both of us interpreted the data similarly and thus strongly believe that the conclusions drawn are as objective as possible.

Another limitation we faced in presenting our findings was the issue of anonymity. Gemstone is a company that, according to what we have seen, is ground-breaking in its industry regarding carbon accounting practices. They are performing specific actions and have put processes in place that no other firm in their industry has. These findings are something that could have further enriched our analysis. However, we ignored some of these potentially relevant findings to

avoid putting Gemstone in a compromising situation. However, this issue is offset by the fact that Gemstone has an extensive focus on its carbon accounting practices and has thus been able to give us more robust data than firms that are less at the forefront of their industry most likely would have.

Finally, since this is a single case study, we always want to encourage scepticism. We have only spoken to representatives from the same organisation, and there is always a risk that people from the company intentionally or unintentionally put themselves in a better light. Through our usage of a semi-structured questionnaire and document analysis, this issue was mitigated. We always had a set of questions we asked every single interviewee and could thus cross-reference their answers for any apparent subjectivity.

6.3 Further Research

There is much potential for future research in carbon accounting, mainly because the research field is still relatively unexplored. While writing this thesis, we found multiple different areas fascinating and encountered several areas needing further research. A first suggestion would be to perform a comparative analysis of the carbon accounting process that involves the study of several companies and how they potentially differ throughout the different phases of the process. As one can tell from our empirical findings and analysis, the comparability between firms regarding their sustainable practices is a major "issue" in our chosen industry. Therefore, it would be interesting to perform more case analyses on companies in our chosen industry and see what conclusions could be drawn regarding, for example, how the interpretation of different regulations is made and what tools are used to interpret and compile the data.

Another area that is surrounded by a lot of ambiguity and interpretation is scope 3 emissions in the GHG framework. It would be fascinating to dive deep into an analysis of the GHG Protocol to gain a better understanding of how companies make use of this initiatives, how it is interpreted in different companies and different industries, and what possible guidance might be needed for companies to use it in a way that makes results comparable.

Finally, we suggest that further research follows the results and implications of the introduction of the EU Taxonomy. While this study provided some insight into the matter, the results showing companies' alignment with the taxonomy is yet to be published at the beginning of 2023. It would be very interesting to investigate further how companies interpreted the criteria. Since our study also showed considerable ambiguity in how to report according to the taxonomy, more research is needed to see what potential consequences will come from this and if the EU succeeds with their intention to make the taxonomy a universal classification of sustainability.

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