

Analysis of how circular economy ideas are considered in sustainability reports

*Evidence from Europe's largest
construction companies*

Master's Degree Thesis

Author

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Abstract

The European construction industry is a pivotal player in the global economy, and its approach to sustainability is crucial for our planet's future. This master's thesis delves into the intersection of these two vital areas by analyzing sustainability reporting practices within Europe's top thirty construction companies. The focus is on how these companies incorporate the concept of the circular economy—a 21st-century innovation deeply linked to sustainability—into their reports.

Initially, the thesis undertakes a theoretical analysis to explore the history, current status, quality, and existing research in sustainability reporting. This sets the stage for a quantitative study that sheds light on how European construction firms address circular economy in their sustainability reports, with a specific emphasis on circular economy principles.

Subsequently, a case study is conducted to gain a deeper understanding of the challenges these firms face in integrating circular economy concepts into their operations. The thesis also includes a discourse analysis of the sustainability reports of thirty construction firms, aiming to dissect how they communicate their sustainability and circular economy strategies to stakeholders.

Employing a data triangulation method, this study seeks to uncover any shortcomings or gaps in current sustainability reporting practices. It aims to provide meaningful insights into both the discourse surrounding circular economy reporting and the practical challenges of implementing these principles in the European construction sector. This research aspires to make a significant contribution to the field by offering a comprehensive analysis of sustainability reporting and circular economy implementation within the European construction sector.

Keywords: *Sustainability reporting, Circular economy, Construction Industry, Sustainable development, Sustainable marketing*

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Acronyms

SR	Sustainable reporting
SD	Sustainable Development
GRI	The Global Reporting Initiative
ESG	Environmental, Social and Governance
UNGC	United Nations Global Compact
CE	Circular Economy
LE	Linear Economy
LCA	Life Cycle Assessment
CSR	Corporate social responsibility
SDG	Sustainable Development Goals
CI	Construction Industry
EPD	Environmental Product Declaration

1 Introduction

The first chapter of this thesis presents an overview of the researched field and outlines the rationale for its significance as a subject of study. The subsequent part presents the problem formulation, followed by this study's purpose and research question. The delineation of the boundaries of this thesis concludes this chapter.

1.1 Background and aim of the study

Over the past decade, sustainability reporting (SR) has experienced a significant and noticeable evolution, solidifying its position as a widely adopted practice (Lovell & McKenzie, 2011). The ability of the planet and its people to maintain social and environmental resilience is influenced by the effects of economic activities, which are intertwined with social and ecological systems. Given the importance of economic operations, numerous stakeholders, including the natural environment and future generations, have increasingly called for firms to take greater responsibility for their actions (Rentorff, 2015; Gal et al., 2018).

SR enable firms to showcase their commitment to social responsibility and serve as a valuable mechanism for boosting communication with various stakeholder groups. By providing more openness and accountability in disclosing non-financial information, these reports play a significant role in fostering improved relationships between companies and their stakeholders (Patten & Zhao, 2014). The viability of a company is no longer solely dependent on its pursuit of profit maximization within the economic realm. Instead, it must be situated within a more comprehensive framework that considers how the company addresses and mitigates the risks associated with its operations' social and environmental consequences over the long term. In doing so, the company can demonstrate its commitment to social responsibility (Milne & Gray, 2007).

The public disclosure of environmental protection and social initiatives through SR demonstrates the entities' commitment to sustainable development (SD). The adoption of environmentally friendly and socially responsible behaviour by corporations can result in economic advantages, as seen by these organizations' enhanced efficiency and productivity. There is a developing trend in which companies face mounting pressures to disclose social and environmental data to provide users with relevant information. The prevalence of corporations

voluntarily disclosing this information has significantly increased over time. According to KPMG (2017), 93% of Fortune Global 250 companies published such reports, a notable rise from the 35% reported in 1999. Similarly, the disclosure rate among National 100 companies increased to 75% in 2017, compared to a mere 12% in 1993. Incorporating economic information and including social and environmental responsibility data are crucial for facilitating informed decision-making processes. The act of reporting on SD has emerged as a mechanism for prominent corporations to demonstrate their commitment to enhancing the transparency of their operations and fostering corporate responsibility (Thoradeniya et al., 2015).

It is crucial to consider the essential components that a report on sustainability needs to encompass. “*Sustainability*” is a concept that incorporates three distinct aspects, namely economic, environmental, and social. These dimensions are sometimes referred to as the triple bottom line (John, 1994). Hence, it is essential to include all these facets from a long-term standpoint to create a sustainability report. Nevertheless, the question arises as to how a business should effectively address and incorporate these concerns, particularly non-financial ones. In recent decades, many standards, frameworks, and other approaches have evolved to tackle the issue of SR. The Global Reporting Initiative (GRI) is widely recognized as the predominant framework in the field. GRI (2015a) has amassed an impressive collection of over 22,000 reports from around 7,000 organizations. This framework delineates the fundamental elements a business needs to disclose and how such disclosures should be made, irrespective of the specific industry in which the organization operates. Hence, this is a solid foundation for examining sustainability reports, even when firms do not explicitly mention the GRI in their disclosures (GRI 2015a).

The paradox is that, despite our efforts to make sense of the tsunami of data, things are becoming less apparent, especially information about firms in sustainability reports. The emergence of environmental, social, and governance (ESG) ratings was intended to streamline processes by providing comprehensive measurements that encapsulate a company's sustainability performance (Chen & Cheng, 2021). However, it is ironic that these ratings have been subjected to investigation and have raised concerns over their legitimacy. In a contemporary era characterized by a heightened focus on sustainability, we encounter a paradoxical circumstance wherein abundant knowledge only sometimes leads to enhanced comprehension (Chen & Cheng, 2021). Nevertheless, with the increasing traction of this movement, there has been a corresponding rise in both the quantity and intricacy of sustainability reports. Consider the following scenario: There is a collection of over 120,000

sustainability reports accessible to the general public. These studies vary significantly, from a formidable 50 pages to an astonishing 100 pages (Chen & Cheng, 2021). It is as if we are drowning in a sea of well-intentioned information, and the task of sifting through these millions of pages to unearth valuable insights into corporate sustainability performance feels downright Herculean (Chen & Cheng, 2021).

The circular economy (CE) has become integral to sustainability discussions, especially concerning the construction industry (CI). We cannot envision sustainable practices without incorporating the principles of CE today. The European Construction Sector Observatory (2019) posits that the concept of a CE pertains to optimizing resource efficacy to minimize waste generation. We are at the peak of a consumer-driven economy that operates on a linear economic framework, succinctly encapsulated as the "take, make, and waste" paradigm. However, within the framework of a CE, there is a focus on the efficient use of natural resources and goods, ensuring that they remain inside the product cycle for as long as possible. Consequently, a limited quantity of resources is squandered. The society's transition towards a CE necessitates modifications in design, industry, and individual consumption patterns. The successful transition to a circular economy necessitates a thorough comprehension of the requisite protocols for its implementation. We require additional information regarding the integration of CE ideas into sustainability reporting. The efficient utilization of resources has several positive consequences, including a decrease in greenhouse gas emissions, a deceleration in the rate of biodiversity loss, a pollution reduction, and the promotion of new ecologically sustainable workplaces and business models. Implementing a circular economy is closely intertwined with the transition towards a society that prioritizes resource efficiency and environmental consciousness and achieving the goals outlined by the United Nations (Arup, 2016).

It is important to include circular economy metrics in discussions about sustainability reporting so that we can get a full picture of how circular the construction industry is. Understanding the degree of circularity is an essential precondition for the successful initiation and execution of circular economy principles. While the circular economy concept is frequently oversimplified to mere recycling, it encompasses a multifaceted strategy that strives to accomplish numerous ambitious objectives. Several strategies have been proposed to address the challenges of sustainable resource management. These include extending product life cycles, adopting industrial symbiosis practises, transitioning from products to services, minimizing waste generation, and establishing a market for secondary raw materials (FAO, 2017). The four primary actors involved in the process of cyclical change encompass the

institutions, industry, consumers, and scientific research. In order to drive global markets towards sustainability, their actions must be intimately interconnected. Policies can enhance the efficiency of low-impact production and incentivize consumers to make sustainable choices.

The problem arises when some businesses do not provide enough information about CE principles in their sustainability reports. On the other hand certain enterprises endeavor to showcase their integration of corporate CE into their regular business operations. Several corporations claim to have made significant progress toward integrating CE principles into their sustainability reports. Circularity can be used as a marketing strategy to make building companies appear more sustainable than they are, or it can be reported as a practice in sustainability reports by businesses that do not truly practice circularity. Most organizations offer minimal data regarding corporate ethics in their sustainability reports. The rationale is that CE does not alienated to one set of ideals. The scenario varies across different nations and businesses. For example, it is not feasible for a singular company entity to implement CE principles throughout its operational sectors. Consequently, most organizations opt to adopt CE practices on a more limited and manageable level.

However, the primary objective of this study is to investigate the practices of construction businesses in the realm of sustainability reporting. The study seeks to comprehend the underlying motivations driving these firms to engage in sustainability reporting and to examine the extent to which circular economy concepts are included within their sustainability reports. The available evidence is derived from Europe's most prominent construction businesses. This study intends to explore sustainability reporting practices, with a specific focus on adopting circular economy principles, within a sample of 30 construction enterprises. On the other hand we will conduct a discourse analysis within the same 30 construction firms SR. In addition, a case study will be undertaken to analyze the incorporation of circularity approaches into Veidekke ASA's annual sustainability reports. This study investigates the organizational structures and approaches employed by these organizations in relation to sustainability reporting and circular economy activities. The data were later analyzed and discussed within the broader framework of the industry as a whole. Considering the data and subsequent discussion, this study will present conclusions and recommend further research.

Research question:

The study will endeavor to accomplish its goals by providing answers to the following research question:

How is the employment of circularity in the European construction industry represented in sustainability reports and the case study of Veidekke?

1.2 Chosen industry

Consider a sector of the economy of such magnitude that it accounts for a substantial 6% share of the global Gross Domestic Product (GDP) and generates an astonishing annual revenue of €9 trillion (World Economic Forum & The Boston Consulting Group, 2016). Indeed, the subject of our discussion pertains to the construction industry. Unsurprisingly, the World Economic Forum and The Boston Consulting Group (2016) have directed their attention towards the projected upswing in its expansion. By the year 2025, the industry is expected to exhibit significant growth, with a projected turnover of approximately 13 trillion euros (World Economic Forum & The Boston Consulting Group, 2016).

The industry exhibits unparalleled scale and impact, yet it also stands as the most voracious consumer of resources globally. Imagine a scenario where approximately 50% of the total world steel production is allocated towards the construction of buildings and infrastructure projects. Annually, the Earth relinquishes around three billion tonnes of its natural resources to meet the demands of the construction sector (World Economic Forum & The Boston Consulting Group, 2016).

Regrettably, significant consumption is accompanied by substantial waste. Construction activities contribute to a significant proportion, namely 40%, of the overall waste generated on our planet. According to a report by the World Economic Forum and The Boston Consulting Group (2016), the industrial sector accounts for around 25-40% of global energy consumption, significantly contributing to carbon dioxide emissions. In the geographical centre of the European continent, the European Union encountered a substantial quantity of construction-related garbage, amounting to 923 million tonnes, during the year 2016. According to the European Construction Sector Observatory (2019), Construction and Demolition Waste (C&DW) is classified as the predominant waste stream in the European Union (EU).

The importance of sustainability reporting in the construction industry cannot be overstated since it has considerable significance within the broader global ecosystem. The industrial sector exhibits substantial energy consumption, carbon emissions, and utilization of natural resources while generating considerable trash. Using sustainable methods within the construction industry yields immediate ecological advantages and long-term benefits, such as

circular economy, energy efficiency, cost-effectiveness, and environmentally-friendly infrastructure. In light of the growing concern about climate change, governments are increasingly implementing stricter regulations, while stakeholders are placing greater emphasis on environmentally friendly activities. In this context, transparent sustainability reporting may give enterprises a distinct competitive advantage and a clear path toward regulatory compliance. Technological advancements have the potential to offer novel prospects for environmentally sustainable construction, and scholarly investigation within this domain might serve as a means to connect conventional methodologies with inventive resolutions. Scholars have the potential to enhance their academic endeavors and make substantial contributions to global sustainability initiatives by incorporating environmental science, engineering, economics, and social sciences into their research. The construction industry has diverse case studies that give valuable insights and opportunities for academic investigation. Therefore, directing attention towards sustainability reporting within the construction industry presents an opportune, pertinent, and all-encompassing pathway for scholarly investigation, holding the potential for both immediate and enduring benefits for the environment and humanity.

1.3 The goal of the study

The author intends to provide an overview of SR in the CI and examine the extent to which CE practices are being reported. Moreover, this thesis provide additional avenues for future study, focusing on SR, particularly within the circularity of CI. The objective of this study is to make a scholarly contribution to the existing discourse on SR in the CI by investigating the impact of the CE on this practice.

In order to address the employment of circularity in the European CI, the author initially does a comprehensive examination of 30 sustainability reports to determine the current state of research about SR. Furthermore, engaging in this process will enhance the author's comprehension of the research subject matter and facilitate the establishment of the empirical investigation. Additionally, five parameters employed to assess the levels of quality in SR were derived from an analysis of 30 sustainability reports from construction companies. The sustainability discourse mainly consists of narrative-based texts, which often encompass a substantial volume of material. Hence, a selected empirical investigation was undertaken with the objective of data reduction and segmentation. Qualitative discourse analysis will examine each organization, aiming to understand how they communicate with their stakeholders.

Additionally, the roles of language and the process of meaning construction in various circumstances. Furthermore, a case study will be undertaken to examine the implementation of circularity strategies in Veidekke's annual sustainability reports. The data were subsequently studied and debated within the context of the overall industry. Conclusions and suggestions for future research will be provided in light of the findings and discussion.

The goal of this study is to investigate the current state of circularity throughout the European CI and assess the extent to which SR is being implemented. This analysis will also identify any potential gaps or omissions in SR practices.

1.4 Limitation of the study

Throughout my research, I've realized that I've relied on information from self-generated sustainability reports. I believe it would lend greater authenticity to my work if I could understand the processes each company uses to create these reports.

In my research, I narrowed my focus to a single company for an in-depth analysis due to participant limitations. This approach stemmed from the necessity to depend on interviews and a case study method for evaluating pertinent literature. Additionally, I encountered challenges related to data accessibility. The variability in the availability of consistent and thorough data, particularly within sustainability reports related to the circular economy, presented a hurdle. My study meticulously covered the core principles and methodologies found in business models, technical innovations, and frameworks such as BREEAM., which introduced further complexity to my thesis by requiring me to broaden the scope of existing resources. It is important to acknowledge, however, that the conclusions drawn from this Master's thesis may have limited applicability in a broader empirical context.

2 Theoretical Analysis

This chapter will present a theoretical analysis focused on three key domains: sustainability reporting (SR), sustainable marketing, and the circular economy. The theoretical analysis will explore contemporary trends in sustainability and examine the significance of SR within the CI. It will elucidate how firms effectively utilize sustainability reports as a tool for sustainable marketing. Additionally, an exploration of the state-of-the-art of the circular economy will highlight its significance, particularly in the construction industry, underscoring the importance of its implementation. In order to understand the theoretical strategy toward sustainability reporting, it is imperative to initially examine the most recent comprehension of this approach,

which is informed by prior scholarly investigations. Following a comprehensive examination of the current advancements in the research domain of circular economy within the context of sustainability reporting, this paper proceeds to introduce the theoretical framework employed to conduct data analysis.

2.1 Sustainability reporting

SR is the systematic collection and presentation of sustainability information, enabling a convenient comparison with historical data and progress towards established goals. SR aims to enhance a company's environmental, social, and economic aspects. (Thaslim & Antony, 2016, p. 25). According to Reynolds et al. (2017), they argue that the disclosure of non-financial performance and the practice of transparency may enhance the quality of communication with stakeholders. Doing so enables investors and other stakeholders to make well-informed choices (Reynolds et al., 2017). The necessity of disclosing a company's environmental and social performance to maintain accountability to shareholders and meet the expectations of many stakeholders is evident. In order to maintain transparency and fulfil their obligations to financial and non-financial stakeholders, corporations are obligated to provide a more thorough and all-encompassing disclosure of information (Solomon & Maroun, 2012).

In the CI, sustainability reports have become essential tools that help companies improve their environmental, social, and economic performance while also telling stakeholders about their efforts. Eccles and Serafeim (2013) argue that using such reports enhances transparency, fostering trust among investors, clients, and the broader community, thus strengthening a company's reputation. According to Clarkson et al. (2008), establishing transparency serves the dual purpose of fostering trust and enabling more knowledgeable decision-making. Adams and Larrinaga-González (2007) also talk about how important these reports are for making sure that regulations are followed and how they can show that a company is serious about following environmental and social rules.

According to Gale and Barg (2014), sustainability reports have the potential to shed light on areas that present opportunities for cost savings, such as waste reduction or improved efficiencies, within the realm of economics. The larger organizational culture also experiences advantages. According to a study by Brio et al. (2007), placing a strong emphasis on sustainability can boost employee morale. It can also serve as a means of attracting individuals who prioritize sustainability as a critical factor in their decision-making process (Norges Bank, 2021). Nidumolu, Prahalad, and Rangaswami (2009) say that focusing on this aspect not only

sets companies apart in the market, but it also leads to creative solutions that could make a company the market leader. The integration of this innovation is closely linked to the practice of risk management. Ameer and Othman (2012) highlight that sustainability reporting can make identifying and addressing environmental, social, and governance (ESG) concerns more efficiently. According to Carter and Rogers (2008), SR can strengthen supply chain relationships by promoting enduring collaborations and partnerships with suppliers with similar dedication to sustainable practices. In the context of construction enterprises, SR is not simply a superficial acknowledgment of environmental awareness but rather a holistic approach to achieving long-term success within a dynamic industry environment. According to Jørgensen and Pedersen (2015), disclosing this data can increase a company's credibility and improve its reputation concerning sustainability. Nevertheless, it is worth noting that corporate acts that deviate from sustainable principles have the potential to negatively impact a company's reputation (Sjåfjell, 2020).

The paradox is that numerous companies continue to participate in SR on a voluntary basis (Gal et al., 2018). In addition, it is common for various organizations to employ diverse reporting standards, which might result in a state of ambiguity among stakeholders. Interestingly, certain companies do not conform to any recognized norms or guidelines (Horrihan 2010). The generation of sustainability reports by a majority of corporations is mostly driven by either industry pressures or legislative mandates imposed by governmental bodies (Joensuu et al., 2015). The reporting standard that is most commonly employed for this objective is the Global Reporting Initiative (GRI) reporting standard. The details of the GRI reporting standard will be explored in depth later in this section.

SR is frequently criticized due to the fact that it is an evolving discipline with numerous areas that require improvement. Readers raise occasional inquiries regarding the integrity and accuracy of the information contained in these reports. A significant concern is the need for uniformity and comparability among various reports, which engenders doubt regarding the shared data (Gray, 2006). Despite some progress, numerous reports continue to provide data that is regarded as incongruous and inadequate (Glazerman & Cohen, 2020). The primary cause of this inconsistency is the absence of standardised regulatory frameworks; consequently, stricter regulations are demanded to enhance reports' comparability and dependability (Bruner & Sjåfjell, 2019). The ongoing discourse regarding SR revolves around how actionable, transparent metrics should be assigned to sustainability-related economic activities. The main concern is whether or not these reports adhere to genuine sustainability principles (Gray, 2010, p. 48). In addition, there are more profound concerns regarding the data collection

methodologies. Gray (2006) argues that reporting social and environmental issues operates under the assumption that established methods can resolve these issues. Nevertheless, some contend that sustainability reporting should foster novel approaches surpassing traditional methodologies. Therefore, the efficacy of exclusively depending on efficiency as a solution to these challenges is doubted (Joensuu et al., 2015). Since transparency is highly valued in reporting, disclosing information regarding a company's endeavours to improve its sustainability practices further enhances the report's perceived credibility. On the contrary, reports that appear to present a company exclusively positively may give rise to uncertainties regarding their reliability (Glazerman & Cohen, 2020).

GRI Reporting Standard:

According to Carson et al. (2003) and GRI (2022a), the establishment of the GRI in 1997 aimed to foster responsible environmental practices within the corporate sector. The GRI standards were first introduced in 2000 due to previous environmental pledges made by different organisations. These guidelines have now become the leading source of advice for SR. Throughout its development, GRI progressively broadened its rules and organisational reach, incorporating training initiatives and the Sustainable Development Goals (SDG) framework.

The GRI reporting standards were implemented in 2016 and are organised into three separate tiers, as outlined by Al-Haija and Kolsi (2021) and GRI (2022a). The initial Universal Standards stratum encompasses GRI 1, 2, and 3. These principles and disclosures apply to all reporting entities, encompassing reporting standards, critical disclosures on the business, and insights on the company's core subjects. A revised iteration of these criteria was introduced in October 2021, emphasising superior governance, improved comparability, and a heightened focus on human rights compared to its previous version in 2016 (Adams et al., 2021; GRI, 2022b).

The succeeding layer emphasizes creating sector-specific standards, which are now being developed for around 40 to 45 industries with a substantial effect. The focus is placed on industries with a significant influence, with the automobile industry being a noteworthy inclusion, although the exact timeframe for publishing its particular standards is yet undetermined. The third tier comprises the topic standards, which are categorized into three series: the 200 series, which focuses on economic factors; the 300 series, which addresses environmental issues; and the 400 series, which concentrates on social issues.

While firms are obligated to comply with disclosure regulations, they possess the autonomy to select the reporting standard of their choice (Kalesnik et al., 2020). The potential

for bias is a significant consideration arising from freedom of choice, as Kalesnik et al. (2020) emphasised in their critique of the existing sustainability reporting criteria. In contrast, GRI (2020a) highlights the necessity of implementing obligatory standards in SR to uphold a level of uniformity and rigour comparable to that of financial reporting. However, Safari and Areeb (2020) point out that despite current regulations, there needs to be more uniformity in the content of sustainability reports, which results in a lack of uniformity.

SR serve as a means to showcase a company's performance and its effects on environmental and social matters (Sjåfjell & Bruner, 2019). Over the previous ten years, establishing sustainability reports has emerged as a necessary need for companies to uphold their societal obligations and establish credibility for their financial pursuits. The emergence of this requirement can be attributed to a growing emphasis on environmental and social accountability in corporate operations. In this contemporary era, corporations must publish information regarding their social and environmental impact. However, the assessment of firm performance often relies on subjective and broader notions of sustainability (Horrigan, 2010). Therefore, it is imperative to establish a standardized framework for assessing organizational performance to facilitate the transition toward sustainability in construction industry (Gacser & Szoka, 2021). I have chosen the thirty largest construction firms that originate from Europe, and I collected all those sustainability reports to undertake a document analysis. It will offer us a clear overview of how sustainability reports portray notions of a CE.

2.1.1 The role of sustainability reporting in construction industry

Sustainability reporting functions as a mechanism through which organizations can enhance the transparency of their strategies, actions, and accomplishments. Construction companies can effectively communicate their performance across multiple dimensions, including environmental preservation, social accountability, and financial feasibility, by means of sustainability reporting. By engaging in this practice, one can not only cultivate a reputation for conscientious conduct but also potentially gain a competitive edge. Notwithstanding its advantages, sustainability reporting in the construction industry continues to be predominantly discretionary (Glass, 2012).

Sustainability reporting is one method of documenting and disseminating the endeavors being undertaken to mitigate the substantial environmental losses associated with the construction sector. Reusing, recycling, environmental innovation, and minimizing waste and contamination are a few of the measures taken to conserve energy, water, and natural resources.

The construction industry endeavors to fulfill the requirements of current and future generations through the implementation of proactive measures and accurate reporting thereof (Lima et al., 2021). In addition, there is a strong correlation between sustainability reporting and corporate social responsibility (CSR). It enables organizations to disclose their performance to stakeholders in a transparent and responsible manner. By means of this reporting mechanism, organizations are able to evaluate, quantify, and oversee their activities, thereby guaranteeing that they are in accordance with more extensive sustainability objectives (Glass, 2012).

Although there is no universally applicable standard for sustainability reporting in the construction sector, it is evident that this approach is increasingly being adopted as a method to showcase organizational accountability and guardianship of the environment. The heterogeneity in reporting scopes, quality, and emphasis is indicative of the construction industry's multifaceted character and the varying degrees of sustainability practice implementation among companies and regions. Since there is limited research in this field, an expanding body of literature indicates that corporations may engage in sustainability reporting for social and political motivations, such as enhancing their public image or in response to stakeholder pressure, as well as for instrumental reasons, such as regulatory compliance (Cortés, 2023).

2.1.2 Sustainability reporting and circular economy

As firms adopt more prevalent CE strategies, there is an urgent requirement for establishing norms to standardise external communication about these endeavours. The non-financial reporting and sustainability fields have established a strong foundation via several international frameworks. However, standardised protocols still need to be for recording and documenting advancements in circularity (Opferkuch et al., 2021). The CI, known for its substantial use of resources, has the potential to benefit significantly from adopting circular CE practices to reduce global consequences and conserve natural resources. The emphasis on recycling resources throughout crucial supply chains positions the CE as a guiding principle for achieving long-term sustainability. Recent research suggests a growing consensus within the construction sector to adopt a CE-oriented strategy. However, factors like fluctuating raw material prices, limited material availability, rising consumer demand, rising consumer expectations, a lack of infrastructure for waste disposal, and improper recycling techniques all have an impact on ongoing issues (Ghufran et al., 2022).

The CE concept has been widely recognised as a significant driver for promoting SD, as highlighted by Sparrevik et al. (2021). Nevertheless, the Linear Economy (LE) paradigm has faced criticism due to its emphasis on uninterrupted economic expansion, often resulting in environmental degradation while neglecting to address issues of social fairness (Agrawal et al., 2021). Given the increasing magnitude of global sustainability difficulties, it is imperative that the CE model effectively and comprehensively tackles these pressing issues. According to Nogueira et al. (2019), for CE to achieve genuine sustainability, it is imperative to maintain a well-rounded emphasis on environmental preservation, social justice, and economic development.

According to Xu et al. (2018), the CE concept has arisen due to extensive international endeavours over ten years to promote sustainable economic development. According to Yaduvanshi et al. (2016), CE is widely recognised as a significant instrument for SD. However, as noted by Kirchherr et al. (2017), there exists a gap in the literature regarding the potential questioning of the sustainability claim of CE when it fails to consider social issues. The capacity of CE to stimulate economic growth while safeguarding environmental and social considerations is subject to uncertainties (Ullah et al., 2021). The limited number of studies examining the influence of CE on social well-being, as highlighted by Merli et al. (2018), underscores the urgent necessity to tackle this issue. Furthermore, it is imperative to adopt a collaborative interdisciplinary methodology to comprehensively comprehend and evaluate the impact of the CE on social fairness. According to Mongsawad (2012), implementing creative strategies plays a vital role in transforming production and consumption patterns, hence decreasing reliance on primary resources and encouraging the utilisation of recycled materials.

In the context of the CI, the ideas of CE hold particular relevance. According to Türkeli et al. (2018), the CE transition is significantly influenced by the massive consumption of resources such as energy and materials by the CI. Although transitioning poses particular difficulties, it is imperative to overcome these obstacles to achieve a sustainable future (Stewart & Niero, 2018). The comprehension and use of CE within the CI is crucial, considering its importance to national economies (Suárez-Eiroa et al., 2019).

The CE framework presents viable resolutions to urgent sustainability issues worldwide (Sparrevik et al., 2021). In addition to its role in stimulating economic growth and facilitating the creation of sustainable employment possibilities, it also serves to decrease reliance on finite resources and mitigate adverse environmental consequences (Schoenmaker, 2017). Nevertheless, the successful implementation of this initiative relies heavily on a collective

endeavour from all sectors of society. The adoption of CE entails a shift from a limited-term consumer perspective to a durable, enduring framework (Kontokosta, 2016).

There is growing interest in integrating CE initiatives inside corporate models and CSR processes. However, the extent to which SR contributes to this phenomenon still needs to be explored in the existing body of research. Examining these studies in terms of their ability to validate and establish comparability in the sustainability implications of CE techniques represents an area explored in the research field. According to the European Commission's 2019 message, the "European Green Deal" establishes CE as a crucial strategy for rejuvenating the economy of the European Union. The agreement also includes a proposal to revise the Non-Financial Reporting Directive to improve the disclosure of climate and environmental information, promoting sustainable investments.

2.2 Sustainability marketing

The concept of sustainability marketing encompasses a philosophical framework and a range of associated actions. The primary objective of this initiative is to fulfil the demands of consumers and establish a favourable market standing for enterprises by demonstrating their dedication toward environmental, social, and economic concerns (Bridges and Wilhelm, 2008; Mitchell et al., 2010). The primary goals of this mode of communication are twofold: firstly, to provide the intended audience with information regarding how their goods fulfill specific requirements while also addressing more general problems, and secondly, to enable discussions among stakeholders pertaining to the overall operations of the company (Belz & Peattie, 2012). Nevertheless, there exists a significant knowledge deficit among marketers regarding the optimal strategies for conveying sustainability, as well as among sustainability specialists regarding the most efficient methods for promoting their projects (Arnold, 2009; Belz & Peattie, 2012).

Organizations that prioritize sustainability frequently encounter the phenomenon of sustainability marketing myopia, wherein their attention becomes disproportionately fixated on promoting their products rather than addressing client requirements. This phenomenon results in the emphasis on sustainability attributes while neglecting consumer needs, leading to the generation of perplexity and inappropriate communication (Ottman et al., 2006; Rex & Baumann, 2007). As a result, there is a possibility that products that are promoted for their environmentally friendly or fair trade characteristics can be viewed as having lower quality, which can lead to a sense of doubt or skepticism (Kreps & Monin, 2011). In addition, it is important to note that sustainability claims have the potential to result in greenwashing, a

phenomenon in which corporations strategically provide favorable sustainability information while concealing any unfavorable aspects (Lyon & Maxwell, 2011). The act of falsely marketing products as sustainable might lead to the development of cynicism among consumers (Belz & Peattie, 2012; Bertilsson, 2014). The act of engaging in sustainability communication has the potential to set a business apart within the market. However, it is important to note that this practice also carries the inherent risk of facing negative reactions from various stakeholders (Lyon & Maxwell, 2011; Smith & Brower, 2012). According to Kreps and Monin (2011), engaging in public demonstrations of moralizing regarding sustainability may be interpreted as a reduction in perceived competence and likability, potentially due to the perception of being judgmental. Individuals frequently harbor negative attitudes towards individuals who exhibit moral superiority due to the potential psychological implications of feeling inferior or perceiving a perceived encroachment upon their consumer rights (Gössling & Buckley, 2014).

The establishment of a Sustainable Value Proposition is of equal significance. Belz and Peattie (2009) argue that in order to be successful, businesses should not only focus on providing economic benefits but also incorporate social and environmental values into their offerings. In addition to this, Wheeler and Elkington (2001) place significant emphasis on the importance of stakeholder involvement, advising businesses to carefully evaluate the broader socioeconomic and environmental consequences of their operations. Life Cycle Analysis (LCA) is a fundamental aspect of sustainability marketing, as it enables the evaluation of a product's environmental consequences across its whole lifecycle, encompassing various stages such as manufacturing, utilization, and disposal (Baumann & Tillman, 2004). The examination of this data is of utmost importance in the effort to mitigate ecological footprints.

Furthermore, sustainable branding assumes a crucial function. According to Janssen et al. (2014), it is crucial to develop brands that not only emphasize quality and efficacy but also align with sustainable practices and corporate social responsibility. Ottman et al. (2006) examine the concept of green positioning and eco-labelling, which are integral mechanisms for effectively conveying the environmental and social advantages of a product. The aforementioned practices play a crucial role in the field of sustainability marketing since it aims to align corporate goals with the demands of the environment and society. Each of these academic viewpoints adds to a more comprehensive comprehension of how sustainability can be efficiently incorporated into marketing strategies, thereby tackling the intricate environmental and social concerns of our contemporary era.

2.2.1 Sustainability reporting as sustainable marketing

SR has the potential to portray a corporate entity that is genuinely committed to the principles of sustainability. Customers will be more inclined to select environmentally friendly alternatives for materials with a significant environmental footprint than those with a minimal environmental footprint, according to Chatterjee (2009). Sustainable marketing has become a crucial technique in modern marketing discussions, driven by increasing concerns about environmental sustainability and a changing customer preference for environmentally conscious products and services (Ottman, 2011; Sharma, 2021). Organisations strive to reduce their environmental impact, enhance their corporate image, and cater to the needs of environmentally concerned consumers by using sustainable marketing strategies (Leonidou et al., 2023). Understanding how sustainable marketing influences consumers' intention to repurchase environmentally friendly products and services is a significant aspect (Tien et al., 2020). Sustainable marketing significantly impacts consumer perceptions and behavioural tendencies as a strategy rooted in modernism. In his study, Ottman (2011) outlined the several dynamic techniques covered within the green marketing concept. He emphasised the potential of these strategies for developing sustainable brand identities. Simultaneously, Rahbar and Wahid (2011) elaborated on the effectiveness of green marketing tools, emphasising the efficacy of environmentally-themed commercials in generating positive consumer attitudes. In the area of brand loyalty, Nagar (2013) and the study by Lin, Lobo, and Leckie (2019) suggest that advertising that cares about the environment and new ideas for brands work together to make people more loyal to brands, which leads to more repeat purchases. Additional research conducted by Chen et al. (2022) and Huang et al. (2014) highlights the crucial significance of green brand equity in shaping decisions regarding repurchasing.

A sustainability report serves as a means for a firm to demonstrate transparency concerning its ESG practices. By openly acknowledging achievements and obstacles, organisations can exhibit their responsibility to the various parties involved. The establishment of open communication can significantly augment trust within a given context (Eccles & Krzus, 2010). Including stakeholder engagement in the sustainability reporting process makes it easier to directly address issues and concerns raised by a wide range of people, such as communities, investors, consumers, and employees. Engaging in such activities can also enhance the overall quality of the report since it helps to prioritise and address significant matters (Unerman & Bennett, 2004). By adhering to established sustainability reporting standards, such as those offered by the GRI or the Sustainability Accounting Standards Board (SASB), organisations

can cultivate trust and assurance among stakeholders over their adherence to industry-leading practices (Brown et al., 2009). Consistently revising and disseminating sustainability reports indicates a sustained commitment to sustainability, in contrast to isolated endeavours or promotional endeavours. According to Dhaliwal et al. (2011), stakeholders emphasise organisations that demonstrate a continuous and enduring commitment to addressing ESG issues.

In corporate strategy, proactive corporate conduct can be defined as an elevated ambition that recognises business opportunities through adopting sustainable practices and SR. This implies that corporations adopt a strategic approach to gain a competitive advantage by implementing environmentally friendly business practices (Joensuu et al., 2015). Within this context, SR aims to communicate a corporation's initiatives that emphasise its proactive and future-oriented stance. Benchmarking tools are valuable tools that facilitate effective communication and enable the comparative examination of performance data. Moreover, reporting might serve as a component of an environmentally-oriented approach, providing companies with a competitive advantage through improved public perception (Joensuu et al., 2015). As a result, the revelation of ecological and societal information may extend beyond fundamental adherence to regulations, as it is inherently connected to a corporation's potential to attain a competitive advantage in markets that prioritise sustainable practices (Joensuu et al., 2015).

2.2.2 Greenwashing

The rise in demand for environmentally friendly products and services has resulted in the phenomenon known as greenwashing. Greenwashing refers to the deceptive practise of making exaggerated or unsubstantiated assertions about the environmental benefits of a product or service to promote its sale. The term "greenwashing" pertains to deceptive advertising practices that mislead consumers about the environmental attributes of a product. Greenwashing refers to the deceptive practice of advertisements and labels that make exaggerated claims about their environmental benefits, ultimately failing to live up to these assertions. Greenwashing is observed when organisations intentionally present their actions to portray them as environmentally benign, creating a perception of being committed to sustainability. As the increasing prominence of the eco-friendly, natural, and green movement unfolds, marketers are increasingly inclined to use it for their own benefit (Schweitzer, 2019).

The Seven Sins of Greenwashing:

Greenwashing occurs when a firm allocates a significant amount of resources, both in terms of time and finances, towards promoting itself as environmentally responsible and sustainable rather than actively integrating these principles into its operational strategies and practises. TerraChoice (2010) and Dahl (2010) has identified what it refer to as the seven sins of greenwashing, which are stated as follows:

- “1. Sin of the hidden trade-off: This is committed by suggesting a product is “green” based on an unreasonably narrow set of attributes without attention to other important environmental issues.*
- 2. Sin of no proof: This is committed by an environmental claim that cannot be substantiated by easily accessible supporting information.*
- 3. Sin of vagueness: This is committed by every claim that is so poorly defend that its real meaning is likely to be misunderstood by the consumer.*
- 4. Sin of irrelevance: This is committed by making an environmental claim that may be truthful but is unhelpful for consumers seeking environmentally preferable products.*
- 5. Sin of lesser of two evils: This is committed by claims that may be true within the product category, but that risk distracting the consumer from the greater health.*
- 6. Sin of fibbing: This is committed by making environmental claims that are simply false. This is the least frequent sin.*
- 7. Sin of false labels: This is committed by exploiting consumers’ demand for third-party certification with fake labels”.*

The inclusion of green advertisements is an essential element within the realm of green marketing, as it conveys the environmentally friendly and sustainable attributes of a brand's products or services to consumers (Nagar, 2013). According to Nagar (2013), empirical evidence indicates that utilising green ads has a significant impact on cultivating favourable customer attitudes and influencing consumer choice towards environmentally friendly products and services. Nevertheless, scholarly research also emphasises the possibility of greenwashing, a phenomenon in which companies exaggerate or distort their environmental dedication, potentially eroding consumer trust and diminishing their likelihood of making repeat purchases. Public uncertainty is a significant consequence stemming from the practice of greenwashing. Greenwashing is a deceptive practice that can result in confusion or misinformation by presenting inaccurate assertions on environmental impact. Due to individuals' limited capacity to discern false advertising and labelling, they often purchase

products that fail to meet their anticipated environmental standards. Sceptical consumers may need more scrutiny to accept advertising claims readily. Another challenge is the need for more assurance regarding the sustainability practices of greenwashing companies. The comprehension of greenwashing necessitates an examination of its subjective interpretation by individuals (Seele & Gatt, 2017).

2.3 The state of the art of circular economy in CI

A CE is a carefully designed system that aims to restore and regenerate resources, hence decoupling economic growth from resource utilization (Ghisellini et al., 2016). The proposal of a CE emerged during the twentieth century to highlight the advancement of the ecological industry (Blomsma et al., 2017). The CE concept is a potential remedy for reducing reliance on resource extraction. Preserving the current way of life necessitates the maintenance of resource value and their continuous circulation (Kalmykova et al., 2018); Adams et al., 2017). The corporate approach eradicates the notion of "end of life" from the various stages of manufacturing, distribution, and consumption (Adams et al., 2017). The concept of CE emphasizes the reduction of waste generation and the promotion of resource reuse, recycling, and recovery. This method is a fresh strategy for attaining sustainable development (Mele & Poli, 2015). Promoting disruptive innovations in product-service systems, social and eco-innovations, optimizing resource utilization, and adopting sustainable consumption practices is actively encouraged (Ma et al., 2019). Transitioning from a LE to a CE poses a significant difficulty.

Nevertheless, attaining this objective will contribute to achieving the overarching sustainability objectives as outlined in reference (Moallemi, et al., 2020). The CE is believed to have played a role in the transition of the traditional LE towards a closed substance economy, which is necessary and advantageous for the establishment of a sustainable society (Ullah et al., 2020). CE principles are gaining momentum as a viable approach to achieving sustainable objectives (Schroeder et al., 2019). There is a requirement for developing novel tools that can assist practitioners, decision-makers, and governments in adopting a more significant number of CE practices and obtaining the comprehensive advantages associated with such practices. The study conducted by Kirchherr et al. Kirchherr (2017) revealed that approximately 35-40% of the 114 formulations of CE focus on the waste hierarchies of the reduce, reuse, recycle (3R) framework.

Nevertheless, the idea of a CE may only comprehensively encompass some dimensions of sustainability. More specifically, the discourse on sustainability lacks attention to its social dimension, which has been identified as a growing critique of its conceptualization and connection to sustainability. However, many academics, business leaders, and politicians are interested in learning more about the possible benefits of adopting the CE model to make the economy more sustainable (Guerra & Leite, 2021). A pressing necessity exists to incorporate the practice of CE to achieve sustainable development within the CI context, which plays a significant role in the overall world economy (Circle Economy, 2018).

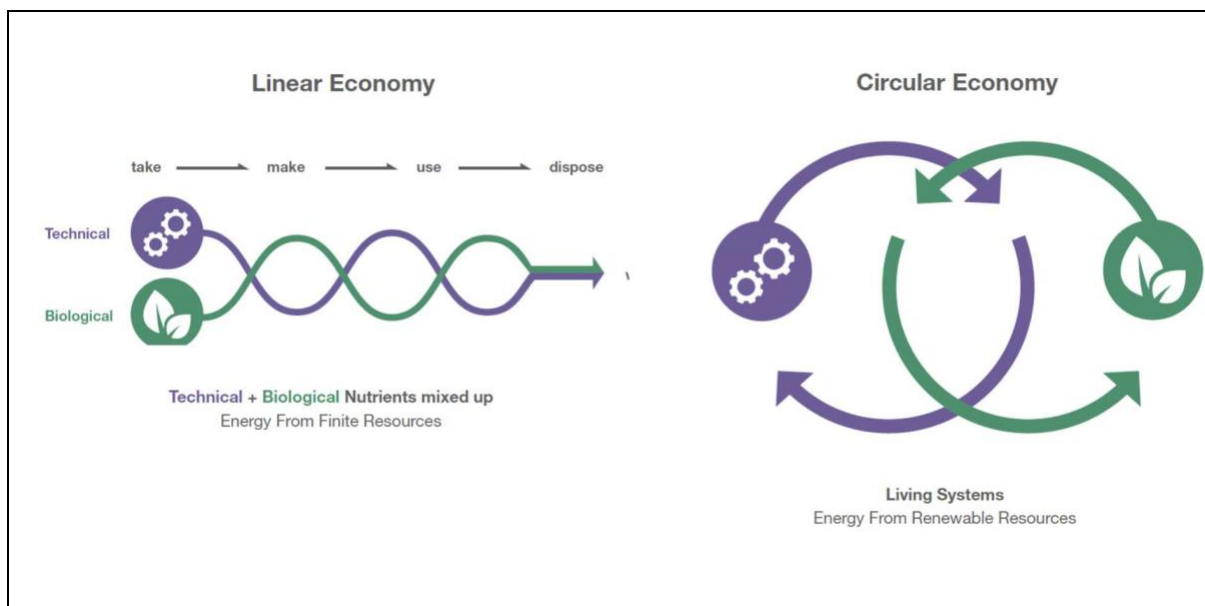


Figure 1: *Linear economy in comparison to circular economy*

Source: (EllenMacArthur Foundation, McKinsey Centre for Business and Environment, & SUN, 2015)

Buildings, the tall, short, beautiful, and plain structures that we pass every day, contain a hidden potential that could reshape the future of our planet. Buildings are comprised of more than just mortar and brick. They can show a world that values each brick, paint particle, and beam. The future is circular; the question is whether we are prepared to construct it. Imagine a world in which our buildings produce no waste and in which the bricks, timbers, and even paint all play a vital role in the buildings' life cycle. Which is the vision envisioned by "Circular Building Design."

Sadly, most modern structures do not belong to this forward-thinking loop. They need to be connected to the circular economy's principles (Circle Economy, 2018). The CE is Mother Nature's business model: nothing is wasted, everything has a purpose, and resources are

reversed. It entails transforming our "throw-away" mentality into one where waste becomes a relic of the past, and every product is designed with a future purpose in mind (Kanters, 2020). While sectors across the globe are embracing these cyclical strategies, the world of architecture, engineering, and construction (AEC) still lags. LCA techniques provide a glimpse of the advantages of circular construction. Attempting to complete a jigsaw puzzle with only half of the pieces is likely futile (Chen et al., 2021).

The European Union made a bold step forward in 2015 when it unveiled its visionary "Closing the Loop" action plan. It paints a vision of an economy liberated from scarcity, where businesses flourish on innovation rather than depleting resources (European Commission, 2015). One of the plan's highlights is the efficient "waste hierarchy." Picture this: a pyramid where the Directive 2008/98/EC (2008) represents "waste prevention," urging us to think before discard. As we progress down the pyramid, we find additional layers: reuse, recycle, and recover, with disposal (Directive 2008/98/EC, 2008).

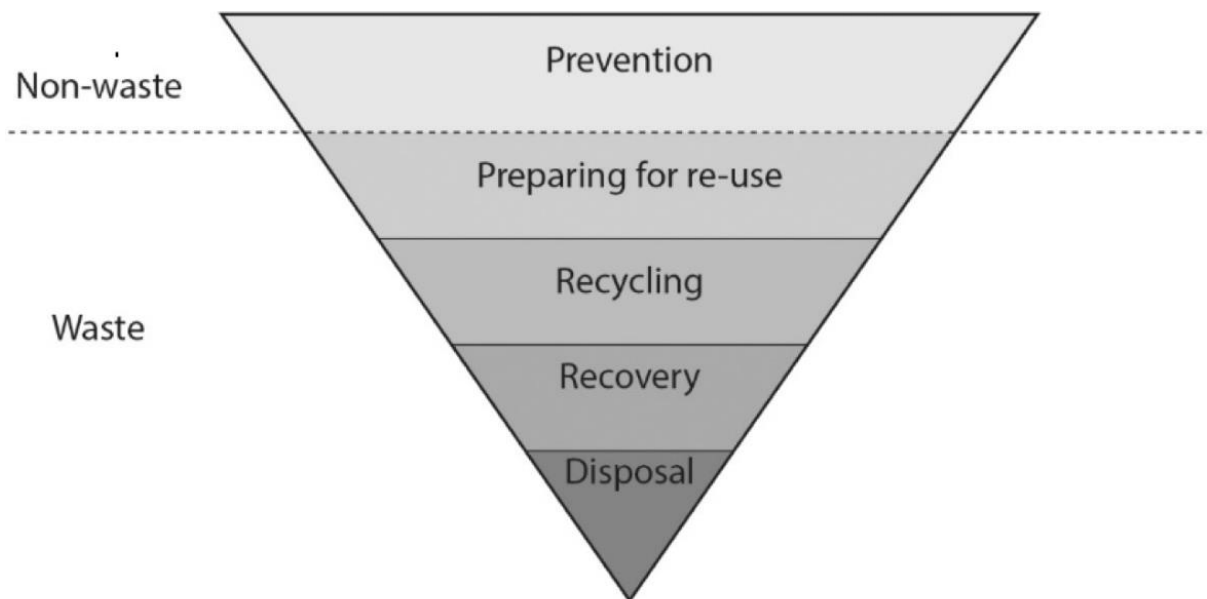


Figure 2: *The waste hierarchy according to Waste Framework Directive 2008/98/EC.*

Source: (Directive 2008/98/EC, 2008)

The Waste Framework Directive 2008/98/EC, as revised 2018/851 (WFD), establishes defined targets for waste management and requirements for waste management and recycling, taking into account quantified recovery targets for Construction and Demolition Waste (C&DW) to be met by 2020. End-of-waste criteria define when a waste ceases to be a reuse and becomes a secondary material or product. According to WFD, "MemberStates shall take measures to

promote selective demolition in order to enable removal and safe handling of hazardous substances and facilitate reuse and high-quality recycling by selective removal of materials, and to ensure the establishment of sorting systems for C&DW at least for wood, mineral fractions (concrete, bricks, tiles and ceramics, stones), metal, glass, plastic and plaster” (Directive 2008/98/EC, 2008). Furthermore, it is recommended that the Commission conducts an assessment by December 31, 2024, with the aim of establishing targets for preparing-for-reuse and recycling construction and demolition waste (C&DW), as well as specified percentages of materials within this waste category.

Within the context of the CE, the CI is experiencing the emergence of several discernible patterns. The adoption of environmentally sustainable materials such as recycled steel, glass, and concrete is experiencing a growing trend in popularity (Veidekke ASA, 2023). Using recycled components during construction can effectively reduce trash generation and yield cost savings simultaneously. Another prevailing trend is the adoption of circular design principles. These principles consider the complete life cycle of a structure, encompassing its construction, operation, and eventual destruction. The abovementioned approach advocates for adopting materials and resources that can be repurposed, recycled, or employed after a building has reached the end of its functional lifespan (Veidekke ASA, 2023).

3 Method

In this chapter, the research design is laid out, detailing the empirical methods used: case study, discourse analysis, and the statistical analysis applied to data from 30 construction companies. In my master's thesis, I employed a data triangulation approach. In the quantitative field, a set of five indicators was derived through an examination of 30 sustainability reports. The selection process involved identifying the parameters that exhibited the highest relevance to the principles and concepts of the circular economy. The present qualitative study involved the implementation of a discourse analysis approach, with a specific emphasis on examining the four most commonly utilized keywords identified within the reports under investigation. Furthermore, a case study was carried out, which played a crucial role in addressing my thesis's research questions.

3.1 Research methodology

This study has included both qualitative and quantitative research approaches. The objective of qualitative research methodologies is to acquire a comprehensive understanding of phenomena rather than derive generalized conclusions based on theories, reflection on the 30 biggest European CI, and a case study. When faced with limited time and resources, the qualitative technique is a highly viable option to be considered. In research aimed at delineating and comprehending the trajectory of any industry, especially when examining SR, a social constructivist approach is often the most suitable. This approach typically involves a multifaceted research strategy, encompassing an extensive review of pertinent literature, thorough analysis of relevant documents, and conducting interviews with key individuals. Such a strategy aims to uncover the subjective meanings that participants associate with the prevailing trend being studied. This research aimed to investigate the prevailing pattern of circularity in the European CI by examining SR from various industry participants. In addition, the research entailed the performance of discourse analysis to investigate the communication techniques that construction companies adopt to inform their stakeholders about circularity.

This research also aims to conduct a comparative quantitative analysis of thirty different construction firms. Drawing from the 2021 Worldwide Powers of Construction report by Deloitte International, which ranks the top 100 global construction companies based on sales and market capitalization, the focus is on understanding the current state and future outlook of reporting CE in the European construction sector. Deloitte's 2021 study showed that the 100 surveyed construction companies were based in 30 different countries. For the purpose of this study, five key parameters will be established based on circular economy-related activities to guide the descriptive statistics, utilizing a sample of 30 enterprises.

This study included a range of data collection methods, including a comprehensive review of 30 sustainability reports, to examine the research question. Utilizing Data triangulation approaches is expected to enhance the reliability and validity of the research. For the purpose of this master's thesis, I am referring to academic investigations that delve extensively into the acquisition of knowledge of the circular economy reporting.

3.2 Data collection

Two data collection approaches were employed in this study, namely "secondary data" and "in-depth qualitative interviews," with a primary focus on annual sustainability reports. The initial research method employed was qualitative in-depth interviews, which allowed me to go deeply

into the subject matter. Specifically, I aimed to engage in comprehensive conversations about managerial roles and responsibilities. I am inquiring about the strategic approach employed by the organizations to foster circularity within the building and construction sector at large and also what obstacles company's has encountered throughout the implementation and reporting of CE practices. When conducting an in-depth interview, it is crucial to employ an interview guide and a predetermined set of questions to provide structure and direction to the conversation, aligning it with the intended research objectives. In order to ensure preparedness, it was necessary to have secondary data readily available, comprehensively reviewed, and thoroughly comprehended.

Secondary data refers to material about previous or comparable research that has already been conducted. The concepts above are introduced within the section dedicated to theoretical frameworks. The data utilized in this study was sourced from various reports, papers, and projects, as well as supplementary sources for the background chapter, including reports, documents, books, and websites. Needless to say, annual SR played a crucial role in my whole study. In addition, academic literature was also a vital part of understanding the different theories of my master's thesis. Employing secondary data has numerous advantages, including time efficiency and the propensity for high-quality data sources. However, it is imperative to exercise critical analysis when evaluating data gathered from other sources in order to ascertain their credibility. Secondary data was employed to examine the reporting and implementation of CE in various projects and provide an overview of technical reports and operational protocols. Upon becoming familiar with the secondary data, I proceeded to develop an interview guide for the purpose of conducting qualitative interviews.

3.3 Data Triangulation

Data triangulation is an indispensable method in research, and it is especially critical for a master's thesis. It significantly enhances the credibility, validity, and dependability of research outcomes. By employing a variety of data sources, theories, methodologies, or researchers, this approach investigates a particular research inquiry (Mertens & Hesse-Biber, 2012). Triangulation is a method employed to enhance the credibility and validity of research outcomes. By utilizing diverse methodologies, perspectives, and theories, it approaches the same topic from multiple angles, preventing the outcomes from relying excessively on a single approach, theory, or researcher. By employing this methodology, potential biases are significantly reduced, thereby enhancing the overall credibility of the research (Mertens & Hesse-Biber, 2012).

The integration of triangulation into a master's thesis is crucial for mitigating research bias that may result from relying solely on one method, theory, or investigator (Moon, 2019). This essential mitigation of bias contributes to maintaining the research process's integrity and objectivity. Triangulation significantly augments the credibility of an investigation, referring to its reliability and plausibility. Additionally, it ensures that the research accurately reflects or evaluates the concepts or ideas being investigated, thereby enhancing its validity (Moon, 2019). Data triangulation enhances the effectiveness of research by incorporating information from multiple sources. This approach enables a more comprehensive examination, resulting in a more profound understanding of intricate topics. An instance of this would be the utilization of a triangulation matrix to facilitate a more exhaustive investigation of the research issue (Moon, 2019).

3.4 Quantitative research

Quantitative research refers to a systematic approach employed to examine phenomena by utilizing statistical, mathematical, or computational methodologies. The main purpose of its application lies in the quantification of relationships, behaviors, and other explicitly defined factors, as well as in the generalization of findings from a broader population sample (Bhandari, 2023). Quantitative research encompasses three primary methodologies: descriptive, correlational, and experimental. Descriptive research aims to provide a comprehensive overview of the variables under study; correlational research explores the links between these factors, and experimental research studies the cause-and-effect relationships among them (Bhandari, 2023). Both correlational and experimental research methodologies can be employed to examine hypotheses through the application of statistical techniques formally. Consequently, the outcomes derived from both research approaches have the potential to be extrapolated to larger populations, contingent upon the sampling methodology employed (Bhandari, 2023). This study employed quantitative methods to conduct descriptive research, with the aim of summarising the variables under investigation. The flexibility inherent in this approach becomes useful for addressing the research objectives outlined in my master's thesis (Bhandari, 2023).

Descriptive statistics is a field within the discipline of statistics that encompasses the process of summarising, organizing, and presenting data in a manner that is both intelligible and succinct (Fisher & Marshall, 2009). The primary objective of this study is to provide a comprehensive description and analysis of the main aspects and characteristics of 30 sustainability reports while refraining from making several indicators of the circular economy

of European construction firms. Descriptive statistics encompasses the utilization of visual tools such as charts, graphs, and tables to depict data, hence facilitating the process of visualizing and interpreting the information. Through the utilization of descriptive statistics, researchers are able to condense and convey the fundamental attributes of a dataset proficiently. This practice enhances comprehension of the data and establishes a basis for subsequent statistical analysis or decision-making endeavors (Marshall & Jonker, 2010).

Deloitte conducted a thorough study in 2021, revealing that the 100 construction enterprises under investigation come from 30 different nations around the world. This extensive dataset employed a selection criterion to focus specifically on the 30 most prominent European construction firms. The primary objective was to critically assess their sustainability reports. A rigorous content analysis revealed recurring themes and concepts prevalent in these reports. From this quantitative analysis, a structured framework emerged, culminating in five distinct parameters. These parameters formed the basis for a subsequent qualitative survey, encompassing the same sample of 30 European firms. The resultant statistics provide an invaluable perspective on the prevailing sustainability trends within the construction sector. And finally we will elaborate those parameters (statistics). While developing these parameters, I concentrated on the SR trends observed in 30 reports focused on sustainable practices. This analysis can significantly impact the CE. The following delineates these five critical parameters:

1. Do they participate in the UNGC program?
2. Does their sustainability report explain how they use the idea of a "circular economy" in their business?
3. Do they use a green building rating system for LCA?
4. Are they using any waste management systems?
5. Do they have an "employment of EPD" policy?

3.5 Discourse analyses

The field of discourse analysis enables a comprehensive exploration of language and its socio-cultural ramifications. According to Fairclough (2013), discourse analysis is valuable for revealing power dynamics within verbal or written communication. It allows for identifying individuals who possess authority, those who are marginalized, and how these power dynamics manifest via language (Gray et al., 1995). As societies transform, there is a corresponding shift

in the utilization of language. The utilization of discourse analysis can serve as a valuable instrument for comprehending these transformations, discerning nascent patterns, and potentially prognosticating forthcoming trends (Gee, 2014). Using discourse analysis within a master's thesis can enhance one's analytical abilities, foster critical thinking skills, and cultivate a more nuanced language comprehension (Johnstone, 2017). In the contemporary landscape characterized by misinformation, partiality in media reporting, and ideological conflicts, it becomes imperative to comprehend the intricacies of discourse. The utilization of discourse analysis by students allows for the thorough examination and comprehension of these present-day difficulties (van Dijk, 2015).

Discourse analysis was employed as a component of qualitative research in this study. Using discourse analysis allows for critically examining the SR developed by thirty construction companies. The primary motivation for doing discourse analysis is its interdisciplinary nature, which has the potential to enhance the quality of my master's thesis by facilitating the integration of ideas on the CE within the CI. Discourse analysis enables researchers to thoroughly examine their data, uncovering subtle and complex patterns that alternative methodologies may overlook. I thoroughly reviewed the SR of thirty construction firms and initially identified eight crucial words that are pertinent to my thesis topic and are consistently used throughout these reports. I decided to exclude four specific terms from consideration due to their lack of universality across all sustainability reports. After careful consideration, I have identified four crucial keywords those are highly linked to my research question for my thesis. The process involved quantifying the frequency of important terms mentioned in each report using a systematic counting method. I have created an Excel spreadsheet to conduct additional analysis.

3.6 Qualitative research

Quantitative research is the primary instrument for a researcher. The researcher's role in qualitative research is central to data collection and interpretation. It can allow for a more direct and immediate understanding of the studied phenomena (Creswell & Poth, 2016). Qualitative research helps to understand the depth, richness, and complexity of human experiences. Unlike quantitative research, which typically counts and measures phenomena, qualitative research seeks to understand meanings, interpretations, symbols, and social life processes and relations (Denzin & Lincoln, 2008). Qualitative research can be more flexible than its quantitative

counterpart. This flexibility allows researchers to modify their inquiries as they progress, leading to a more organic and evolving understanding of the topic (Merriam & Tisdell, 2015).

Qualitative methods are typically employed when the objective is to comprehend the phenomenon's fundamental conditions (Gray, 2018). On this basis, sustainability reporting in specific contexts is investigated in depth to determine its motivation. I have selected the social constructivist approach as the framework for my qualitative investigation. The social constructivist approach is a theoretical framework that posits that various elements of social reality, such as concepts, beliefs, norms, values, and even biological attributes, are influenced by human interactions and interpretations under specific cultural and historical circumstances. This perspective questions the assumption that these elements are inherent or universally valid, instead positing that social dynamics and the use of language shape them. This method emphasizes the notion that knowledge is a collective and collaborative endeavor, as opposed to being just an individual pursuit. It is derived from active participation in social interactions and effective communication (Palincsar, 1998).

3.6.1 Case study method

Case studies are used to examine SR for the empirical part of the study. Thus, the practice is examined as a component of social actuality (Crotty, 1998). Typically, the case study method is employed in research to investigate complex topics in a real-world context (Yin, 2014). In addition, it can help explain why and how a particular phenomenon occurs (Eisenhardt & Graebner, 2007). In addition, case study research can be designed to investigate a single case or multiple cases to identify common patterns and characteristics (Eriksson & Kovalainen, 2008). This study employs numerous case study methodologies to investigate the SR practices of one Norwegian company and how these practices are received within the company. The case were selected from Norway to examine the dissimilarities and similarities between current trends practises and perceptions. Due to the emphasis on the dynamics of a specific setting, case studies offer contextual data (Eisenhardt, 1989).

When the demarcation between the phenomenon under investigation and its surrounding context is ambiguous, employing a case study might be a valuable approach (Yin, 2014). This particular form of research is characterised as an empirical approach that comprehensively delves into a contemporary issue while highlighting its contextual aspects (Yin, 2014). Case studies are an effective method for conducting in-depth investigations into the dynamics and manifestations of certain events and processes (Easterby-Smith, 2018).

Moreover, an embedded case study design is appropriate when the research encompasses multiple interconnected units of analysis, either inside a single case or across multiple cases. However, since logical analysis units cannot be identified, we employ what is known as holistic case studies, which concentrate more on examining an organisation as a whole. This master's thesis examines the phenomenon within an organisation using an anchored single case study design. This study conducted interviews to gather pertinent data at the managerial level. Additionally, sustainability reports assessed the alignment between companies' reporting to CE principles and their actual implementation. The complexities of identifying what drives material reuse in the CI necessitate a closer examination of the underlying processes and justifications. Utilizing a case study approach is considered appropriate for such an investigation (Easterby-Smith, 2018).

3.6.2 The process of case and interview selection

The selection of the case study is suitable for this empirical investigation since its objective is to gain a thorough understanding of the instances that have been chosen (Bell et al., 2018). Sampling on purpose entails identifying and selecting individuals with relevant knowledge and experience regarding the phenomenon of interest. In addition, participant selected based on their availability and willingness to participate (Creswell & Plano Clark, 2011). The sample was selected from Norway in order to investigate the dimension of sustainability reporting, in terms of CE approach. The primary focus will be on Veidekke's circularity approaches in their annual sustainability reports. In the context of a case study, it is common practise to conduct a thorough examination of one or a limited number of organisations. Researchers have the option to pursue this approach by either focusing on a single case or analysing multiple examples. For the purpose of my investigation, I have chosen to employ a straightforward approach in order to comprehensively examine a particular organisation and thoroughly investigate the entire case. Simultaneously, I conducted a comparative analysis of the circular approaches data obtained from Veidekke's sustainability report and the information gathered through interviews. I focused on working with Veidekke and made an effort to obtain the most of my references from their websites and annual sustainability reports, as the majority of my data comes from these reports.

The primary method of data collection for this case relies heavily on sustainability reports and semi-structured interviews. I chose semi-structured interviews as the primary data source because they allow the researcher to place social and cultural aspects within a broader context, as noted by Ryen (2002). Initially, I intended to conduct at least two interviews with

representatives from distinct companies. I contacted several potential participants at Skanska in Sweden and Veidekke in Norway. However, I only received a reply from Mr. Lars at Veidekke in Norway. Consequently, I revised my plan to proceed with just one interview. The interview was conducted with a sustainable manager of Veidekke, and information was collected from company websites and annual sustainability reports. I sought to conduct interviews with informants at the management level, as they provide valuable insights into the internal dynamics of sustainability within the construction process. I inquired about the intended implementation of those concepts and techniques in order to ensure comprehensive awareness among all individuals involved. Additionally, I am interested in understanding the underlying motivations that drive their actions, as well as their anticipated response in the face of challenges or obstacles. Sampling on purpose entails identifying and selecting individuals with relevant knowledge and experience regarding the phenomenon of interest. This approach to data collection is most appropriate when aiming to capture individuals' perceptions and thoughts about a particular phenomenon, mainly when the number of units under investigation is limited, as highlighted by Jacobsen (2005). My particular interest lies in understanding how the company integrated the concept of the CE and utilized sustainability reports. Prior to conducting the interviews, I took care to acquaint myself with the interviewee's work environment, their roles and responsibilities, the duration of their tenure within the company, and their influence on the firm's sustainable decisions. This contextual information proved invaluable in interpreting the interviewee's responses. I have designed a questionnaire consisting of 20 questions, mostly oriented around the issue of SR and the incorporation of circularity concepts in the construction business. The primary purpose is to identify and investigate the main challenges faced by the CI in reporting and adopting CE principles.

3.6.3 Why Veidekke ASA?

There are several reasons to select Veidekke as the focus of my case study. Firstly, it possesses data readily available for evaluation compared to 29 other construction firms, including those from Norway. After investigating thirty construction firms, it was observed that a small number of them possess convenient accessibility to company documents. I contemplate the sustainable approach presented in their annual sustainability reports. Subsequently, I needed to enhance the specificity of my investigation by taking into account the circularity approach employed in the papers under consideration, as it holds significant relevance for my research. For the purpose of my case study, I have identified two firms, namely Skanska and Veidekke.

Unfortunately, I was unable to find any Skanska participants. Therefore, I decided to exclude Skanska and instead chose Veidekka ASA as the subject of my investigation.

I aim to conduct a case study on the companies Skanska and Veidekke. Later on, I had to eliminate Skanska due to a problem during the interview process. I have made multiple attempts to schedule an interview with an individual in a managerial position; however, unfortunately, I have been unable to secure any interview opportunities. Subsequently, I made the deliberate choice to conduct a case study on a solitary entity, particularly Veidekke.

4 Analysis of 30 Sustainability reports

4.1 Descriptive statistics of sustainability reporting

The dataset encompasses a variety of enterprises originating from multiple countries, including France, Spain, the United Kingdom, Sweden, Austria, the Netherlands, Italy, Norway, Belgium, Switzerland, Finland, Greece, and Portugal. This selection of nations demonstrates the global presence of construction and infrastructure firms under examination in this analysis. If there are any particular inquiries or a need for additional insights regarding this data, please check the appendix.

Deloitte thoroughly investigated 100 construction companies from 30 different nations in 2021. This comprehensive research mainly focused on analyzing sustainability reports from Europe's top 30 construction companies. Deloitte ranked the 100 construction firms worldwide according to their annual revenue. The subsequent list presents the most prominent revenue-generating giants in the construction business worldwide. I selected a sample of 30 European enterprises from the Deloitte list, employing a revenue criterion as the basis for selection.

I extensively reviewed a minimum of 20 scholarly articles pertaining to circularity in the construction sector, as well as studied 30 annual sustainable reports. This rigorous examination allowed me to establish a comprehensive set of parameters for my subsequent quantitative study. By conducting a rigorous examination of the text, several consistent themes and concepts were discerned in these reports. This quantitative examination established a structured framework based on five key parameters. A subsequent quantitative survey was then administered, focusing on these 30 European firms, offering valuable insights into the dominant sustainability practices in the construction industry. The critical parameters identified are as follows:

1. Do they participate in the UNGC program?

2. Does their sustainability report explain how they use the idea of a "circular economy" in their business?
3. Do they use a green building rating system for LCA?
4. Are they using any waste management systems?
5. Do they have an "employment of EPD" policy?

I have analyzed five distinct indicators generated in Microsoft Excel using five different graphs. To facilitate comprehension of these graphs, we have provided a corresponding table below. In this table, varying numerical values correspond to different companies, for instance, 22 representing Veidekke ASA.

Number	Name of the firms
1	VINCI
2	BOUYGUES
3	ACTIVIDADES DE CONSTRUCCION Y SERVICIOS, S.A. (ACS) SPAIN
4	EIFFAGE, S.A. FRANCE
5	STRABAG AUSTRIA
6	SKANSKA AB SWEDEN
7	BALFOUR BEATTY UK
8	ACCIONA SPAIN
9	ROYAL BAM GROUP NV NETHERLANDS
10	FERROVIAL SPAIN
11	FOMENTO DE CONSTRUCCIONES Y CONTRATAS, S.A. SPAIN
12	SALINI IMPREGILO SPA ITALY
13	PEAB AB SWEDEN
14	BARRATT DEVELOPMENTS PLC UK
15	NCC AB SWEDEN
16	PORR AG AUSTRIA
17	TAYLOR WIMPEY PLC UK
18	SACYR, S.A. SPAIN
19	PERSIMMON PLC UK
20	KIER GROUP PLC UK
21	MORGAN SINDALL PLC UK
22	VEIDEKKE ASA NORWAY
23	CFE GROUP BELGIUM

24	BELLWAY PLC UK
25	IMPLENIA AG SWITZERLAND
26	YIT OYJ FINLAND
27	OBRASCON HUARTE LAIN, S.A. SPAIN
28	MYTILINEOS HOLDINGS GREECE
29	MOTA ENGIL SGPS PORTUGAL
30	KELLER GROUP PLC UK

Table 1: *List of 30 largest construction firms in Europe*

4.1.1 Participation in the UNGC

In 1999, then-UN Secretary-General Kofi Annan introduced the United Nations Global Compact, a voluntary initiative aimed at guiding companies and organisations towards integrating universal principles regarding human rights, labour, the environment, and anti-corruption into their strategic and operational frameworks (UNGC, n.d.). By adhering to this initiative, businesses across the globe are encouraged to adopt sustainable and socially responsible policies, thereby advancing not only their own corporate missions but also broader societal goals. The Ten Principles, which encompass the areas of human rights, labour, environment, and anti-corruption, are central to the Compact's mandate (UNGC, n.d.). These principles urge businesses to uphold and respect human rights, avoid all forms of forced labour and child labour, advocate for the freedom of association and the recognition of collective bargaining, eliminate employment discrimination, adopt a precautionary stance towards environmental challenges, actively pursue greater environmental responsibility, champion environmentally friendly technologies, and combat corruption in all its forms, including bribery, with vigour (UNGC, n.d.). Beyond counselling businesses on ethical and responsible practises, the Compact fosters collaborative ventures and communities committed to advancing the United Nations' 2015 Sustainable Development Goals (SDGs). In doing so, it envisions the development of an inclusive and sustainable global economy in which businesses play a central role in advancing societal progress (UNGC, n.d.).

The building sector is becoming more aware of the importance of eco-friendly construction methods. Its profound influence on social, environmental, and economic sustainability. As a result, there are commitments to adopt green practices throughout construction processes (Darko, Zhang, & Chan, 2017). Most sustainability disclosure methods are optional, but bigger firms must publicize their sustainability reports. The UNGC has stirred

considerable debate among scholars, advocates, and policy-makers (UNGC, 2022). The aims and breadth of the UNGC initiative will reshape how companies approach sustainability (UNGC, 2022). This parameter will offer additional insights into crucial elements pertaining to construction enterprises that are actively engaged in the UNGC programme.

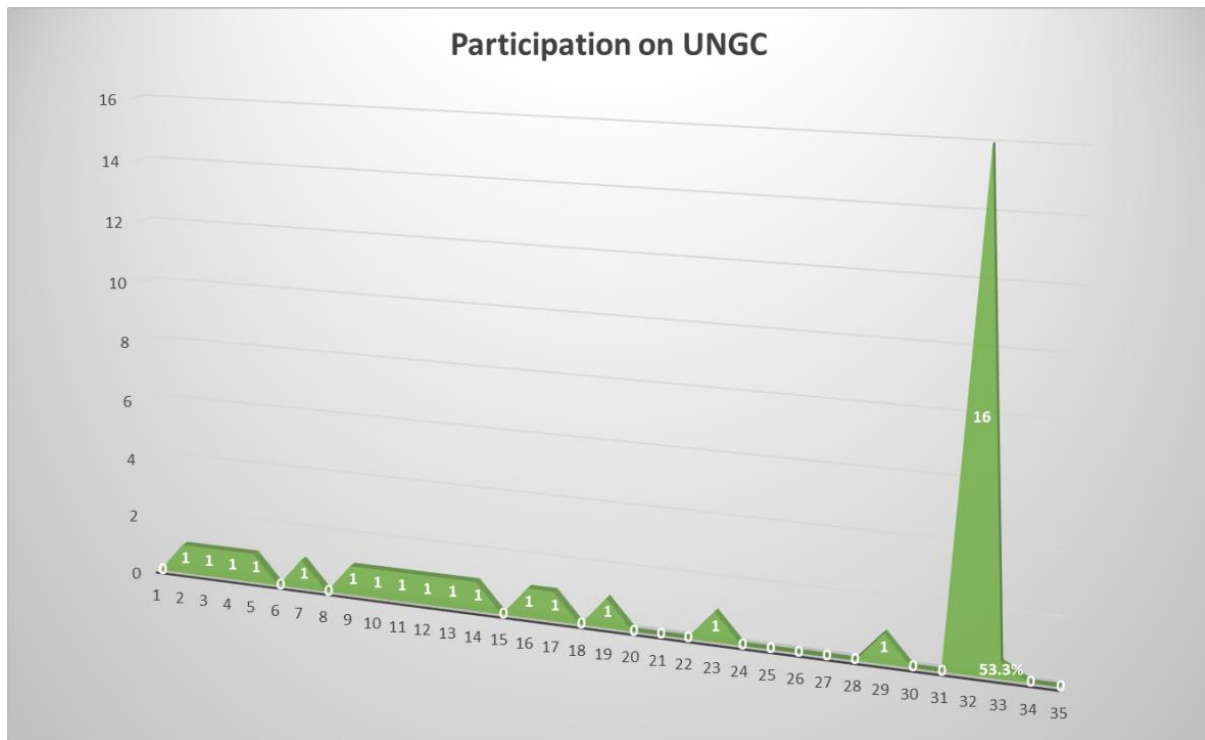


Figure 3: Participation rate in the UNGC programme

The graph presents a comprehensive overview of 30 European construction businesses, elucidating their involvement in the UNGC effort. Every corporation is classified based on its name and country of origin. A value of "1" in the "Participation on UNGC" column implies active engagement by the company in the project, whereas an empty cell indicates non-participation. The bar denoted by the numerical value 16 in the graph represents the aggregate number of enterprises that are actively engaged in the UNGC programme. Based on the provided data, it can be observed that 16 out of the total 30 listed companies, accounting for 53.3% of the sample, are actively engaged as participants in the UNGC programme. These companies originate from many European countries, such as France, Spain, the United Kingdom, Austria, and Sweden, among others. There is a suggestion that companies involved in the UNGC effort possess an increased potential for attaining sustainability compared to organizations that do not participate in the initiative.

In the dataset of construction and infrastructure companies, 16 out of the 30 companies listed, which amounts to 53.3%, participate in the UNGC, signifying their commitment to sustainable business practices. Spain is well-represented among the UNGC participants, with all three Spanish companies (ACS, Acciona, and Ferrovial) actively involved in the initiative. France also has a strong presence, with both Vinci and Eiffage participating. Sweden has one company (Skanska AB) participating, while the UK, Austria, the Netherlands, Italy, Norway, Belgium, Switzerland, Finland, Greece, and Portugal each have one company involved in the UNGC.

The study illustrates the involvement of thirty European construction companies in the UNGC initiative, providing a comprehensive account of their diversity. Multiple corporations listed in France, Spain, and the United Kingdom demonstrate that these nations are dominant players. However, it is essential to note that not all businesses from these leading nations have chosen to participate in the UNGC, suggesting that although the initiative may be well-known, participation is not uniform even among these leading nations. Positively, more than half of the corporations, or precisely 53.3%, are involved, indicating a proactive stance towards sustainability. Furthermore, the table exhibits a noteworthy distribution throughout Europe, including corporations hailing from Norway, Belgium, Switzerland, Finland, Greece, and Portugal. This geographic variety highlights the interest of the entire European continent in sustainable initiatives such as the UNGC. In light of the claim that engagement in the UNGC positively correlates with the likelihood of attaining sustainability, it is heartening to observe that more than 50% of publicly traded companies share this viewpoint.

4.1.2 Reporting the circular economy in sustainability report

Companies are becoming increasingly aware of the significance of incorporating the circular economy into sustainability reports. The circular economy emphasizes the design of products and systems to ensure that materials are reused, recycled, or regenerated, thereby promoting resource efficiency and waste reduction (European Environment Agency, 2016). This method helps companies save money and gives them a competitive advantage, allowing them to stand out. According to McKinsey & Company (2015), early adoption of this model can provide a first-mover advantage, benefiting businesses in various ways, including profitable growth and reputation enhancement. Moreover, as the influence of government and international organizations advocating for more sustainable practices grows, there is an increase in circular economy-supporting policies. Companies that adhere to these practices have a greater chance

of remaining compliant and avoiding potential regulatory penalties (European Commission, 2020).

Modern stakeholders, such as investors, consumers, and employees, are increasingly environmentally conscious, above and beyond compliance requirements. According to research published in the Harvard Business Review (2021), integrating sustainability can substantially increase stakeholder engagement and loyalty. Companies that demonstrate a commitment to the CE can improve stakeholder relations. Adopting the CE also provides companies with long-term resilience, protecting them from supply chain disruptions and volatile raw material prices (Ellen MacArthur Foundation, 2013). Financial benefits are also evident. Adopting CE strategies could result in substantial cost savings for enterprises. According to a 2015 study by Accenture, these strategies could save businesses up to \$4.5 trillion in material costs by 2030.

Incorporating the principles of the circular economy into sustainability reports affords businesses the chance to demonstrate forward-thinking leadership, future-proof their businesses, and engage with their stakeholders more effectively. Businesses can position themselves as leaders in both sustainability and business innovation if they share their approaches and successes openly in their sustainability reports. Thus, mentioning CE in sustainability reports is not only beneficial for business, but also a green marketing strategy.

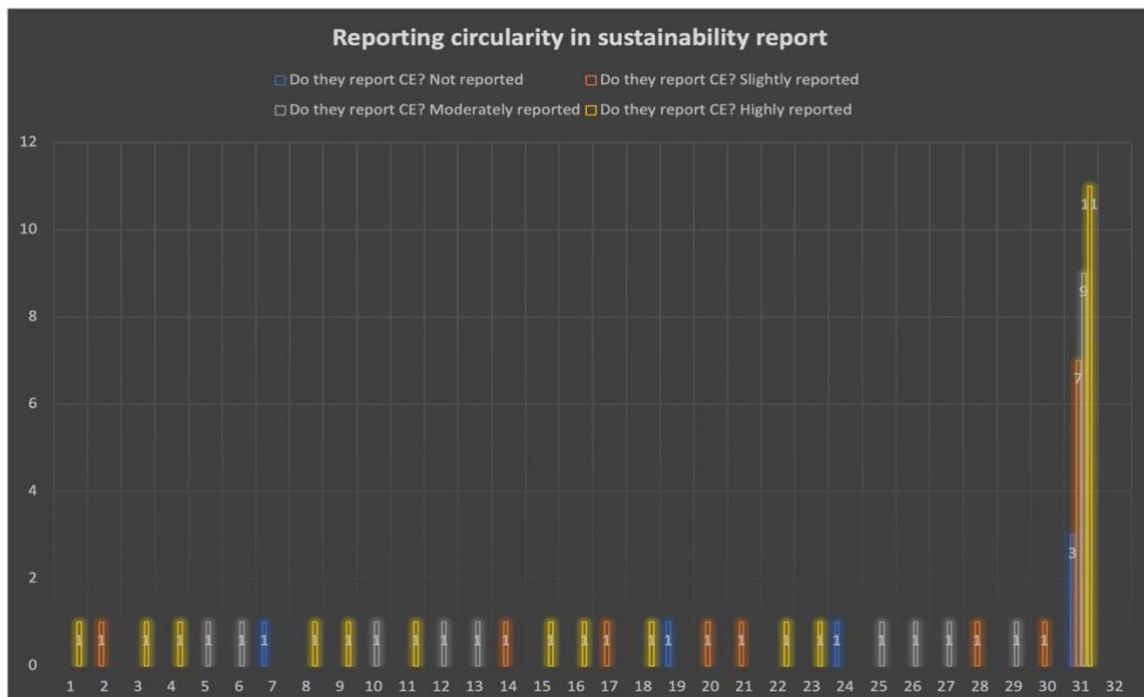


Figure 4: Reporting the circular economy in sustainability report

In this graph, various colors indicate different levels of reporting on CE by firms. Blue is used for firms that do not report on CE at all. White denotes firms that report on CE to a moderate extent. Orange is for firms that have slightly reported on CE, and Yellow signifies firms that have extensively reported on CE. The aforementioned graph shows that, in the context of reporting on CE activities, it is apparent that 11 out of the total number of companies, representing 36.7%, demonstrate a high level of reporting on CE. Additionally, 9 companies, accounting for 30% of the sample, engage in moderate reporting, while 7 companies, equivalent to 23.3%, engage in relatively minimal reporting. Interestingly, a mere 10% of corporations, specifically three, do not provide any reports on CE. The term "highly reported" refers to firms that have mentioned CE at least 20 times in their annual sustainability reports. "Moderately reported" refers to firms that have mentioned CE at least 10 times. "Slightly reported" indicates firms that have mentioned CE a few times. Lastly, "not reported" pertains to firms that have not mentioned CE even once in their annual sustainability reports. According to the findings, a significant proportion of organizations (66.7%) demonstrate a moderate to high level of reporting regarding their corporate environmental actions. This implies that numerous enterprises within the industry are actively engaging in the disclosure of their environmental initiatives and consequences, a development that can be interpreted as a favorable stride towards openness and responsibility.

The graph presents data on 30 construction companies from different nations, illustrating the extent to which they incorporate CE practices in their sustainability reports. The prominence of countries such as the United Kingdom, Spain, and Sweden in terms of representation suggests that these nations may serve as crucial hubs for construction enterprises. The firms in the table are classified into four groups based on their reporting level: not reported, slightly reported, moderately reported, and highly reported. The term "highly reported" denotes firms that have made a minimum of 20 mentions of the CE in their discourse. "Moderately reported" signifies firms that have made at least 10 mentions of the CE. "Slightly reported" indicates firms that have made a minimum of 3 mentions of the circular economy. Lastly, "not reported" pertains to firms that have not mentioned the circular economy in their sustainability reports. Many companies have chosen to engage in a greater degree of transparency, aligning themselves with the Highly Reported classification. This implies that many firms within the CI are increasingly inclined to adopt sustainable practices and are enthusiastic about disseminating their ideas.

A considerable number of construction firms that are included in the list have demonstrated noteworthy initiatives in disclosing their practises pertaining to the CE. One notable observation derived from the data is the significant proportion of companies that can be classified as belonging to the "Highly reported" category. This suggests a significant focus on the thorough documentation of CE practises in the building industry. In contrast, the group labelled as "Moderately reported" exhibits a lower number of companies, indicating a significant disparity between entities that demonstrate complete transparency and those who provide only a moderate level of information. It is noteworthy that the category labelled as "Slightly reported" exhibits a restricted level of representation, as only a small number of companies are featured. This observation suggests that organisations tend to prioritise offering a comprehensive description rather than a superficial remark when they choose to communicate about their CE initiatives. In contrast, the category labelled as "Not reported" comprises a limited number of companies who have made a deliberate decision to withhold any disclosure regarding their implementation of CE practises. It is worth mentioning the notable predisposition towards robust reporting observed among enterprises originating from Spain and the UK. This observation implies the possibility of an industry or national trend towards comprehensive sustainability reporting in these specific locations.

Nevertheless, a considerable portion of the population still needs to provide reports, suggesting either a deficiency in transparency or a potential disparity in implementing sustainable measures. In conclusion, a significant proportion of the companies mentioned above demonstrate proactive engagement in CE practices. However, there are still areas within the business that present opportunities for further development and a heightened dedication to sustainability.

4.1.3 Green building rating system for LCA

The Green Star SA Rating Tool is a rating system that conducts an independent assessment of the environmental design qualities of a building during both the design and construction phases. Two comparable global tools include LEED in the United States and BREEAM in the United Kingdom and Europe (SolidGreen, 2020). The instrument assesses the level of "Greenness" in a building by employing a comprehensive set of criteria and requirements categorized into nine distinct areas: management, indoor environmental quality, energy, transport, water, materials, land use, ecology, emissions, and innovation (SolidGreen, 2020). To assign ratings, allocating credits and computing the category score as a percentage of the points earned out of the total

points available is necessary. The highest rating is a 6-star rating, requiring more than 75 credits (SolidGreen, 2020).

BREEAM, a British environmental certification for the building. The primary value of BREEAM, known as "The code," is delineated by two distinct standards. The first standard emphasizes technical aspects, while the second emphasizes procedural and operational requirements (BREGroup, n.d.). In order to address the reduction of adverse effects on both the global and local environment, it is essential to prioritize many factors such as resource efficiency, health, comfort, safety, security of users, and socio-cultural value (BREGroup, n.d.). The primary outcome derived from a certified BREEAM evaluation is the rating. A certified rating is an assessment of the performance attained by a project and its stakeholders, evaluated against a specific standard and its corresponding benchmarks. According to the BRE Group (n.d.), the organization also demonstrates its commitment to promoting a circular economy by embracing the principles of resource reevaluation and waste management outlined in the notion of a circular economy.

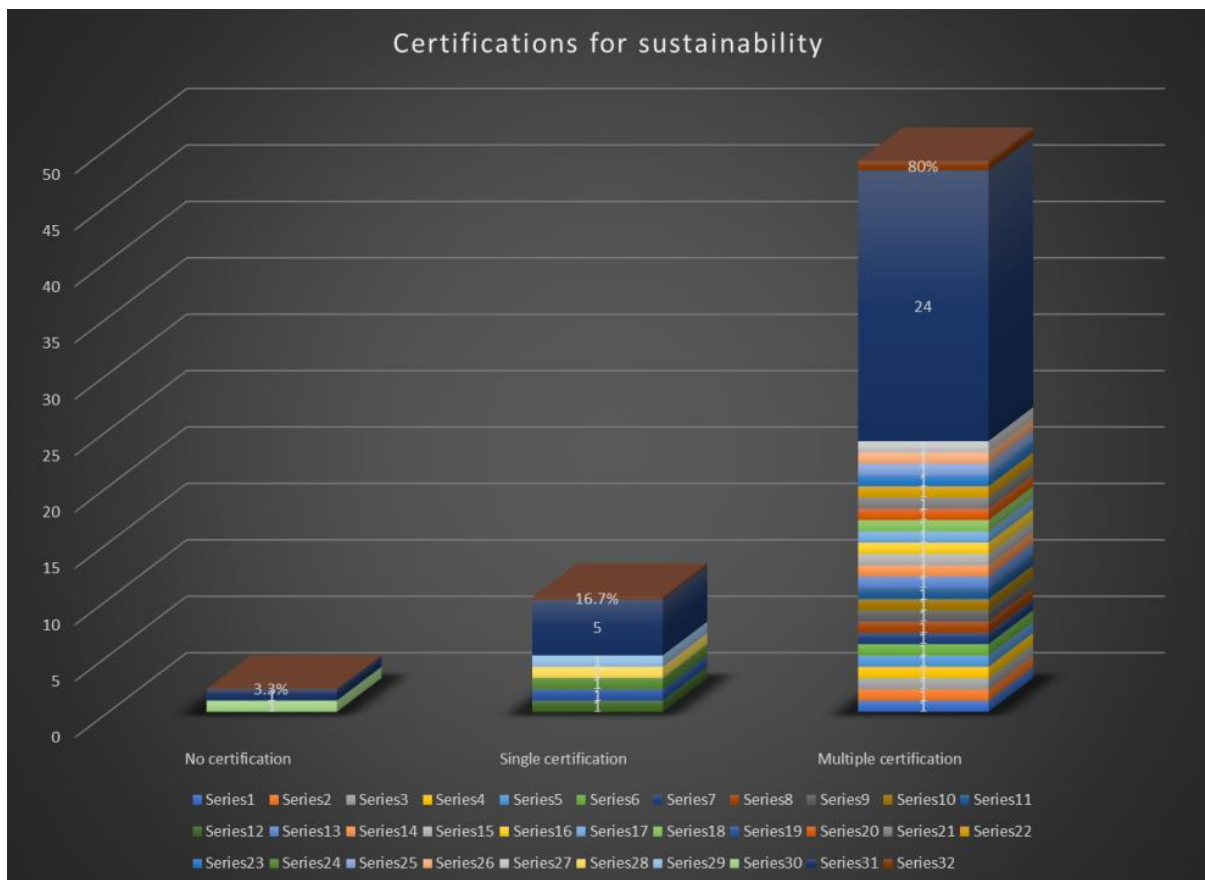


Figure 5: Green building rating system for LCA

In this graph, each series represents a different construction firm, with each firm being denoted by a distinct color. For instance, according to Table 1, series 4 denotes EIFFAGE, S.A from France. Additionally, the blue portion of each bar indicates the number of firms belonging to each category. For example, the bar for the 'Single Certification' category shows that there are 5 companies with a single certificate.

Certifications Categories:

No Certification: It denotes organizations needing more qualifications in life cycle assessment. A single firm, KELLER GROUP PLC comes into this particular category, accounting for 3% of the overall number of enterprises.

Single Certification: It signifies companies with only one LCA certification. 5 companies possess a single certification, accounting for 17% of the total.

Multiple Certifications: This category includes companies with more than one life cycle assessment certification. 24 companies have multiple certifications, making up a substantial 80% of the total.

Regarding certifications, a notable majority of the companies in the dataset hold multiple certifications, as 24 out of 30 (80%) have this distinction. In contrast, 5 companies (16.7%) hold a single certification, and just 1 company (3.3%) lacks any certifications altogether. Interestingly, among the companies that highly report on CE, All of them (11 out of 11) hold multiple certifications. This suggests a correlation between a robust commitment to sustainability reporting and a broader range of certifications. Further analysis could explore which specific certifications are most commonly held among these highly reporting companies. It's notable that while the majority of companies have multiple certifications, there is still a portion (16.7%) with only a single certification and a smaller portion (3.3%) with no certifications. Exploring the relationship between the number and type of certifications and the extent of CE reporting could reveal interesting insights into how certifications impact a company's commitment to environmental initiatives.

The evidence indicates that sustainability practices are a prevailing priority among most of the construction enterprises listed. An impressive 80% of these organizations possess multiple certifications for life cycle evaluation. This substantial percentage highlights these companies' dedication to upholding environmental and sustainability criteria. A single organization represents the small proportion of businesses that require these certifications—only 3%. This could mean they need to adopt more sustainable practices. In contrast, a

relatively small proportion of organizations, precisely 17%, have made preliminary efforts towards achieving sustainability by obtaining a single certification. While this suggests progress, their certification portfolio must have the same diversity level as the majority. The considerable contrast between organizations possessing several certificates and those possessing single or no certifications underscores the diverse levels of dedication to sustainability within the construction sector.

4.1.4 Waste management system

The evolution of the construction industry has been driven by the demand for effective waste management, which has led to the development of recycling technologies and sustainable construction materials (Tam et al., 2016). Construction waste consists of materials and byproducts generated during the process of constructing, renovating, or restoring both residential and commercial structures (Kabirifar et al., 2020). According to the latest available data, it has been estimated that a total of 333 million tonnes of construction and demolition waste (excluding soils) was generated throughout the European Union in the year 2014 (Menegaki and Damigos, 2018). The category of construction waste encompasses a diverse range of items, several of which possess the potential to cause environmental harm if not effectively handled and controlled. Instances of leaching can occur when substances such as concrete, chemicals, metals, and wood infiltrate the soil and water, hence leading to the occurrence of contamination. Implementing effective waste management strategies is crucial in reducing the environmental impact associated with construction operations (Mah et al., 2018).

In terms of waste management systems, all 30 companies (100%) have implemented waste management practises within their operations, highlighting their commitment to environmentally responsible practises. All companies in the dataset have implemented waste management systems, indicating a universal awareness of the importance of responsible waste handling in the CI. All of the companies in the dataset have a waste management system in place. This reflects a universal understanding of the importance of managing waste responsibly, which is critical for reducing environmental impacts and complying with regulations.

It has been observed that a total of 30 firms possess their own waste management systems, with a subset of these firms opting to use third-party companies to ensure proper waste management practises. However, the majority of organisations do not reveal the procedures they employ to manage waste. Managing construction waste becomes progressively crucial as urban areas expand to promote SD and enhance the livability of cities (Zhao et al., 2010).

Various governments worldwide have implemented regulatory measures to ensure appropriate construction waste management. Effective waste management assures compliance with the requirements, whereas failure to comply with these regulations can result in monetary fines and legal action (Yuan, 2013).

4.1.5 Employment of EPDs

The Environmental Product Declaration (EPD) is a comprehensive document that offers transparent and detailed information regarding the environmental consequences associated with the whole lifespan of a given product or material. The EPD is a comprehensive document that assesses the environmental performance of a specific product. An impartial third party independently verified the declaration, and the EPD system has officially recorded it (K. Lukaševića, 2022).

The EPD typically has a validity period of five years and is established following internationally recognized standards, namely ISO 14040, ISO 14044, and ISO 14025. The European standard EN 15804 established and governs the EPD within the construction materials industry. In order to build sustainability programmes like Leadership in Energy and Environmental Design (LEED), Building Research Establishment Environmental Assessment Method (BREEAM), and others, you need to use essential tools like EPD and LCA (K. Lukaševića, 2022).

When it comes to the employment of EPD, 6 companies (20%) within the dataset make use of EPDs. Among the companies employing Environmental Product Declarations (EPDs), it would be worthwhile to investigate the specific products or services for which these declarations are being used. EPDs can provide transparency about the environmental impacts of specific products, which can be essential for environmentally-conscious consumers and clients. While 20% of the companies employ EPDs, the majority do not. EPDs can provide valuable information about the environmental performance of products or services, and their adoption may vary based on industry and regional factors.

The EPD provides a standardised approach to quantifying the ecological impact of a given product or system. This declaration addresses, among other things, the extraction of raw materials, energy consumption, chemical content, air, soil, and water emissions, and refuse generation. Using the EPD is especially important in the building industry. It demonstrates an organization's commitment to environmental accountability and ethical business conduct. Construction companies that adopt the EPD demonstrate their environmentally friendly practices and provide tangible data to substantiate their claims regarding sustainability. As

shown in the graph, a mere 20% of the highlighted construction firms have implemented EPD. This suggests significant potential for EPD to be more widely adopted within the industry. Organizations that have adopted the EPD are at the forefront of promoting environmentally sustainable building practices, while those that still need to meet international sustainability benchmarks and expectations.

4.2 Discourse analysis

Discourse analysis is a way of doing research that looks at how language is used on purpose in a text or group of texts to build and communicate meaning. Discourse analysis is a useful tool for getting a deep understanding of the cultural, historical, and social foundations. This methodology facilitates a more accurate and significant analysis of the textual content and communicative exchanges contained within these reports. Given that my thesis focuses on the topic of reporting circularity, I need to acquire a deep understanding of CE reporting. The objective of this analysis is to gain an understanding of how these organisations are making efforts to effectively communicate their CE practices and strategies to their stakeholders.

The subject matter at hand concerns the annual sustainability reports of construction firms, for which I have emphasized the frequencies of relevant keywords. After an in-depth examination of thirty construction companies' sustainability reports, I selected eight key terms relevant to my thesis. However, I later discarded four due to their inconsistent presence across the reports. Ultimately, I established four essential keywords for my thesis, selecting them based on a structured count of their occurrence in each report. For further analysis, I have organized this data into an Excel spreadsheet. Based on the information in the following table, a comprehensive discourse analysis will be presented.

Name of the companies	Sustainability/Sustainable	Circular/Circularity	Environment/Environmentally	Climate
VINCI	113	46	826	159
BOUYGUES	116	4	39	27
ACTIVIDADES DE CONSTRUCCION Y SERVICIOS, S.A. (ACS) SPAIN	378	51	355	264
EIFFAGE, S.A. FRANCE	39	26	64	105
STRABAG AUSTRIA	258	39	181	114
SKANSKA AB SWEDEN	894	24	117	204
BALFOUR BEATTY UK	309	3	132	124
ACCIONA SPAIN	958	96	334	272
ROYAL BAM GROUP NV NETHERLANDS	279	46	104	145
FERROVIAL SPAIN	192	18	185	90
FOMENTO DE CONSTRUCCIONES Y CONTRATAS, S.A. SPAIN	1491	160	1160	248
SALINI IMPREGILO SPA ITALY	101	13	211	74
PEAB AB SWEDEN	334	24	224	196
BARRATT DEVELOPMENTS PLC UK	305	1	141	187
NCC AB SWEDEN	223	41	129	201
PORR AG AUSTRIA	395	42	199	161
TAYLOR WIMPEY PLC UK	169	0	170	202
SACYR, S.A. SPAIN	100	13	252	27
PERSIMMON PLC UK	196	3	132	118
KIER GROUP PLC UK	163	2	108	96
MORGAN SINDALL PLC UK	84	9	141	213
VEIDEKKE ASA NORWAY	436	59	171	201
CFE GROUP BELGIUM	201	43	63	16
BELLWAY PLC UK	171	1	83	141
IMPLENIA AG SWITZERLAND	275	4	37	0
YIT OYJ FINLAND	131	18	124	67
OBRASCON HUARTE LAIN, S.A. SPAIN	425	43	174	172
MYTILINEOS HOLDINGS GREECE	472	22	236	163
MOTA ENGL SGPS PORTUGAL	696	31	357	54
KELLER GROUP PLC UK	191	4	118	35
Avarage	337	30	219	136
Median	241	23	156	143
Max	1491	160	1160	272
Min	39	0	37	0

Table 2: Discourse analysis of 30 sustainability reports

Key concepts

Sustainability: The concept of sustainability is widely emphasized in many organizations. This observation highlights a notable focus on sustainability within their communication, implying that the companies acknowledge and give importance to sustainable practices in their activities.

Environment: The frequency with which the term 'Environment/Environmentally' is used indicates that environmental issues play a prominent role in the discourse and potentially the operations of these organizations.

Climate: The inclusion of the term 'climate' as a prominent keyword suggests that these corporations are recognizing the significant problems posed by global climate issues and may be promoting themselves as proactive and accountable within this framework.

Circular: The concept of the CE, although less frequently referenced in comparison to other terms, remains significant. This observation may suggest an increasing inclination or

dedication toward the circular economy, which is an economic framework designed to minimize waste by promoting the perpetual utilization of resources.

Most Frequent Terms:

The analysis of the annual reports of the 30 construction enterprises reveals that the term "Environment/Environmentally" is the most prevalent among the many terms associated with sustainability. According to its appearance in a company's report on as many as 1160 occasions and an average of 219 mentions across all companies, the term in question has a high level of usage. The concept of "Sustainability/Sustainable" is also highly featured, with the maximum mention by a single company reaching 1491 and an average of 337 mentions overall. The phrase "climate" holds considerable importance within the discourse, being spoken on average 136 times. In contrast, the term "Circular/Circularity" appears to have a somewhat lower frequency of occurrence, with an average of 30 occurrences. This observation implies that it may not hold the same level of significance as the other terms within the framework of sustainability reports produced by these construction firms.

Leading Organisations in the Discourse:

Based on the available data pertaining to sustainability discourse within the CI, certain entities emerge as prominent leaders. The term "Sustainability/Sustainable" is prominently employed by a certain corporation, as seen by its notable recurrence of 1491 instances inside its annual sustainability report. In the context of environmental concerns, it is noteworthy to notice that another company has been prominently associated with the terms "Environment" and "Environmentally" a total of 1160 times. The frequency of references to the notion of a CE, denoted by the phrase "Circular/Circularity," reaches its highest point at 160 occurrences inside the discourse of a particular company. Furthermore, the phrase "Climate" holds significant importance within the discourse on sustainability, with one particular corporation emerging as a frontrunner in this domain by making reference to it a total of 272 times. According to the above numbers, different aspects of sustainability are given different levels of importance and priority in the annual reports of construction companies.

General Observations:

Several patterns become apparent when examining the frequency with which construction companies include sustainability-related terms in their annual reports. The term

"environment/environmentally" is the most commonly used, indicating that the construction industry as a whole acknowledges and prioritizes the significance of its ecological footprint. This prominence suggests that businesses are probably engaging in extensive discussions regarding their environmental contributions, impacts, and mitigation strategies. In contrast, the usage of the term "Circular/Circularity" is comparatively infrequent. This may suggest that the CE principles of reduction, reuse, and recycling are not as fundamental to the discourse on sustainability in the CI. This phenomenon may be attributed to the intrinsic difficulties prevalent in the construction sector, or it may be an area that has yet to acquire substantial momentum within the industry. The substantial discrepancy between the highest and lowest number of mentions for each term is an additional observation. For instance, the difference between the highest number of times companies use "Sustainability/Sustainable" (1491) and the lowest number of times (39) shows that while some companies put a lot of weight on certain aspects of sustainability, others may not talk about them as much.

Comparative Analysis:

When analyzing the language surrounding sustainability in the construction sector, some corporations stand out as influential in crafting the prevailing narrative. One notable example is the company Bouygues, which continually distinguishes itself with an astonishing 826 instances of the term 'Sustainability/Sustainable' being mentioned. The observed high frequency of sustainability-related activities within Bouygues may indicate that the company has integrated sustainability principles into its fundamental business narrative rather than treating it as a superficial or trendy concept. Following closely behind BOUYGUES are SKANSKA AB SWEDEN and ACCIONA SPAIN, with 894 and 958 references, respectively, indicating a comparable dedication to sustainability.

Moreover, within the context of the discussion surrounding environmental accountability, BOUYGUES emerges as the frontrunner, garnering a noteworthy 1,160 references to 'Environment/Environmentally.' Nevertheless, it is essential to acknowledge that BASFON HUARTE LAIN, S.A. Spain and MYTILINEOS HOLDINGS Greece also prioritize this feature, as evidenced by their respective mentions of 1,174 and 1,236. This observation suggests that the organization has adopted a thorough and well-planned strategy to address environmental issues in its day-to-day activities and communication strategies.

Although they might get less attention than other ideas, companies like VINCI and ROYAL BAM GROUP NV NETHERLANDS support the principles of the circular economy.

Both companies emphasize the term 'Circular/Circularity' in 46 instances, suggesting a possible correlation with or inclination toward circular economic principles. In contrast, 264 references to "Climate" show that BOUYGUES is a vocal supporter of climate-related issues. However, it is encouraging to observe that other prominent companies in the business, such as EIFFAGE, S.A. FRANCE, and SKANSKA AB SWEDEN, are closely trailing with 255 and 244 references, respectively.

It is worth noting that certain companies, such as TAYLOR WIMPEY PLC UK and PERSIMMON PLC UK, exhibit an equitable allocation of keywords across various sustainability categories. One possible interpretation of this observation is that the people in question use language about sustainability that takes a holistic view, meaning that it covers many aspects rather than just one. In sustainability, it is noteworthy that corporations such as SACYR, S.A. SPAIN, and PORR AG AUSTRIA, while not necessarily dominant in specific sectors, have a sustained commitment to engaging with sustainability issues. This indicates their growing influence and participation in the ongoing conversation surrounding sustainability. Nevertheless, it is crucial to recognize that more than simply examining the frequency of keywords is needed to determine a company's genuine dedication to sustainability in the real world. It is essential to recognize that buzzwords alone do not guarantee tangible dedication; qualitative analysis and an in-depth examination of actual operations would be necessary to obtain a more comprehensive understanding of each company's position regarding sustainability.

To sum up, the research indicates that various organizations place differing levels of priority on specific terms. For example, certain organizations may prioritize the concept of 'Sustainability' over 'Environment,' whereas others may have the opposite inclination. This observation may be indicative of the distinct areas of emphasis or strategic endeavors pursued by each organization. The utilization of average, median, maximum, and minimum numbers might yield valuable insights regarding the overall pattern observed across the various organizations. As an illustration, the mean value for the phrase 'Sustainability/Sustainable' is 337, indicating a significantly greater magnitude compared to the remaining terms. This observation implies that the CI, as a collective, prioritizes sustainability to a greater extent in its interactions. The use of words like "Sustainability" and "Environment" and "Environmentally" in the CI shows that people are becoming more aware of the damage the industry does to the environment and are working hard to make a strong commitment to reducing those effects. The fact that the words "Circular" and "Circularity" do not come up

very often could mean that the idea of a CE is being talked about, but it may not be as important right now as other topics.

5 Veidekke ASA: The Case Study

5.1 Background of Veidekke

Veidekke is considered to be one of the largest contractors in the Scandinavian region. Furthermore, the organisation is involved in a wide range of construction and civil engineering projects, while also assuming responsibility for road maintenance and the production of asphalt and aggregates. Veidekke places significant emphasis on the involvement of stakeholders and the effective utilization of local expertise. With an approximate yearly revenue of NOK 39 billion, about half of the company's 8,000 workers are shareholders (Veidekke, 2021). Veidekke is a publicly traded company that is listed on the Oslo Stock Exchange. Since its establishment in 1936, the company has consistently reported positive financial results, demonstrating profitability in each fiscal year. Veidekke acknowledges the significance of embracing CE ideas as a means to mitigate environmental consequences and augment long-term sustainability. The dedication to circularity serves as a driving force behind our operations and influences the framework of its sustainability strategy (Veidekke, 2022).

Veidekke aligns itself with the United Nations' 17 sustainable development objectives and has committed to adhering to the UN Global Compact's 10 principles for responsible corporate conduct. Veidekke's reporting for the year 2021 adheres to the GRI Universal Standards as outlined by the Global Reporting Initiative. Veidekke's SR provides an analysis of the company's influence on and susceptibility to alterations in the environment, nature, climate conditions, and society. Additionally, it outlines the group's strategies for addressing the financial risks and commercial prospects that emerge as a result of these transformations (Veidekke, 2020).

Veidekke sustainability reporting:

The sustainable reporting follows the standards of the GRI and shows how our business impacts the environment, climate, and society. It also shows how climate change and the transition to a low-emission society impact Veidekke and how this affects their financial risks and business opportunities (Veidekke, 2020). “By minimising the environmental damage caused by our operations and by assisting our clients in attaining their sustainability objectives, Veidekke is an active agent of change in the green movement. Customers and endeavours in which our

collaborative work methods and specialised knowledge can contribute to a more negligible environmental impact are given precedence by Veidekke. Furthermore, new business opportunities are created through cooperation, innovation, and strategic investments” (Lars, Personal communication, 21 February, 2023).

5.2 Sustainability at Veidekke

Veidekke asserts that sustainability constitutes a fundamental component within the strategic framework and operational procedures of the firm. Veidekke's core focus has always revolved around individuals and customer projects. However, the company strategy also highlights an additional area of emphasis: mitigating greenhouse gas emissions and promoting the transition towards environmentally sustainable practises. The imperative of addressing climate change is equally essential in order to protect and preserve the natural environment. Veidekke's future success is contingent upon active engagement in the green shift (Veidekke, 2019).

The sustainability reports published by Veidekke provide an account of the company's influence on the environment, climate, and society. These reports also address the implications of climate change and the shift towards a zero-emission society on the operations of the group. Furthermore, they outline the measures undertaken by the group to address the financial risks and commercial prospects arising from these developments (Veidekke, 2022). The sustainability report of Veidekke has been meticulously crafted in adherence to the GRI 2021 standard, which has been issued by the esteemed Global Reporting Initiative. The study commences with an overview of fundamental ideas and organisational structure, afterwards delving into an examination of the group's endeavours pertaining to many aspects of environmental, social, and governance matters (Veidekke, 2022). Veidekke has implemented quantitative objectives across various domains, placing specific emphasis on:

Goal 1: The objective is to achieve a decrease of 20% in the generation of building waste by the year 2025.

Goal 2: The objective is to achieve a 15% increase in the utilisation of recycled materials projects by the year 2030.

Goal 3: One potential strategy to enhance the longevity of buildings is by the incorporation of modular and flexible designs, hence augmenting their effectiveness and overall worth.

Goal 4: The objective is to align with the Paris Agreement by implementing measures to decrease greenhouse gas emissions. This entails reducing overall greenhouse gas emissions in

the value chain by 50% within a short-term timeframe, specifically by the year 2030. Additionally, the aim is to attain net-zero emissions in the long term, precisely by the year 2045 (Veidekke, 2019).

5.3 Circular Economy Initiatives at Veidekke

The concept of the circular economy entails the transformation of the linear economic model into a more sustainable system that aims to minimise waste generation, promote the continuous utilisation of resources, and facilitate the restoration of natural ecosystems. Currently, the rates of recycling are quite low, indicating a significant opportunity for improvement in this area. Veidekke can achieve a reduction in mineral, metal, fossil fuel, and biomass consumption, as well as a decrease in emissions to soil, water, and air, by implementing strategies that involve slimming, halting, closing, and renewing resource flows (Veidekke, 2021).

Veidekke, a maker of several products including asphalt and precast concrete components, wields significant influence over materials usage and the circular economy. Within the realm of construction, several types of agreements, such as cooperation contracts, design and build contracts, and public-private partnerships (PPPs), provide a wider range of opportunities compared to other agreement types. Veidekke has the capability to inquire about the recycling rate associated with all procurement activities (Veidekke, 2020).

Veidekke is obligated, as per its group policy on climate and the environment, to create additional value for its customers by effectively leveraging its environmental expertise. This entails actively encouraging and guiding customers in their efforts to minimise their influence on the external environment. Veidekke's compulsory internal training programme, titled "Right Choices," aims to educate personnel on effectively encouraging consumers to make environmentally responsible decisions. In addition, the Veidekke School incorporates the subjects of sustainability and the circular economy into many courses, including the Perspective and Horizon management training programmes (Veidekke, 2020).

The decisions taken during the design phase of building projects have far-reaching implications for the whole lifespan of the final product. Veidekke, as a result, endeavours to include circularity principles into both process and product designs. This involves enhancing durability and streamlining maintenance, repair, upgrading, and recycling processes. Moreover, Veidekke places emphasis on the utilisation of renewable resources and the adoption of nontoxic, bio-based, and recyclable products (Veidekke, 2022). Veidekke has implemented many steps, some of which include:

- Promoting the practise of soil reuse.
- Implementing recycled steel on a large scale.
- The practise of monitoring and requesting reuse rates in procurement processes.
- Advocating for amendments to the existing concrete regulations in Norway with the aim of reducing the overall consumption of concrete.
- The objective is to devise a technique that only use recycled aggregates in the construction of Veidekke's forthcoming headquarters situated in Ulven, Oslo.
- The forthcoming headquarters of Veidekke will incorporate recycled office furniture sourced from the existing head office located in Skøyen, Oslo. An ongoing evaluation is being conducted to determine the potential for reutilization with minimal financial outlay. Every individual furniture item is equipped with a QR code, enabling the retrieval of information regarding its provenance and potential recycling status via an online portal. The proposed strategy involves implementing this process across a majority of the materials procured by the organisation (Veidekke, 2022).

Veidekke has implemented many strategies aimed at waste reduction, with the establishment of comprehensive waste management protocols and effective at-source separation mechanisms. All projects establish and oversee waste management plans. Veidekke consistently demonstrates a commendable level of at-source isolation, surpassing the stipulated criteria set forth by the EU Taxonomy. The reuse and recycling of timber products have become more prevalent, with a growing trend towards sourcing them from local suppliers. Solid wood possesses the ability to sequester carbon, necessitates minimal use of fossil energy during its manufacturing process, and may predominantly be generated through the utilisation of bioenergy that is climate-neutral. In 2022, Veidekke was engaged in the construction of several solid wood structures, including the Oksenøya Centre located in close proximity to Oslo at Fornebu, as well as the Cederhusen and Sigtuna apartment complexes situated in and surrounding Stockholm (Veidekke, 2022).

The progression from a LE model to a circular one is currently in its early stages. Veidekke is currently engaged in the endeavour of recycling or repurposing various resources, encompassing asphalt, concrete, bricks, soil, and plastics. One potential application involves the reuse of old asphalt in the production of new asphalt, provided that a enough supply is available. In order to enhance the ease of future modifications, expansion, and repurposing of

buildings and facilities, Veidekke places significant focus on the monitoring of properties and the provision of dismantling options (Veidekke, 2020).

Veidekke's strategic approach is making targeted investments in innovative initiatives and solutions that facilitate the transition towards environmentally sustainable practises. In the year 2022, the aforementioned group founded a subsidiary known as Veidekke Circular. This corporation is primarily dedicated to addressing intricate matters pertaining to circularity, such as reuse, repurposing, and recycling. By implementing resource-efficient and circular business models that facilitate consumers' selection of sustainable options, these projects will enhance the group's competitiveness and contribute to shaping the future of Veidekke (Veidekke, 2022).

5.4 Impact of the measures

In the year 2021, there was a reduction of 10% in building waste as compared to the preceding year. In the year 2021, a proportion of 5% of the materials utilised in our projects were derived through recycling processes. The implementation of modular construction techniques has resulted in a notable improvement of 2 years in the average lifespan of our buildings. The Oslo Sustainable Building Project aims to attain a 15% decrease in building waste by implementing modular design principles and promoting the recycling of materials. The Circular Supply Chain Initiative is a programme that aims to promote sustainable practises within supply chain management. Collaborating with suppliers in order to mitigate packaging waste and foster the circulation of materials within a CE framework. Collaborated with suppliers to ascertain potential avenues for the implementation of material recycling practises and the utilisation of packaging materials in a sustainable manner. The vendors were encouraged to embrace the ideas of the CE, which involve the adoption of practises such as the design of items that facilitate disassembly and subsequent reuse (Veidekke, 2022). The annual assessment of the efficacy of actions implemented to enhance the CE is conducted via the utilisation of the subsequent indicators:

- The recycling rate in asphalt production (Norway, Sweden)
- Percentage of renewable energy (scope 1 and 2, location-based methodology)
- The overall number of asphalt manufacturing plants that are operated using renewable energy sources. (Norway, Sweden)
- The proportion of road surfaces that are covered with environmentally-friendly asphalt materials. (Norway, Sweden)

- The number of construction sites that operate without the use of fossil fuels or produce zero emissions.
- The establishment of a specific waste volume objective has not yet been determined (Veidekke, 2022).

Companies such as Veidekke can demonstrate their dedication to circular economy ideas and advancement towards more sustainable and environmentally conscious business practises by including these factors into their sustainability strategies. The provision of this information aids stakeholders, encompassing investors, customers, and regulators, in comprehending the company's role in advancing a circular and sustainable future (Veidekke, 2022).

5.4.1 Veidekke's consumption of recycled materials

The determination of material consumption was conducted utilising the expenditure-based approach, relying on data obtained from Veidekke's greenhouse gas (GHG) reporting. The use of materials was restricted solely to Veidekke's direct procurement of these materials. The omission of consumption data pertaining to items included in Veidekke's subcontracts can be attributed to a dearth of available information. The determination of the percentage of recovered materials was derived from the analysis of (EPDs) pertaining to the items procured by Veidekke. It is noteworthy that these products exhibited a substantial degree of similarity between the years 2020 and 2021. The assessment determined that the percentage of reused materials per materials category remained consistent during the specified years. In cases when recovered materials are expressed as a range, the proportion of reclaimed materials may have differed within the product category, and the available data may not have allowed for a direct correlation between volume and the corresponding EPD (Veidekke, 2022).

Consumption of materials by weight or volume - and proportion of recycled input materials	Unit	2022 ¹	Percentage of recycled materials	2021	Percentage of recycled materials	2020	Percentage of recycled materials
Non-renewable materials used							
Reinforcement steel	tonne			54 239	99%	59 333	99%
Precast concrete components	tonne			225 505	0-8%	243 191	0-8%
Bitumen	tonne			135 768	0%	123 952	0%
Ready-mixed concrete	m ³			372 611	0-3%	377 603	0-3%
Fillers	tonne			26 358	0%	20 430	0%
Facade glazing	m ²			29 317	7%	31 850	7%
Structural steel	tonne			3 467	57%	4 547	57%
Mortar and screed	tonne			6 979	0%	8 401	0%
Piles/sheet piling	tonne			93 416	65%	24 952	65%
Aggregates	tonne			5 199 892	0%	5 266 943	0%
Salt	tonne			38 541	0%	42 645	0%
Cement	tonne			29 071	0%	16 200	0%
Windows	m ²			61 713	12%	95 458	12%
Renewable materials used							
Bitumen (biogenic) ²	tonne			NA		NA	
Wood ³	MNOK			660	NA	577	NA

¹ Calculation of material consumption in 2022 to be completed in June 2023.

² The number of tonnes of biogenic bitumen is confidential.

³ Wood is a broad category of materials, which at Veidekke comprises anything from timber, massive wood and formwork materials to floors, kitchens, and other building furnishings. Data is collected from the companies annually, to get an overview of the total volume and proportion of certified wood and follow up on the use of certified wood in accordance with the company's targets related to deforestation. Due to limitations in Veidekke's and the suppliers' systems, this volume can to date only be stated in NOK, rather than in volume units.

Figure 6: Consumption recycled materials of Veidekke

Source: (Veidekke annual sustainability report, 2022)

5.4.2 Veidekke's waste diverted from disposal and waste directed to disposal

Disposal and treatment of waste generated in the reporting company's operations Waste in tonnes, broken down by final treatment method	2022 ¹	2021	2020
Waste diverted from disposal, tonnes		10 801	11 250
Waste directed to energy recovery, tonnes		10 241	12 344
Waste directed to landfill, tonnes (excl. masses)		30 104	6 573
Soil masses directed to landfill, tonnes		75 929	68 332
Total		127 075	98 500

¹ Waste accounting to be completed in June 2023.

Figure 7: Waste diverted from disposal and waste directed to disposal of Veidekke

Source: (Veidekke annual sustainability report, 2022)

The trash quantity and ultimate treatment technique, as stated by waste firms, accounted for 27% of the overall expenditures associated with garbage categorization in 2021, and 29% in 2020. The production of waste is impacted by various factors, such as the nature of the project,

the phase of the project, and the quantity of projects. Veidekke intends to maintain its collaboration with suppliers in order to enhance the existing database. Excluding soil masses, waste businesses have reported a material recovery rate of 21%. Veidekke is actively engaged in efforts to enhance the percentage of recycled materials within its operations in the foreseeable future (Veidekke, 2022).

5.5 Veidekke's sustainable projects

Building circular and sustainably in Asker

Veidekke has been contracted by Asker, (Norway) municipality to construct a work centre and sheltered dwelling facility at Nedre Sem Farm. The project encompasses highly ambitious sustainability objectives and is Asker municipality's inaugural endeavour in circular building initiatives (Veidekke: Building Circular and Sustainably in Asker, 2023).

The Nedre Sem Farm is situated in Semsvannet in the municipality of Asker and presently serves as a facility for municipal work operations. The barn structure has undergone progressive deterioration over an extended period of time, necessitating its complete dismantling prior to the construction of a new building that will incorporate the reuse of the existing elements (Veidekke: Building Circular and Sustainably in Asker, 2023).

The construction of Nedre Sem Barn will adhere to the requirements established by Futurebuilt, specifically Zero, Zero T, and NZEB (nearly zero energy building). Moreover, the project serves as a pilot initiative for Futurebuilt's established criteria pertaining to the utilisation of plastic and circular buildings, with a specific focus on minimising the presence of plastic items and promoting the reuse and recycling of construction materials. The upcoming construction project aims to attain a minimum 50% decrease in carbon dioxide emissions, aligning with the objectives outlined in FutureZero. Nedre Sem Barn is additionally encompassed as a pilot within the Circular Cities and Regions Initiative of the European Union. The building site is expected to achieve emission-free by employing electric construction machinery (Lars, Personal communication, 21 February, 2023).

Residential project in Bjørvika

Vannkunsten Syd comprises a collection of five distinct edifices, encompassing a cumulative sum of 91 residential units. In its whole, the project spans an area of 15,500 square metres, comprising 12,400 square metres dedicated to residential units with subterranean parking facilities, and an additional 3,100 square metres designated for commercial purposes. The

project is set to obtain certification in compliance with the BREEAM NOR environmental standard (Veidekke: New Residential Project in Bjørvika, 2023).

Director Anders Haugen of Veidekke Bygg Oslo states that we take great pride in undertaking yet another building project that adheres to environmental practices. He also expressed a special appreciation for the fact that all aspects will be approved for their adherence to environmental standards (Veidekke: New Residential Project in Bjørvika, 2023).

5.6 Challenges to implementing circularity in Veidekke

The present study aims to conduct an analysis of Veidekke's implementation of CE principles and the challenges it faces in this regard. Veidekke, a prominent company within the CI, is presently undergoing a transitional phase as it moves towards adopting a CE model. The efforts made in this particular field are unquestionably ground-breaking, yet, the undertaking is riddled with intricacies and obstacles that are characteristic of big construction endeavours.

One of the foremost obstacles encountered by Veidekke in the implementation of a circular economy pertains to the limitations imposed by time and labour. Due to their inherent characteristics, extensive construction endeavours necessitate rigorous scheduling and adherence to timetables (Lars, Personal communication, 21 February, 2023). The transportation of materials, both in the form of incoming and outgoing shipments, plays a crucial role in the execution of these projects. Inaccurate estimation of material movement may lead to bottlenecks, hence introducing complexities into the whole construction process. The logistical difficulty is further compounded when taking into account the utilisation of recycled or repurposed resources (Lars, Personal communication, 21 February, 2023). The quality and supply of reused materials exhibit an inherent volatility when compared to their brand-new equivalents. Choosing direct resources is often a more straightforward and advantageous approach, both in terms of logistical considerations and the quality of the resources.

The utilisation of repurposed materials entails additional complexity due to the governmental procedures involved. The incorporation of such materials in building necessitates authorization from both material brokers and architects, a procedure that can be arduous and time-consuming. From a financial perspective, it is often observed that new materials exhibit more feasibility, hence raising concerns about the economic viability of recycled materials in specific circumstances. The presence of local constraints, however, presents an extra obstacle. The adherence to specific criteria may occasionally conflict with the fundamental ideas underlying a CE. Although these ideas may be applicable to smaller projects,

implementing them on a larger scale requires substantial effort, particularly in terms of managing material storage, coordinating supply scheduling, and ensuring quality assurance (Lars, Personal communication, 21 February, 2023).

Notwithstanding these obstacles, Veidekke has demonstrated its dedication to sustainability through a range of projects. The effective utilisation of construction components in many projects throughout Denmark and Sweden serves as a tribute to their unique methodology. The focus placed on recycling, particularly in relation to waste materials such as aggregate concretes, demonstrates encouraging potential. The organisation has established collaborative relationships with waste suppliers that place a strong emphasis on recycling, so demonstrating a comprehensive dedication to sustainability. Veidekke's implementation of EPD can be viewed as a strategic initiative aimed at comprehending the environmental impact of materials. It is in accordance with the overarching trend within the sector towards the implementation of data-driven approaches to promote sustainability. The possibility for reusing a wide range of construction materials, including earth and steel, has been emphasised, indicating a broad perspective on the recyclability and repurposing of such resources (Lars, Personal communication, 21 February, 2023).

The presence of local constraints, however, presents an extra obstacle. The adherence to specific criteria may occasionally conflict with the fundamental ideas underlying a CE. Although these ideas may be applicable to smaller projects, implementing them on a larger scale requires substantial effort, particularly in terms of managing material storage, coordinating supply scheduling, and ensuring quality assurance (Lars, Personal communication, 21 February, 2023). The methodology of Veidekke is influenced by the complexities inherent in the client-contractor relationship. The given illustration, which involves a client specifying the utilisation of particular recycled materials, highlights the complex difficulties in reconciling client expectations with the subtleties of finding and employing materials. The current state of the larger market environment in Norway indicates that it has not yet fully adapted to meet the requirements of a circular economy in the building sector. The lack of a market for certain recycled materials represents a notable deficiency. Nevertheless, the proactive measures taken by Veidekke to build such a market are praiseworthy. Achieving significant reform in this field will require the collaboration of construction businesses, stakeholders, and regulatory organisations.

In summary, although Veidekke's commitment to achieving a CE is commendable, their present execution only encompasses a modest 1% utilisation of recycled materials (Lars, Personal communication, 21 February, 2023). This observation highlights a clear disparity

between their sustainability reports. Veidekke, as a prominent player in the CI on a global scale, presents a compelling case study that provides significant insights into its trajectory and the obstacles it has encountered within this domain. The trajectory observed implies that the pursuit of a CE, despite the presence of obstacles, is both necessary and feasible via collaborative efforts and determination.

6 Discussion and analysis

This section provides a comprehensive analysis and discussion of the research findings. This study examines the effects resulting from the adoption of SR in the CI and investigates the industry's adherence to the concepts of the CE. Moreover, this section offers valuable insights into the current condition and characteristics of the construction sector regarding its adoption of CE principles.

The primary objective of this thesis has been to examine SR practices within the European construction industry. Specifically, the research question guiding this study is: How is the employment of circularity in the European CI represented in sustainability reports and the case study of Veidekke? The research question will be addressed in two separate sections. Firstly, an analysis on discussion will be presented on how organisations adopt CE concepts within their sustainability reports. Secondly, the study's empirical component will involve analyzing four sustainability reports from the selected case company. Finally, the optimal solution entails adopting circular solutions that effectively reduce the utilization of natural resources.

6.1 Inconsistency of incorporate circularity

The recognition of the construction industry's vital role in promoting SD has grown due to its substantial environmental impact. This study aimed to investigate the portrayal of circularity in the European construction sector, as evidenced by the sustainability reports of 30 prominent companies. The focus of our analysis revolved on five primary parameters: Participation in the UNGC, Integration of circular economy (CE) principles, the use of green building rating systems for LCA, waste management systems, and the employment of EPD. The subsequent discourse explores the ramifications of the results of these factors.

1. **Participation on UNGC program:** Concerning the UNGC, it is observed that slightly more than 50% of the enterprises surveyed are involved in the UNGC program. This

finding suggests a reasonable degree of involvement with global sustainability frameworks. It is worth noting that there is a disparity in the level of interest observed among different countries, with Spain and France demonstrating substantial levels of participation. This observation indicates a negative trajectory towards the establishment of global sustainability standards. However, the significant proportion of enterprises that have yet to engage in the initiative raises concerns about the industry's overall dedication to upholding the ideals of the UNGC. The phenomenon mentioned above can be ascribed to divergent regulatory pressures across different countries, the demands of the market, or a dearth of incentive mechanisms that would foster the adoption of such pledges.

2. **Reporting circularity:** The reporting levels on CE demonstrate a range of transparency and involvement in circular practices. The current state of corporate reporting on corporate ethics reveals that only a minority of companies, precisely one-third, engage in comprehensive reporting. There is potential for further development in terms of integrating and effectively communicating CE concepts within the industry. The limited reporting exhibited by a majority of companies may suggest that they are in the early stages of adopting CE practices or that they prioritize other SR aspects over circularity. The hesitance or inability to report may be attributed to practical difficulties in implementing CE principles, the intricacy of measuring and reporting circularity, or a lack of agreement on what qualifies as significant CE practices. It is imperative to remember that sustainability reports serve to bolster the perception that construction enterprises are both sustainable and circular. Assessing the credibility of information requires diligent effort. Further investigation is required to investigate the specifics of their everyday operations and ascertain their activities.

3. **Green building rating system:** The widespread use of Green Building Rating Systems for LCA certifications by firms indicates a positive trend within the sector towards implementing standardized sustainability metrics. Nevertheless, the discrepancies in the quantity and nature of certificates indicate a fragmented environment in which the significance and influence of different certifications must be uniformly acknowledged. It was a frequent observation that various companies employed distinct LCA tools, such as the Nordic Swan Ecolabel, BREEAM, and LEED. The observed fragmentation could be attributed to the differing levels of development in sustainable practices among

companies, highlighting the necessity for a unified method of evaluating and conveying sustainability credentials. Moreover, certain companies have employed LCA methodologies in constructing their facilities but not in every projects. However, these endeavors should have been explicitly disclosed in their sustainability reports. For example, my research indicated that rather than utilizing LCA, firms opt for renewable energy certifications like the Renewable Energy Guarantee of Origin (REGO) or certifications for forest product producers such as the Forest Stewardship Council (FSC). This is positive, as it shows firms are endeavoring to engage in activities promoting circularity. However, quantifying the degree of circularity remains a challenge.

4. **Waste management:** Adopting waste management systems is praiseworthy and demonstrates the industry's collective acknowledgment of the significant value of practicing appropriate waste management. I was pleased to discover that each of the 30 facilities possesses its own waste management system. Nevertheless, the limited extent of comprehensive reporting of waste management practices gives rise to inquiries regarding the effectiveness and inclusiveness of these systems. The level of standardization and adherence to circularity concepts, such as waste minimization and resource recovery, remains to be determined across the industry. For instance, it has been found that some firms use third-party companies to manage their waste; they leave the waste on-site once they have done their project. We need to investigate the manner in which the third-party company deal with the waste.

5. **Employment of EPD:** The relatively low adoption rate of EPD indicates a substantial potential for expansion within the industry's endeavor to enhance transparency and accountability. The use of EPD serves as a definitive indication of a company's dedication to environmental stewardship. It establishes a standard for evaluating the environmental impact of its products. The limited availability of EPD may indicate a dearth of customer interest, insufficient regulatory motivations, or the existence of obstacles hindering their widespread implementation, such as financial constraints or intricacy. Out of thirty prominent companies, only six are currently employing EPD, which is minimal. This gives rise to questions regarding the credibility of their claims in the reports.

In summary, the current level of involvement in the UNGC program stands at over 50 percent, which falls under expectations. Given their prominent position within the sector, it is within their capacity to enhance participation rates to close to 100 percent. The level of circularity reporting remains inadequate, as a significant majority of corporations, specifically two-thirds, have yet to enhance their reporting on circularity. The green building rating system presents a complex scenario due to variations among organizations in their emphasis on sustainability initiatives and possession of distinct or multiple certifications. Waste management solutions are prevalent in the construction industry. In this context, it is imperative to assess the extent to which companies can repurpose or recycle waste materials for subsequent utilization. Companies must provide quantifiable data regarding the extent of waste recycling or reutilization in their sustainability reports. The utilization of EPD within the industry as a whole is significantly limited, thus serving as an unfavorable indication. Due to the fact that sustainability reports are internally generated, companies possess the capacity to make assertions of any nature within these reports. Consequently, it becomes imperative for enterprises to obtain external validation through third-party verification processes. In general, the construction industry has a multifaceted challenge when it comes to embracing circularity. Although several corporations are in the early stages of embracing circularity, the number of organizations actively pursuing this approach remains limited. However, it is imperative for the majority of companies to prioritize their efforts towards the implementation of a circular economy. It is imperative to consolidate all firms within a unified framework in order to assess the level of circularity accurately.

The implications for industry practice are significant and noteworthy. The portrayal of circularity within sustainability reports provides insights into the advancements and obstacles encountered by the European construction sector in its pursuit of sustainable practices. Although there is evidence of involvement in sustainability programs and adherence to standards, the extent and scope of this involvement need to be revised. This study offers an overview of sustainability reporting practices within a specific cohort of European construction companies. The results suggest that although the industry acknowledges the importance of sustainability, there needs to be more consistent implementation of circularity. In order to promote the implementation of circularity in the industry, a more cohesive strategy should be adopted. This strategy should encompass establishing standardized reporting frameworks, enhancing collaboration among enterprises and sectors, and implementing supportive policy measures that facilitate the widespread adoption of circular principles.

6.2 Exaggerated sustainability reports

The discourse analysis of thirty construction companies' sustainability reports thoroughly examines how these businesses convey their dedication to sustainability, especially concerning the CE. This discourse study enhances the multidisciplinary aspect of the master's thesis by offering a comprehensive comprehension of how CI incorporate sustainability and circular economy concepts into their communication strategies, which may subsequently impact their marketing strategies.

6.2.1 Emphasis on Environmental Impact

The prevalence of the terms "environment/environmentally" and "sustainability/sustainable" in the discourse indicates a significant focus on ecological factors in the building industry. The prevalence of this terminology indicates a widespread acknowledgment within the sector of the imperative to tackle environmental issues. The frequency of usage of the terms "environment" and "circularity" suggests that businesses appear to devote more attention to reporting on environmental issues than to employing the specific principles and procedures of the circular economy. This suggests that businesses do care about how their actions affect the environment. However, they may still be in the early stages of fully implementing circular economy principles into their daily operations.

Various approaches have been proposed and implemented to address the complex issue of climate change. These approaches encompass a range of strategies and policies aimed at mitigating greenhouse gas emissions and adapting to the impacts of climate change. Including the term "climate" in the reports suggests that construction corporations understand and are willing to address the broader implications of global climate change. The inclusion of this acknowledgment may also serve as a strategic manoeuvre by companies to link themselves with international initiatives and meet the growing consumer expectations for climate responsibility.

6.2.2 Minimal Engagement with CE Concept

The word "circularity" is not used very often, which suggests that while the circular economy is attractive to people in the construction industry, it has not become as well-known as other sustainability ideas. Circular practices are hard to implement in the construction industry because they are complicated, require significant investments over a long period and a change

from traditional business practices. Nevertheless, these phrases suggest an increasing recognition and a possible progressive transition towards greater adoption of circular methodologies.

The study shows big differences in the amount of sustainability-related language used by different companies, which suggests that they are not all as committed to or focused on the same aspects of sustainability. While several organizations emphasize sustainability significantly, others may not accord it the same priority in their reports. The differences show that different construction companies have different strategic goals and levels of involvement with environmental issues. According to their reports' extensive use of pertinent terms, businesses like Skanska Sweden and Veidekke Norway have established themselves as significant figures in the sustainability discourse. This leadership position implies that these organizations have incorporated sustainability into their business models and operations to a greater extent.

The keyword frequency analysis provides valuable insights into the thematic priorities corporations emphasize in their sustainability discourse. However, it is imperative to recognize that the genuine assessment of a company's dedication to sustainability is contingent upon its actions and resulting outcomes. For instance, FOMENTO DE CONSTRUCCIONES SPAIN has prominently employed the concepts of "sustainability," "environmental," and "circular economy," while neglecting the utilization of employment of EPD. This raises concerns about the credibility of their sustainability discourse. To fully understand the sustainability strategies each organization uses, it is necessary to examine how these phrases are translated into real-world actions closely.

In brief, the discourse analysis presents an overview of the construction industry actively addressing sustainability concerns, but with differing levels of attention to various facets. There is a discernible trend throughout the construction industry towards heightened environmental accountability and increased recognition of climate-related concerns. Nevertheless, the limited frequency of references to circular economy notions implies that, although the business is familiar with the notion, it may have yet to adopt or execute it fully. The current context offers a promising prospect for expanding and further incorporating sustainable practices in the forthcoming period.

6.2.3 Sustainability: As a part of the “Marketing Lingo”

Construction companies' utilization of sustainability-related terminology may indicate a phenomenon known as "greenwashing". The phrase "greenwashing" refers to firms disseminating misleading information to create a positive public perception of their environmental responsibility even though their actual business practices do not align with these claims. Companies frequently include sustainability-related terminology extensively in their reports and promotional materials to project an impression of environmental conscientiousness, even when their operational procedures do not fit with the fundamental tenets of sustainability. Here is how keyword frequency might relate to greenwashing:

Buzzword: Organizations may employ sustainability-related terminology extensively within their reports to convey a perception of unwavering dedication towards environmental and social accountability. The frequent utilization of phrases such as "sustainable," "environmentally friendly," or "circular economy" may form a narrative strategically designed to resonate with stakeholders who are progressively prioritizing these concerns. Compliance with regulations and standards: Businesses that strictly follow environmental laws and sustainability standards are less likely to use buzzwords as meaningless words.

Lack of Verification: Without empirical validation through tangible activities, policies, and quantifiable results, using keywords may indicate a shallow application. A high keyword frequency is only sometimes a sign of actual activity and might be used to draw attention away from the paucity of significant environmental initiatives.

Comparative Analysis: The comparative analysis reveals that if a company's discourse on sustainability does not conform to industry benchmarks or align with established sustainability frameworks such as the GRI or the CSRD, it may indicate that the company is employing sustainability terminology primarily for reputational purposes rather than genuine environmental or social impact.

Qualitative vs. Quantitative Analysis: The comparison between qualitative and quantitative analysis examines the extent to which these concepts are employed within a framework that conveys significance. Are comprehensive reports available that provide extensive information

on projects aligned with the specified keywords? Do the reports encompass third-party validation or certification of sustainability declarations?

Progress Over Time: Companies that demonstrate a genuine dedication to sustainability are expected to provide a track record of success over time, characterized by consistent increases in sustainability measures on an annual basis. A consistent and sustained high frequency of keywords without accompanying advancements could indicate the utilization of buzzwords to manage one's public perception.

It appears that corporations frequently use broad assertions devoid of substantive substantiation or evidence. Using the parameters that I have developed to analyze the frequency of specific words in thirty sustainability reports, a significant number of companies are presumably employing trendy sustainability terms primarily as marketing rhetoric. This phenomenon stands in opposition to the prevailing belief that companies are fully dedicated to sustainability, as an examination employing five distinct parameters reveals an alternative picture. A number of businesses frequently claim that they are capable of resolving problems or satisfying requirements, but fail to specify how they achieve this. As an illustration, ACCIONA SPAIN asserts that it has implemented environmentally sustainable asphalt in its activities; however, the precise volume utilised is not specified. Although analyzing the frequency of keywords in sustainability reports can offer some understanding of the topics emphasized by a company, it should be noted that this approach needs to provide a conclusive assessment of the company's tangible sustainability efforts. Further examination of the contextual framework in which these keywords are employed, the provision of evidence to support assertions, the coherence of reported information with tangible achievements, and adherence to external sustainability benchmarks are necessary in order to differentiate authentic sustainability endeavors from instances of greenwashing.

6.3 Circular economy: A long way to go

Veidekke's circularity strategy exemplifies their strategic commitment to sustainability, which goes beyond simple compliance and is ingrained in the business's fundamental functions. The case study portrays Veidekke as an organization actively promoting sustainable practices in the CI as part of the movement towards a CE. The use of circularity in Veidekke's operations is

assessed in this conversation, taking into account the company's successes as well as its challenges.

Veidekke's circularity is based on its compliance with the GRI Universal Standards and its alignment with the UN's Sustainable Development Goals. Veidekke has positioned itself as an ecologically friendly company by committing to lowering greenhouse gas emissions, increasing the use of recycled materials, and setting quantifiable goals for minimizing building waste. Its focus on using local expertise and involving stakeholders points to a business model that puts long-term value creation ahead of short-term revenue.

Veidekke's strategic framework demonstrates its dedication to incorporating the principles of the CE into its fundamental business processes. The emphasis on reducing building waste, using more recycled materials, implementing modular designs, and adhering to the Paris Agreement on greenhouse gas emissions are all signs of a strategic shift towards sustainability beyond compliance to proactive environmental stewardship. These objectives align with the UN's Sustainable Development Goals and show an honest company culture that puts long-term environmental responsibility ahead of immediate financial gain.

Veidekke's efforts towards a circular economy show they are concerned with the entire lifetime of building materials, but only in a few projects. The company is actively working to close the loop in resource flows by campaigning for regulatory reforms that would enable more use of recycled concrete, promoting soil reuse, and implementing large-scale recycled steel. Adopting flexible and modular designs intends to increase the adaptability and lifespan of buildings in addition to cutting waste. This demonstrates a thorough comprehension of the tenets of the CE, which aims to extend the lifecycle of resources and design out waste.

The stated results demonstrate the concrete effects of Veidekke's CE initiatives on a number of projects. Examples of these results include decreased building waste and using recycled materials. These results also highlight the difficulties in measuring the success of sustainability initiatives, particularly when compared to lofty objectives and industry standards. The yearly sustainability report for the company shows a trajectory of small but significant increases in the company's progress, indicating that the integration of circularity is a process rather than a finished material.

6.3.1 Challenges toward circularity

The shift to a CE, however, is not without challenges. Large-scale construction projects have intrinsic complexity, as Veidekke's case study illustrates. Several obstacles to overcome

include the unpredictability of recycled material quality and availability, the administrative burden of getting permissions for their usage, and the financial factors that can occasionally favor new over recycled materials. Regional restrictions and the need for a market that promotes circular practices in the construction sector also bring to light structural issues outside of the company's direct control. Even with these developments, Veidekke's case study is fearless in pointing out the difficulties in implementing circularity. The actual realities of time, labor, logistics, and the unpredictability of the quality and availability of repurposed materials temper the aspiration for circular principles. Additionally, market and regulatory barriers frequently prevent the use of recycled materials, highlighting a conflict between operational viability and environmental objectives.

It is noteworthy that the sustainability reports of many firms did not address any issues pertaining to the industry's limitations. What are the problems or barriers associated with the implementation of a circular economy? It has been observed that there is currently no universally accepted reporting system in place. Consequently, it is imperative to emphasize the inclusion of problems encountered with the presentation of accomplishments. However, the interviewee discloses the underlying challenges associated with the implementation of circularity within the construction sector. Based on Mr. Lars statement, I have identified the key problems faced by the industry.

Key challenges:

Challenges	Comments/analysis
Ongoing Development	Veidekke is currently engaged in the active development of its circular economy model.
Challenges with Implementation	The implementation of the circular economy model is hindered by scheduling constraints in large-scale projects. The process of estimating the period required for the transportation of items has the potential to result in bottlenecks. The issue of quality arises when making comparisons between reused materials and new ones that are reused. Both materials brokers and architects are required to obtain authorization prior to utilising reused materials, resulting in a time-consuming process that frequently incurs higher costs compared to the use of new materials.
Waste Management and Recycling	Veidekke engages in waste management and recycling practises by repurposing waste goods and aggregates derived from concrete materials. The organisation has effectively implemented the recycling of construction materials in several projects conducted in Denmark and

	Sweden. The procedure was more expensive also time consuming. The company has established relationships with waste suppliers who are committed to maximising recycling and repurposing of waste materials.
Supply Chain Considerations	When acquiring materials, particularly those that are reused, it is imperative to take into account various supply chain considerations such as timing, quality, and manner of delivery.
The Broader Market Problem	Norway presently has a significant challenge in its construction industry, namely the absence of a market for recycled materials. Veidekke and other stakeholders in the sector posit that the establishment of such a market might potentially serve as a viable alternative. However, its realisation would necessitate collaborative endeavours from industry participants and the implementation of supportive governmental legislation.
Low Adoption Rate	Despite the prevailing enthusiasm surrounding the concept of the circular economy, the use of recycled materials in Veidekke's construction projects currently represents a mere 1% of their overall endeavours. The observed discrepancy serves to underscore a discernible disparity between the sustainability reports provided by the organisation and the tangible implementation of sustainable practises.

Table 3: *Key challenges of Veidekke to implement circularity*

The key points in the table provides a comprehensive overview of the challenges and complications associated with the implementation of a CE model within the CI, with a specific focus on the case of Veidekke address by the interviewee. The importance of collective endeavour, supportive policies, and industry-wide transformations is underscored in order to achieve substantial advancements. In light of Veidekke's positive perspective on the CE, it is evident that there exists significant potential for further development, particularly given its influential position within the worldwide construction sector.

Veidekke has shown a forward-thinking approach in addressing these issues, as seen by the company's strategic investments in creative solutions and the creation of Veidekke Circular, a subsidiary devoted to circularity. The company's commitment to internal training and its ability to influence legislation highlight its function as an industry change agent. Nevertheless, the case study's admission of a meagre 1% use of recycled materials highlights a gap between expectations and reality. This disparity highlights the early stages of the circular economy's adoption in the construction sector and the necessity of coordinated efforts from a range of stakeholders to quicken the process.

Veidekke's application of circularity concepts proves its environmental responsibility and strategic foresight. Even if the company has made significant progress towards

sustainability, it is clear that the construction industry must continue to innovate, develop its market, and receive legislative support to ultimately realize a circular economy. Infrastructure and logistics deficiencies constitute a significant obstacle in the construction industry. By implementing more effective legislation that compels firms to assume responsibility for managing their own waste and advocating for the development of appropriate infrastructure, societal growth can be facilitated. Veidekke's case study provides insightful information about how CE ideas can be applied in real-world situations, the observable advantages of this strategy, and the obstacles that must be overcome. It is impossible to separate the conversation about Veidekke's efforts from the more significant dynamics of the market and regulations. For example, Veidekke has the opportunity to spearhead market development despite the challenge of Norway's weak recycled materials market. Veidekke has started working with suppliers collaboratively, investigating new business models, and advocating for legislative changes—all essential steps towards building an environment that supports circularity.

Based on my research, Veidekke stands as one of the sustainability-conscious companies among 30 European construction firms. They adhere to the GRI standards, are active participants in the UNGC, and practice the employment of EPD. However, their Circular Economy (CE) principles are still evolving, as noted by Mr. Lars. This highlights the significant efforts other construction firms need to make in order to enhance their CE practices.

6.4 Circularity: A key components for sustainability

The primary objective of the CE is to progressively dissociate economic activity from the utilization of limited resources while simultaneously eliminating waste from the system (Ellen Macarthur Foundation, 2015). In 2015, the EU introduced a strategic initiative known as 'Closing the Loop' as part of its action plan for the CE (European Commission, 2015). This plan aims to enhance the EU's competitiveness by safeguarding businesses against resource scarcity and fluctuating prices, while fostering the emergence of novel business prospects and promoting innovative and efficient approaches to production and consumption. The action plan delineates various components, including the waste hierarchy as discussed in Chapter 2. This hierarchy serves as a visual representation of the recommended approach for maintaining materials in their initial state and preserving their embodied energy. Waste prevention is the highest tier in the waste hierarchy, followed by reuse, recycling, recovery, and disposal, which is the lowest tier.

By incorporating its provisions into national legislation and setting corresponding goals, the member states of the EU successfully implemented the action plan for the CE. As an illustration, the Netherlands has established the objective of achieving a state of complete circularity by the year 2050 (Rijksoverheid, 2016). In order to achieve the desired outcome, three objectives have been delineated:

1. Optimizing the utilization of resources within current production processes
2. Prioritizing the utilization of sustainable, renewable, and readily accessible raw materials when new inputs are required
3. Fostering the development of innovative production methodologies and designing products with circularity in mind

In a recent publication by Rau and Oberhuber titled "Materials Matter" (2022), the authors present a manifesto advocating for the transformation of our existing LE into a CE, emphasising the role of materials as a starting point. The main things to think about in the circular building sector are how to change who is responsible for what materials and products, as well as how buildings can be used and who owns them, in order to make the move towards circularity in the built environment easier.

The CE concept is of utmost importance in driving a paradigm shift in construction practices. The effectiveness of resource utilization is critical, and it is recommended that recycled or sustainably sourced materials be utilized. By doing this, there is much less need for newly made materials, which helps protect natural resources and lessens the damage that getting and processing these materials does to the environment. The construction sector stands to gain significantly from this circular approach, as it reduces refuse production by a substantial margin. By repurposing materials obtained from demolished structures, forthcoming projects are able to generate valuable resources from what would otherwise be debris. By reducing the amount of waste directed towards landfills, this practice also alleviates the environmental consequences associated with waste processing. The CE model considers the complete lifecycle of a structure, which includes its conception, construction, operation, and eventual deconstruction. This all-encompassing point of view guarantees less damage to the environment over the entire life of the structure, which makes it easier to create more environmentally friendly building methods.

Cradle-to-cradle encapsulates the concept of designing and producing all types of products so they are genuinely recyclable at the end of their lifecycle. This approach seems

promising, emphasizing creating a greater positive impact rather than merely minimizing harm. Unlike traditional eco-efficiency methods, which aim to lessen the ecological footprint and reduce damage, cradle-to-cradle shifts the focus towards eco-effectiveness. It encourages actions that enhance our positive ecological footprint. This philosophy advocates for a shift from a 'less bad' to a 'more good' mindset, using growth as a catalyst for the innovations needed for such transitions (Toxopeus et al., 2015).

Furthermore, to comprehensively gauge sustainability in construction, it is vital to integrate CE metrics into reporting. Recognizing circularity levels is crucial for effectively launching and implementing CE strategies. The CI stands to gain economic benefits from the CE model. Achieving refuse reduction and material reuse results in decreased construction costs. It also stimulates employment growth in the recycling and renovation industries. Nevertheless, the adoption of circular practices in the construction sector presents an intricate dilemma that necessitates the collaboration of every industry stakeholder. It is possible for policymakers to make a significant difference in this transition by supporting the CE and creating new regulations that are easy to put into practices.

6.5 Why are firms not interested in disclosing the challenges?

Sustainability reports are carefully crafted to favorably portray a company's environmental and social endeavors, typically emphasizing accomplishments rather than challenges. This phenomenon might be attributed, at least in part, to the significance of upholding a favorable brand reputation for corporations. Acknowledging difficulties in adopting a CE approach may be perceived as exposing vulnerabilities. The move to a CE encompasses various delicate aspects such as supply chain management, material procurement, product design, and alterations in consumer behavior. These elements pose challenges in terms of quantification and reporting.

Concerns about competitive sensitivity may also make companies hesitant to discuss some problems since telling competitors about strategic problems could give them an edge. The need for transparent reporting frameworks makes this problem even worse, making it harder for companies to measure and communicate their losses accurately. Stakeholders often put progress reports ahead of talks about problems.

Furthermore, the complexities surrounding innovation and safeguarding intellectual property rights might engender a sense of hesitancy among corporations when divulging comprehensive insights into their operational procedures. Ultimately, firms may prioritize

rapid, quantifiable achievements above addressing the uncertainties surrounding the long-term implementation of the CE, perhaps neglecting its complex and unresolved difficulties. Nevertheless, there is an observable inclination towards enhanced transparency in reporting, driven by the growing insistence of stakeholders on integrity and responsibility in the realm of corporate sustainability endeavors.

Companies ought to formulate a strategic plan that harmonizes immediate successes with enduring sustainability ambitions. This strategy requires establishing distinct, attainable short-term goals that align with and support the overarching, long-term aims of CE initiatives. To navigate the complexities and uncertainties inherent in the CE, companies need to heighten their investment in research and development. This can encompass the exploration of innovative materials, processes, and technologies to enhance the feasibility and effectiveness of CE methods. In their sustainability reports, companies can be transparent about the challenges they encounter and the potential solutions they are considering. Furthermore, rather than concentrating exclusively on specific sectors, companies should embrace a comprehensive approach to sustainability. This approach involves the integration of CE principles across the entire spectrum of their operations, from the design and production of products to their distribution and interaction with consumers.

6.6 The Future of sustainability reporting:

Organizations face a complex problem when it comes to implementing sustainability and circularity and reporting on these concerns is just as difficult. As there are more and more reporting standards and frameworks, some of which are required by law and some of which are voluntary, it could be hard to figure out how to use them. This has made people more likely to need clarification about using them. The majority of businesses report circularity in an ambiguous manner. For instance, “We use LCA tools, to assess and reduce the impact of its developments, and also its consumption of materials and energy. In 2022, ACCIONA ran 7 LCAs” reported by Acciona. Afterwards, unexpectedly, there is no more information regarding LCA. If various sectors and organizations need to modify these standards to meet the demands of their particular contexts, it might be difficult to report on the challenges and barriers encountered consistently.

KPMG says that the International Sustainability Standards Board (ISSB) and the Corporate Sustainability Reporting Directive (CSRD) in the European Union are likely to make a big difference in the amount and type of sustainability reporting. Business reporting

requirements will include a broad spectrum of environmental issues, such as pollution, water and marine resources, biodiversity, resource consumption, and the circular economy. This in-depth reporting goes beyond and beyond the standard procedures, which often concentrate their attention primarily on climate-related elements. The difficulty lies not just in reporting but also in monitoring and keeping track of the significant number of criteria that are imposed across the entire organization.

In addition, the quality of the underlying data determines the quality of the produced sustainability reports. If the data are correct or complete, the reliability of the overall assessment could be called into question. It is difficult for many firms to authenticate data entirely since there is a lack of traceability, and the process involves a burdensome amount of administrative work. Adopting digital technologies can facilitate more effective data management and analysis, both of which can improve the quality of SR.

Considering these problems, it is possible that existing sustainability reports do not commonly include challenges and obstacles because organizations may need more systems or processes to store and manage the complex and thorough data required for complete reporting. If this is the case, then the omission of challenges and barriers is likely due to this deficiency. It is anticipated that, as the new reporting standards are pushed out, firms will begin incorporating more information regarding their difficulties and obstructions to provide a more comprehensive picture of their sustainability activities. A new EU directive, the Corporate Sustainability Reporting Directive (CSRD), mandates publicly traded companies disclose their activities' social and environmental consequences. This directive underscores the significance of accountability and transparency in the implementation of corporate sustainability initiatives. Nevertheless, to satisfy the new standards, this shift may call for considerable adjustments to the internal processes and systems.

7 Conclusions

The study was initiated by investigating the current patterns observed in SR, explicitly examining the construction industry's interpretation of the CE. The present investigation has led to the emergence of the primary research question: How is the employment of circularity in the European CI represented in sustainability reports and the case study of Veidekke? In order to address this question, the study employed a data triangulation method, encompassing both quantitative and qualitative analyses. The process involved carefully reading through 30

sustainability reports and picking out five key indicators that could then be used to make a quantitative assessment. In addition, a qualitative investigation was conducted employing a case study on Veidekke, complemented by a discourse analysis of 30 European construction firms.

The investigation of sustainability reports originating from the European construction sector indicates an explicit acknowledgement of the significance of sustainability, as well as active involvement in circularity initiatives and adherence to established criteria. Nevertheless, the practical use of circularity concepts within the industry exhibits a lack of consistency. In order to address the disparity between recognition and implementation, the industry must embrace a cohesive and coordinated strategy. Implementing standardized reporting standards is necessary to provide transparency and universally facilitate the comparison of sustainability practices. Moreover, promoting inter-enterprise and cross-sector collaboration can stimulate innovation and facilitate the exchange of best practices, hence enhancing the integration of circularity within the sector's underlying principles. The significance of policy in promoting the widespread adoption of circular concepts should not be underestimated. Policymakers play a critical role in providing supportive measures that promote and facilitate the implementation of these principles. Long-term environmental, financial, and societal advantages can only be guaranteed by the European CI if such coordinated efforts are made to fully achieve the promise of sustainability and circularity.

Veidekke's case study vividly illustrates a construction company earnestly integrating circular economy principles into its core business strategies to promote sustainability. Their commitment is evidenced through strategic alignment with the GRI Universal Standards and the UN's Sustainable Development Goals, focusing on reducing greenhouse gas emissions, leveraging recycled materials, and prioritizing waste minimization. This approach underscores Veidekke's environmental stewardship and reflects a progressive business model that values long-term ecological responsibility over immediate financial gains.

Veidekke's challenges in implementing circularity are emblematic of the construction industry's broader struggle with transitioning to a CE. These challenges, which range from logistical complexities in large-scale projects to market and regulatory obstacles, highlight the tension between aspirational sustainability targets and the pragmatic realities of the industry. Despite a commendable strategic vision, the company acknowledges the difficulties inherent in this shift, with recycled materials constituting a minimal fraction of their total project inputs. Veidekke's case study is a microcosm of the challenges and opportunities inherent in adopting a CE within the CI. It provides a valuable blueprint for how companies can navigate the

complexities of sustainability while paving the way for significant industry transformation. Veidekke's commitment to circularity is an ongoing process, reflecting a dynamic engagement with sustainability that will evolve as the market matures and regulatory environments become more conducive. While fraught with challenges, this journey is a testament to Veidekke's role as a change agent and illustrates its potential to influence the broader industry towards a sustainable and circular future.

The discourse analysis of the sustainability reports from the construction sector offers an intricate picture of how these companies present their engagement with sustainability and, by extension, the circular economy. The widespread use of words like "environment," "sustainability," and "climate" shows that everyone in the sector is aware of their environmental responsibilities. However, the relatively infrequent mention of "circularity" raises questions about the depth of integration of circular economy principles into the core operations of these firms. Using sustainability-related language “marketing lingo” does not necessarily mean that sustainable practices are being adopted. Greenwashing is a concern when using keywords does not lead to verifiable actions and results. Substantive policies, practices, and advancements that align with international standards and frameworks must accompany sustainable discourse. Without this, the frequent mention of sustainability terms could serve more as a reputational shield than evidence of fundamental transformation. The construction industry is undeniably engaging with the sustainability discourse, yet the extent to which this discourse reflects actual operational change remains to be determined. For the industry to move beyond mere conversation to concrete action, it must evolve from a narrative-driven approach to one that is demonstrably action-oriented, with evident, quantifiable achievements and third-party validations that attest to a real commitment to sustainability and the principles of the circular economy.

The CE is a paradigm shift that seeks to separate economic growth from the consumption of finite resources and waste generation. The 'Closing the Loop' action plan of the EU outlines a strategy framework aimed at enhancing competitiveness, ensuring resource security, promoting innovation, and developing sustainable production and consumption patterns. EU member states are taking steps towards a more sustainable future by incorporating principles of the CE into their national legislation and establishing ambitious objectives. As a substantial generator of waste, the building industry plays a crucial role in the shift towards a circular economy. Adopting reuse and recycling practices is necessary to prolong the lifespan of resources, optimize their worth, and recover materials after they have been used. In order to mitigate environmental impacts, the CI must place the utmost importance on waste prevention

and enhance recycling rates. Initiatives such as cradle-to-cradle design can be more effective in implementing circularity.

In essence, There is a pressing demand for a few changes in the business, including our rules and methods, especially regarding companies reporting on sustainability. In order to minimize the deficiency in sustainability reporting, policymakers may find it advantageous to thoroughly investigate this issue, as doing so has the potential to streamline the process of attaining our goals. On the other hand, advancing towards a circular economy is not merely a policy goal but a comprehensive cultural and economic shift that requires reimagining and re-engineering the way we produce, consume, and think about economic activity and the environment. This is not just a challenge; it is an opportunity for transformative change. The construction industry stands at a crossroads, and the path it chooses now will define its sustainability legacy for generations to come.

7.1 Contribution and Limitations

This study has contributed valuable to the current body of research on sustainability reporting and accounting. It has achieved this by accumulating, examining, and analyzing the problems contributing to a need for more legitimacy in the circular economy approaches to sustainability reports. Previous studies have expressed criticism towards sustainability reporting, highlighting its deficiencies in terms of comparability and trustworthiness. This study has made an additional contribution to identifying obstacles associated with implementing circular economy principles in the construction sector. The study has also added to our understanding of the possible direction of sustainability reporting by incorporating the recognized present issues with the insights and opinions of perceptive interviewees.

This study draws upon a single case study, hence presenting limits in terms of generalizability. Nevertheless, sustainability reporting is a widely adopted practice that transcends other industries, making the problems addressed in the case study relevant to the construction industry. Furthermore, it is worth noting that this study was undertaken during the spring of 2023, a period characterized by significant advancements in the field of sustainability reporting. The CSR Directive (EU) was under development and intended to be implemented in 2025.

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Appendix

Interviewee

Lars Evensen Paulsrud

Time: Feb 21, 2023 02:30 PM Oslo

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Interview questionnaires:

Sustainability approach

1. What is your company's definition of sustainability in construction?
2. How does your company report its sustainability efforts and outcomes?
3. Can you provide examples of sustainable initiatives that your company has implemented in the past?
4. How does your company measure the impact of its sustainability initiatives?

5. What is your company's approach to reducing its carbon footprint?
6. How does your company ensure the materials used in construction are sustainably sourced?
7. How does your company handle waste generated during construction projects?
8. How does your company educate and engage its employees on sustainability practices?
9. Is the current sustainability reporting system providing sufficient information for stakeholders?

Circular economy approach

10. Can you discuss your company's position on the circular economy?
11. How does your company approach the lifecycle assessment of buildings and infrastructure?
12. In sustainability reports, do you believe reporting circularity is essential?
13. What steps is your company taking to promote circular practices in its operations and supply chain?
14. How does your company plan to adopt circular principles in its design and construction processes?
15. What is your company's strategy for promoting circularity in the building and construction industry as a whole?
16. How does your company collaborate with suppliers and partners to create a more circular economy?
17. What role does your company see for technology in promoting circularity in the construction industry?
18. How does your company measure its progress towards a more circular economy?
19. Can you discuss any challenges your company has faced while implementing circular economy practises?
20. Do you believe businesses should disclose the challenges they face while implementing circularity in their sustainability reports?

Top 100 Construction Firms by Deloitte

Name	country	Sales 2021 (M	% change 202	% change in l	2021 market	% change 202	% change 202
CHINA STATE CONSTRUCTION ENGINEERING CORP. LTD.	China	293 194	0,25	0,17	32 133	0,02	0,00
CHINA RAILWAY GROUP LTD. CREC	China	166 378	0,18	0,10	12 983	-0,29	-0,31
CHINA RAILWAY CONSTRUCTION CORP. LTD. (CRCC)	China	158 121	0,20	0,12	8 882	-0,41	-0,43
CHINA COMMUNICATIONS CONSTRUCTION GROUP LTD.	China	106 287	0,18	0,10	8 790	-0,41	-0,43
METALLURGICAL CORPORATION OF CHINA LTD (MCC)	China	77 598	0,34	0,25	5 289	-0,34	-0,35
POWER CONSTRUCTION CORP OF CHINA (POWER CHINA)	China	69 601	0,20	0,12	19 254	1,14	1,08
VINCI	FRANCE	58 437	0,18	0,14	60 043	0,02	0,10
CHINA ENERGY ENGINEERING CORP	China	49 966	0,28	0,19	7 058	1,43	1,37
BOUYGUES	FRANCE	44 469	0,12	0,08	13 715	-0,12	-0,06
SHANGHAI CONSTRUCTION GROUP (SCG)	China	43 569	0,30	0,22	5 033	0,23	0,20
DAIWA HOUSE INDUSTRY CO. JAPAN	Japan	38 899	-0,03	-0,06	19 170	0,16	0,19
ACTIVIDADES DE CONSTRUCCION Y SERVICIOS, S.A. (ACS) SPAIN	Spain	32 932	-0,18	-0,20	7 401	-0,22	-0,16
SAMSUNG C&T CORP. SOUTH KOREA	South Korea	30 095	0,18	0,14	16 347	-0,21	-0,14
D. R. HORTON USA	USA	27 774	0,37	0,37	29 895	0,09	0,09
LENNAR CORP. USA	USA	27 131	0,21	0,21	31 456	0,33	0,33
SEKISUI HOUSE JAPAN	Japan	23 008	0,04	0,01	13 565	0,03	0,14
EIFFAGE, S.A. FRANCE	FRANCE	22 148	0,19	0,15	9 854	0,05	0,13
LARSEN & TOUBRO LTD. (L&T) INDIA	India	18 520	-0,13	-0,09	27 240	0,81	0,76
STRABAG AUSTRIA	Austria	18 099	0,07	0,04	4 281	0,02	0,08
KAJIMA CORP. JAPAN	Japan	17 977	-0,03	-0,05	7 177	0,36	0,40
SKANSKA AB SWEDEN	Sweden	16 765	-0,08	-0,10	10 684	0,02	0,12
OBAYASHI CORP. JAPAN	Japan	16 655	-0,13	-0,15	6 586	0,07	0,10
HYUNDAI ENGINEERING & CONSTRUCTION CO. LTD.	South Korea	15 779	0,10	0,07	4 160	0,09	0,19
JACOBS ENGINEERING USA	USA	14 093	0,04	0,04	17 357	0	0
DAITO TRUST CONSTRUCTION JAPAN	Japan	14 034	-0,04	-0,06	7 893	0,24	0,27
TAISEI CORP. JAPAN	Japan	13 952	-0,13	-0,16	7 947	0,23	0,26
PULTEGROUP USA	USA	13 927	0,26	0,26	14 251	0,24	0,24
SHIMIZU CORP. JAPAN	Japan	13 729	-0,12	-0,14	6 180	0,03	0,06
IIDA GROUP HOLDINGS JAPAN	Japan	13 726	0,06	0,06	6 977	0,74	0,79
AECOM USA	USA	13 341	0,01	0,01	9 041	0,38	0,38
SICHUAN ROAD AND BRIDGE (GROUP) CO. LTD. CHINA	China	13 184	0,41	0,32	9 046	1,80	1,73
SUMITOMO FORESTRY JAPAN	Japan	13 063	0,29	0,26	3 868	0,66	0,77
FLUOR CORP. USA	USA	12 435	-0,21	-0,21	3 503	0,56	0,56
DOOSAN SOUTH KOREA	South Korea	11 533	-0,25	-0,27	1 341	1,06	1,25
BALFOUR BEATTY UK	UK	11 396	0,04	-0,04	2 447	-0,04	-0,03
ACCIONA SPAIN	Spain	9 587	0,30	0,25	10 499	0,34	0,44
NVR USA	USA	8 702	0,19	0,19	20 370	0,35	0,35
ROYAL BAM GROUP NV NETHERLANDS	Netherlands	8 654	0,11	0,07	837	0,47	0,58
TOLL BROTHERS USA	USA	8 432	0,22	0,22	7 227	0,35	0,35
FERROVIAL SPAIN	Spain	8 019	0,11	0,07	23 020	0,14	0,22
GS ENGINEERING & CONSTRUCTION SOUTH KOREA	South Korea	7 893	-0,08	-0,11	2 825	0,02	0,11
FOMENTO DE CONSTRUCCIONES Y CONTRATAS, S.A. SPAIN	Spain	7 878	-0,12	0,08	5 364	0,22	0,31
SALINI IMPREGILO SPA ITALY	Italy	7 752	0,35	0,31	2 369	0,47	0,45
DAEWOO ENGINEERING & CONSTRUCTION CO. SOUTH KOREA	South Korea	7 673	0,12	0,07	1 992	0,06	0,16
HASEKO JAPAN	Japan	7 630	-0,02	-0,04	3 873	0,23	0,26
HEBEI CONSTRUCTION GROUP CO. LTD. CHINA	China	7 414	0,28	0,19	305	-0,68	-0,68
KBR USA	USA	7 339	0,27	0,27	6 657	0,53	0,53
LENLEASE AUSTRALIA	Australia	7 301	-0,15	-0,27	5 885	0,01	-0,07
PEAB AB SWEDEN	Sweden	6 867	0,01	-0,02	3 727	0,16	0,27
WORLEY Australia	Australia	6 763	-0,20	-0,27	4 419	0,36	0,36
DAELIM INDUSTRIAL CO. LTD. SOUTH KOREA	South Korea	6 666	-0,23	-0,26	1 071	-0,60	-0,56
BARRATT DEVELOPMENTS PLC UK	UK	6 485	0,51	0,41	9 770	0,56	0,40
NCC AB SWEDEN	Sweden	6 225	0,02	-0,01	1 997	0,02	0,12
GRUPO CARSO MEXICO	Mexico	6 141	0,40	0,32	7 295	-0,03	-0,01
PORR AG AUSTRIA	Austria	6 116	0,15	0,11	611	0,34	0,44
TAYLOR WIMPEY PLC UK	UK	5 898	0,65	0,54	8 667	0,05	0,06
SNC-LAVALIN INC. CANADA	Canada	5 881	0,13	0,05	4 290	0,44	0,42
SINOMA INTERNATIONAL ENGINEERING CO. LTD.	China	5 618	0,73	0,62	3 991	1,18	1,12
SACYR, S.A. SPAIN	Spain	5 531	0,07	0,03	1 692	0,13	0,22
PERSIMMON PLC UK	UK	4 970	0,16	0,09	12 335	0,02	0,03
TODA CORP. JAPAN	Japan	4 780	0,00	-0,02	2 248	0,26	0,29
TUTOR PERINI CORP. USA	USA	4 642	-0,13	-0,13	632	-0,04	-0,04
KIER GROUP PLC UK	UK	4 486	0,02	-0,04	808	3,12	4,11
PENTA-OCEAN CONSTRUCTION CO. LTD. JAPAN	CO. LTD	4 440	-0,16	-0,18	2 239	0,49	0,53
MORGAN SINDALL PLC UK	UK	4 422	0,14	0,06	1 582	0,63	0,65
VEIDEKKE ASA NORWAY	NORWAY	4 373	0,08	-0,01	2 029	0,17	0,20
CFE GROUP BELGIUM	BELGIUM	4 302	0,17	0,13	3 539	0,37	0,47
BELLWAY PLC UK	UK	4 239	0,51	0,40	5 629	0,37	0,29
IMPLENIA AG SWITZERLAND	SWITZERLAND	4 117	-0,03	-0,06	501	-0,33	-0,39
SUMITOMO MITSUI CONSTRUCTION CO. LTD. JAPAN	CO. LTD	3 974	-0,09	-0,11	709	0,01	0,04
PRIMORIS SERVICES CORP. USA	USA	3 498	0,00	0,00	1 276	-0,04	-0,04
YIT OYJ FINLAND	FINLAND	3 382	-0,04	-0,07	1 027	-0,19	-0,13
HAZAMA ANDO CORP. JAPAN	Japan	3 318	-0,05	-0,07	1 432	0,16	0,19
OBRASCON HUARTE LAIN, S.A. SPAIN	Spain	3 288	0,02	-0,02	687	2,18	2,41
AECON GROUP INC. CANADA	Canada	3 173	0,17	0,09	812	0,05	0,04
MYTILINEOS HOLDINGS GREECE	Greece	3 152	0,45	0,40	2 329	0,17	0,26
MOTA ENGIL SGPS PORTUGAL	Portugal	3 066	0,11	0,07	446	0,13	0,21
KELLER GROUP PLC UK	UK	3 061	0,16	0,08	964	0,40	0,41
BERKELEY GROUPS HOLDINGS UK	UK	3 031	0,23	0,15	8462	0,18	0,07
GRANITE CONSTRUCTION INC. USA	USA	3 010	-0,15	-0,15	1 774	0,45	0,45
ELECTRA LTD. ISRAEL	Israel	2 886	0,20	0,20	2 653	0,29	0,24
ENKA INSAAT VE SANAYI AS TURKEY	Turkey	2 859	0,72	0,72	6 374	0,15	1,04
CTCI CORP. TAIWAN	Taiwan	2 525	0,34	-0,27	1 025	-0,01	-0,03
PER AARSLEFF HOLDING DENMARK	Denmark	2 360	0,18	0,11	777	-0,01	0,00
INFRASTRUCTURE & ENERGY ALTERNATIVES INC., USA	Usa	2 078	0,19	0,19	442	0,27	0,27
HEIJMANS NV NETHERLANDS	Netherlands	2 068	0,04	0,00	386	0,54	0,66
ITALIAN-THAI DEVELOPMENT PUBLIC CO. LTD. THAILAND	Thailand	1 875	0,08	0,09	363	0,86	1,05
TEKFEN HOLDING AS TURKEY	Turkey	1 831	0,10	0,38	566	-0,32	0,22
BAUER AG GERMANY	Germany	1 819	0,55	0,49	260	-0,11	-0,12
JM AB SWEDEN	Sweden	1 702	-0,03	-0,05	3 104	0,26	0,39
STERLING CONSTRUCTION CO. INC. USA	USA	1 582	0,11	0,11	785	0,51	0,51
COSTAIN GROUP PLC UK	UK	1 562	0,25	-0,16	199	-0,11	-0,10
GALLIFORD TRY PLC UK	UK	1 516	0,07	0,00	216	0,33	0,19
GEK TERNA GREECE	Greece	1 354	-0,16	-0,18	1 042	0,19	0,17
MRV ENGENHARIA BRAZIL	Brazil	1 319	0,01	0,06	1 040	-0,41	-0,37
GRUPO EMPRESARIAL SAN JOSE SA SPAIN	Spain	1 098	0,00	-0,04	363	-0,06	-0,10
ELLAKTOR SA GREECE	Greece	1 083	0,06	0,03	515	0,14	0,22
ORASCOM CONSTRUCTION LTD. U.A.E.	UAE	965	-0,71	0,05	564	-0,07	-0,07
SALFACORP SA CHILE	Chile	940	0,67	0,78	170	-0,34	-0,21
HANJINHEAVY SOUTH KOREA	South Korea	776	-0,46	-0,48	563	0,01	0,10

Descriptive statistics of circular economy parameters of 30 Construction firms

Name	Country	Participation on UNGC	Do they report CE?				Certifications			Waste management system	Employment of EPD
			Not reported	Slightly reported	Moderately reported	Highly reported	ISO certification	Other certification	Multiple certification		
VINCI	FRANCE	1				1			1		
BOUYGUES	FRANCE	1							1		
ADES DE CONSTRUCCION Y SERVICIOS, S.A. (AC)	Spain	1		1					1		
EIFFAGE, S.A. FRANCE	FRANCE	1				1			1		
STRABAG AUSTRIA	Austria				1				1		
SKANSKA AB SWEDEN	Sweden	1			1				1		1
BALFOUR BEATTY UK	UK		1						1		
ACCIONA SPAIN	Spain	1				1			1		
ROYAL BAM GROUP NV NETHERLANDS	Netherlands	1				1			1		
FERROVIAL SPAIN	Spain	1			1				1		1
INTO DE CONSTRUCCIONES Y CONTRATAS, S.A.	Spain	1				1			1		
SALINI IMPREGILO SPA ITALY	Italy	1			1			1	1		
PEAB AB SWEDEN	Sweden	1			1				1		1
BARRATT DEVELOPMENTS PLC UK	UK			1					1		
NCC AB SWEDEN	Sweden	1				1			1		1
PORR AG AUSTRIA	Austria	1				1			1		
TAYLOR WIMPEY PLC UK	UK			1					1		
SACYR, S.A. SPAIN	Spain	1				1			1		
PERSIMMON PLC UK	UK		1						1		
KIER GROUP PLC UK	UK			1					1		1
MORGAN SINDALL PLC UK	UK			1					1		
VEIDEKKE ASA NORWAY	NORWAY	1							1		1
CFE GROUP BELGIUM	BELGIUM					1			1		
BELLWAY PLC UK	UK		1					1	1		
IMPLENIA AG SWITZERLAND	SWITZERLAND					1			1		
YIT OYJ FINLAND	FINLAND					1			1		
OBRASCON HUARTE LAIN, S.A. SPAIN	Spain					1			1		
MYTILINEOS HOLDINGS GREECE	Greece	1		1				1	1		
MOTA ENGIL SGPS PORTUGAL	Portugal					1		1	1		
KELLER GROUP PLC UK	UK			1			1		1		
		16	3	7	9	11	1	5	24	30	6
		53,3%	10%	23,3%	30%	36,7%	3,3%	16,7%	80%	100%	20%