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How are financial decision-making tools and sustainable thinking connected in Norwegian corporations?

Corporate Finance & Corporate Sustainability

Master's thesis in Executive Master of Technology Management
Supervisor: Puck Hegeman
January 2023



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Preface

This thesis is written as a final part of the Executive Master of Technology Management at the Norwegian University of science and Technology (NTNU) and Norwegian School of Economics (NHH). The study has been conducted during the autumn semester 2022. The authors have previously Master's in Business Administration and almost two decades of combined experience from finance & operation processes within industry and environmental services.

We are grateful for the cooperation with our supervisor Puck Hegeman, who has shared her knowledge and interest in the connection between finance and sustainability. Her eagerness for impact investments is inspiring.

We are grateful for the opportunity to interview such knowledgeable CFOs and sustainability leaders in some of Norway's largest companies; Entra ASA, Skanska Norge AS, Veidekke ASA and Yara International ASA.

The topic of this study is clearly of high interest to corporations. We have seen a clear motivation and eagerness for this topic on both professional and personal levels during our interviews. They all agree that decisions must be good for the planet as well as for their companies. We believe this study can enlighten the connection between corporate finance and sustainable thinking and highlight some of the differences between academic literature and management's practice on these topics.

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Abstract

The transition towards more sustainable solutions is highly on the corporate agenda, due to several reasons such as legislation, capital access restrictions, customer demand, and more. An important task for corporates is to properly allocate their capital to projects supporting their sustainability goals.

The purpose of this study is to increase our knowledge about the connection between financial decision-making tools and sustainable thinking, focusing on capital budget tools for capital investments.

A literature review has been conducted presenting relevant theories from corporate finance, corporate sustainability and the challenges between these academic areas. Corporate finance principles and theories have formed the capital allocation practiced in corporations for decades. This practice is well anchored in academics and for practitioners in corporations. Corporate sustainability, on the other hand, is newer and less integrated. Why corporate sustainability is on the agenda is discussed to a large extent, but how this is integrated by corporations is currently a limited discussion. The challenges with traditional corporate finance theories when it comes to supporting sustainable transition are discussed in a few papers, which are presented in this study. The paper presents existing process frameworks that enable corporations to formalize the identification process of environmental factors, and sustainability adjusted capital budget tools. This presents the theoretical foundation of the thesis.

In order to align with the purpose of this study, a multiple case study has been conducted with four selected case companies. The findings are analyzed in relation to the research question. The discussion relates to the presented analysis.

Four companies are investigated in this study; Entra ASA, Skanska Norge AS, Veidekke ASA and Yara International ASA. These are some of the major companies within real estate, construction and chemicals in Norway. The CFOs in Entra ASA and Veidekke ASA, the VP Sustainability Governance in Yara International ASA and the Director of Sustainability in Skanska Norge AS have been interviewed.

This study reveals a connection between financial decision-making tools and sustainable thinking, and presents six observations: 1) acceptance and knowledge of sustainability and profitability from both finance and sustainability experts, 2) organization culture and structure triggers motivation for focus on sustainability, 3) limited formal frameworks for the identification process of environmental factors for capital investments, 4) limited quantification of benefits and costs from environmental factors for capital investments and 5) limited use of existing sustainability adjusted capital budget tools.

The discussion highlights four challenges that limit the corporation's ability to fully connect sustainable thinking with financial decision-making tools.

First, the externality challenge prevents corporations from acknowledging a potential benefit or cost from environmental factors because they are not affecting the financial statement. Second, the tangibility challenge prevents the corporation's ability to quantify potential benefits and costs. The paper introduces The Internality & Tangibility Matrix in order to reduce the negative effects of the externality and tangibility challenges. The matrix categorizes environmental factors in order to identify different challenges attached to these different categories. Third, the complexity challenge prevents corporations to consider environmental factors due to the complex connection between their operation and environment. Fourth, the knowledge challenge hinders management from

implementing the sustainability adjusted capital tools due to lack of awareness and knowledge about such tools.

This study stresses the importance of understanding how corporations should connect sustainable thinking in financial decision-making tools. The authors encourage future research to investigate this connection's deeper integration in organizations and broader across more organizations and industries. This research will contribute to a better understanding of how capital allocation should support sustainable transformation and improve corporation's ability to successfully meet their sustainability goals.

Sammendrag

Overgangen til mer bærekraftige løsninger er tydelig på selskapene sin agenda som følge av flere årsaker, blant annet lover og regler, restriksjoner på kapitaltilgang, kunde etterspørsel. En viktig oppgave for selskaper er å allokere kapital til prosjekter som støtter deres bærekrafts mål.

Hensikten med denne studien er å øke vår kunnskap om koblingen mellom bedriftsøkonomiske beslutningsverktøy og bærekrafttankegang. Spesielt med fokus på bedriftsøkonomiske verktøy for realinvesteringer.

En gjennomgang av litteraturen har blitt utført og presenterer relevante teorier fra bedriftsøkonomi, bærekraft i bedrifter og utfordringene mellom disse akademiske områdene. Bedriftsøkonomiske prinsipper og teorier har formet hvordan selskaper allokere kapital. Dette forankret i akademia og blant praktiserende i selskapene. På den annen side, er bærekraft i bedrifter et nyere og mindre integrert område. Hvorfor bærekraft i bedrifter er på agendaen er diskutert i et stort omfang, men hvordan dette skal integreres i bedrifter er foreløpig diskutert i mindre grad. Utfordringene med tradisjonelle bedriftsøkonomiske teorier når det kommer til å støtte bærekraftig transformasjon er diskutert i noen studier som er presentert i denne studien. Denne studien presenterer eksisterende prosess rammeverk som hjelper bedrifter til å formalisere identifikasjonsprosessen av miljømessige faktorer, og bærekrafts justerte bedriftsøkonomiske verktøy. Dette presenterer det teoretiske grunnlaget for denne oppgaven.

For å besvare formålet med denne studien er det utført en case studie med fire case bedrifter. Funnene er analysert i sammenheng med gjeldende forskningsspørsmål. Diskusjonen er relatert til analysen.

De fire bedriftene som er undersøkt i denne studien er; Entra ASA, Skanska Norge AS, Veidekke ASA og Yara International ASA. Dette er noen av de største selskapene innen eiendom, entreprenørvirksomhet og kjemi i Norge. CFO i Entra ASA og Veidekke ASA, VP Sustainability Governance i Yara International ASA og Director of Sustainability i Skanska Norge AS er blitt intervjuet.

Studien viser til en sammenheng mellom bedriftsøkonomiske beslutningsverktøy og bærekrafts tankegang, og presenterer seks observasjoner; 1) aksept og kunnskap om bærekraft og profitt fra både finans- og bærekrafts eksperter, 2) organisasjonskultur og –struktur påvirker motivasjon for fokus på bærekraft, 3) begrenset formelt rammeverk for identifikasjonsprosessen av miljøfaktorer for realinvesteringer, 4) begrenset kvantifisering av gevinster og kostnader fra miljøfaktorer for realinvesteringer og 5) begrenset bruk av eksisterende bærekrafts justerte bedriftsøkonomiske verktøy.

Diskusjonen viser til fire utfordringer som begrenser en bedrift sin evne til å fullstendig koble bærekraft tankegang med bedriftsøkonomiske beslutningsverktøy. For det første, eksternalitet utfordringen hindrer bedriftene fra å erkjenne en potensiell gevinst eller kostnad fra miljøfaktorer som følge av at de ikke påvirker det finansielle regnskapet. For det andre vil lavere grad av håndfasthet begrense bedriftens evne til å kvantifisere mulige gevinster og utfordringer. Studien introduserer The Internality & Tangibility Matrix for å redusere negative effekter fra utfordringene med eksternalitet og håndfasthet. Matrisen kategoriserer miljøfaktorer for å identifisere forskjellige utfordringer koblet til disse kategoriene. Tredje er utfordringen med kompleksitet, som begrenser bedriften til å inkludere miljøfaktorer som følge av utfordringene med å fullt ut forstå koblingen mellom bedriftens

operasjoner og påvirkning på miljøet. Fjerde utfordring er mangel på kunnskap om bærekrafts justerte bedriftsøkonomiske beslutningsverktøy som hindrer bedriften i å implementere slike verktøy.

Denne studien viser viktigheten av å forstå hvordan bedrifter skal koble bærekraft i bedriftsøkonomiske beslutningsverktøy. Forfatterne oppfordrer fremtidige studier til å utforske denne koblingen sin dypere integrasjon i organisasjoner og bredere på tvers av organisasjoner og industrier. Denne forskningen vil oss til å forstå bedre hvordan kapital bør allokeres for å støtte den bærekraftige transformasjonen og bedre bedriftenes evne til å oppnå sine bærekrafts mål.

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1. Introduction

i. Background

In 1987, the Brundtland report stressed the need for our society to embrace sustainable development. They defined sustainable development as “development which meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). In 2015, the United Nation (UN) introduced 17 sustainable development goals (SDGs) as an urgent call for action by all countries in a global partnership¹. In 2016, the Paris Agreement went into force², with a focus to decrease CO2 emissions.

In 2019, the European Green Deal³ was presented, with a focus on making Europe the first climate-neutral continent by 2050. One of the main differences from earlier initiatives is that EU decided to do this in the form of regulations instead of directives, making it mandatory to adapt into the national legislations without changes, as was allowed earlier due to national differences. One of these is the Fit for 55 packages; *a set of proposals to revise and update EU legislation and to put in place new initiatives with the aim of ensuring that EU policies are in line with the climate goals agreed by the Council and the European Parliament.*⁴ The aim is to establish mechanisms that incentivize the companies to invest in solutions with lower CO2 emissions, by increasing pricing of carbon emissions, and in this way accelerate the transition to lower overall emissions within a certain timeframe, reducing the CO2 emissions at least 55% by 2030. Norwegian companies are also covered by these regulations through the European Free Trade Association (EFTA) agreement.

The need for action combined with changes in legislation has led to a desire for more transparent corporate reporting. The European Commission adopted, in 2014, the Directive 2014/95/EU. Also known as NFRD (Non-Financial Reporting Directive) and requires large companies to disclose information about environment, social and governance in their annual reporting. From the fiscal year of 2023, the EU plans to replace NFRD with the Corporate Sustainability Reporting Directive (CSRD), which requires more extensive reporting. Companies operating in today's marketplace are subject to higher requirements in terms of reporting and transparency of the way they operate their business, documenting the consequences of their actions on people, society and the environment.

One of the frameworks used by the companies in measuring and managing CO2 emission is the Greenhouse Gas Protocol (GHG protocol) which classifies a company's CO2 emissions into three scopes. *“Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions”* (GHG Protocol, 2004). In a recent KPMG survey, they reveal that the number of the world's 250 largest companies, by revenue, reporting Environmental, Social, & Governance (ESG) information increased from 35% in 1999 to 96% in 2022 (KPMG, 2022).

In order to successfully reach the UN SDG goals, Goldman Sachs estimated, in 2021, the global required capital to be USD 6 trillion annually this decade⁵. The EU will need EUR 10 trillion in total for the decade (Goldman Sachs, 2021). In order to succeed with the UN SDGs, it is reasonable to assume that allocation of the USD 6 trillion to the correct projects is crucial. Hence, how do we ensure that capital is allocated to the best available solutions in order to succeed with this transition? Traditionally

¹ UN SDGs history <https://sdgs.un.org/goals#history>

² Synopsis the Paris agreement <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

³ Overview European Green Deal https://ec.europa.eu/commission/presscorner/detail/en/ip_19_6691

⁴ Overview Fit for 55 <https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/>

⁵ Goldman Sachs Insight article about Green investments https://www.gsam.com/content/gsam/global/en/market-insights/gsam-connect/2022/Green_Capex_Capturing_the_Opportunities.html

these kinds of investments, often called capital expenditures (CAPEX), capital investments or Green CAPEX as Goldman Sachs refers to, are allocated by corporate management following the corporate finance theory of capital budgeting. Where the measure of capital efficiency is one of the most crucial measures to maximize in order to maximize the return to shareholders (Friedman, 1962; Jensen & Smith, 1984). In 1994, John Elkington challenged this perspective by introducing the triple bottom line (TBL) approach in order to stress the need for considering environmental and social value together with economic value (Elkington, 2013; Elkington 2018). Porter & Linde (1995) points out that material efficiency is good for both the shareholders and the planet.

Consequently, securing the allocation of capital to the best available capital investment opportunities considering both profit and sustainability raises challenges. An important and challenging question is how do companies distinguish between a sustainable and non-sustainable opportunity? The EU Taxonomy tries to make a framework for this classification. Sustainability reporting frameworks, like the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB) and the Task force on Climate-related Financial Disclosures (TCFD), tries to enable companies to measure and report sustainable data for stakeholders to use this information.

A challenge for the managers of these companies is to identify factors, in their operation, that have an impact on the environment and how this will impact on their cash flow. Second, how do the managers reflect these factors in their financial evaluation? Academic literature presents several frameworks for systematizing the identification of sustainable factors affecting the capital investments for instance, the corporate sustainability management system (Azapagic, 2003), incorporating sustainability into NPV and DFC: predicting cash flows (Kimbrow, 2013), the corporate sustainability model (Epstein & Buhovac, 2014) and the return on sustainability investment (Eckerle et al., 2020a; Eckerle et al., 2020b; Atz et al., 2021; Whelan, 2022). A few efforts have been made in order to reflect such factors into financial evaluation tools; internal carbon cost (GHG Protocol, 2004; World Research Institute, 2015), the net present sustainable value (Liesen et al., 2013), internal waste tax (Epstein & Buhovac, 2014), calculating decrease in cost of capital by decarbonization (Eckerle et al., 2020) and the sustainability cost NPV (Kimbrow, 2013). Consequently, there does not appear to be a lack of frameworks for helping managers with these challenges. This raises an interesting question of whether corporations have implemented such tools, and in that case how and why they have done this.

ii. Purpose, research question and contribution

The rationality for why corporations should focus on sustainability in their strategy appears to be broadly discussed in the literature (Maas et al., 2016), and many corporations seem to have a clear sustainability focus in their strategy. However, how corporations are considering sustainability in their decision-making appears to be a rather limited discussion in the literature (Maas et al., 2016). The literature is abundant with literature focusing on the financial aspects of economic activities delivering a return on the invested capital (Jensen & Smith, 1984; Berk & DeMarzo, 2011; Boye et al., 2018).

Few studies have investigated how corporations apply sustainable thinking in their financial evaluation for decision-making. If traditional capital budgeting tools like net present value, internal rate of return and payback are some of the most widely used tools for capital allocation for managers. An obvious question is whether those tools need to reflect environmental impact for managers to allocate capital properly considering both capital return and environmental impact. Sustainability strategies and -reporting appear to be well communicated in several corporations in our society. Hence, how do they secure proper allocation of capital supporting their sustainability targets? This leads us to the following research question for this study:

Research question: “How are financial decision-making tools and sustainable thinking connected in Norwegian corporations?”

Our research will investigate Norwegian corporations practice of linking the sustainability targets and financial tools. With financial tools, we are specifically focusing on capital budget tools presented within the corporate finance literature. The mission and goal of the study is to understand how sustainable environmental thinking and data are reflected in financial tools in corporations that have a significant impact on the environment. However, our study does not focus on a specific decision/business case, we want to understand how sustainability is reflected regardless of if the decision/business case is driven by sustainability thinking. This will in turn provide us with an overview of the current practice of the companies compared with the opportunities presented in academic literature on integrating the sustainability goals in the companies’ economic activities. The research will conclude with a generic recommendation to companies that seek to further develop their decision-making models to facilitate more sustainable decisions.

iii. Research method

Limitation of existing theory exists to answer the research question. To answer the research question, this study employs an exploratory case study with a multi-case holistic design approached following the methodology presented by Yin (2018). A significant literature research through scientific databases has been done exploring terms like; corporate finance, finance tools and corporate sustainability. In addition, references and citations from relevant articles were further examined. Main sources of evidence for data collection are documentation and interviews. To maintain the quality of the case study, the following actions have been performed by the researchers; creation of a case study protocol, creation of a document to connect observation with sources and developing of a case database. The document with observations and draft of the study has been reviewed by the interviewees.

2. Theory

In the following section we will present the theoretical framework which is the basis for our research. We will start with the traditional corporate finance theory, followed by the existing literature on how to include sustainability in corporate finance. Next, we will present the current literature on corporate sustainability before presenting existing tools for corporations seeking sustainability. For the term sustainability we follow the definition presented by Brundtland (1987).

i. Corporate finance theory

The following section presents some of the main corporate finance theories relevant for this study. Corporate finance theory seeks to understand and improve the logic of corporate decision-making in order to compare alternatives and manage risks (Jensen & Smith, 1984). According to Jensen & Smith (1984), corporate finance theory has its fundament in the following theories; efficiency market theory, portfolio theory, capital asset pricing theory, option pricing theory and agency theory (Jensen & Smith, 1984). The market efficiency theory (Fama, 1970; Jensen & Smith, 1984; Malkiel, 2003; Louche et al., 2019), also called the efficient markets hypothesis, argues that financial markets are operating efficiently (Fama, 1970; Jensen & Smith, 1984) with rational behavior from all market participants (Berk & DeMarzo, 2011). In addition, all relevant information is distributed to all relevant market participants (Berk & DeMarzo, 2011).

The portfolio theory presents how an investor should structure the portfolio in order to optimize profit and risk (Jensen & Smith, 1984). The capital asset pricing theory argues how an investor should determine the price of an investment under certain restrictions (Jensen & Smith, 1984). An output of

this theory is the capital asset pricing model (CAPM), which enables an investor to calculate the expected return on assets considering risk (Sharpe, 1964; Jensen & Smith, 1984). The option pricing theory presents a way for investors to consider the valuation of different alternative investments (Jensen & Smith, 1984; Brennan & Schwartz, 1985; Brealey et al., 2017).

Jensen & Smith (1984) presents three major areas of corporate financial policy: capital budgeting, capital structure and dividend policy. Within capital budgeting a fundamental idea is that a corporation should plan and make decisions considering the corporation's cost of capital (Jensen & Smith, 1984). The trade-off hypothesis, presented by Friedman in 1962, argues that the only purpose for a corporation is to create profit for the shareholders (Friedman, 1962). This puts expectations on the return on the invested equity. Consequently, this affects the level of cost of capital. A central idea is to discount future expected cash flow by the cost of capital reflecting risk. Capital structure policy involves how the corporation should finance its operation (Jensen & Smith, 1984). Sources for capital can involve equity from shareholders, debt from banks or bonds, leasing, where all sources have different pros and cons regarding their nature of cost and risk. An important contribution within the dividend policy is the Modigliani-Miller theorem which states that the capital structure of the corporation is not a factor of its value (Modigliani & Miller, 1958; Jensen & Smith, 1984). In addition, Modigliani-Miller presented their arbitrage principle, which states that the market value of a company is the present value of its future earnings (Modigliani & Miller, 1958; Miller, 1988; Berk & DeMarzo, 2011).

For this study, the area of capital budgeting is highly interesting, and following the presented theory there exists several evaluations methods presented in the literature. The weighted average cost of capital (WACC) model (Berk & DeMarzo, 2011; Boye et al., 2018) is useful for calculating the expected rate of return in order to reflect the cost of different funding and the potential risk. Where the internal rate of return (IRR) calculates the actual return of the investment given the cost of capital (Kimbrow, 2013). The net present value (NPV) and discounted cash flow (DCF) methods have been developed in order to evaluate an investment, based on the expected cash flow, cost of capital and involved risk (Jensen & Smith, 1984; Berk & DeMarzo, 2011; Kimbro, 2013; Brealey et al., 2017). This enables a corporation, or investor, to evaluate the capital efficiency of a potential investment. Consequently, they can compare alternatives and choose the most profitable alternative. This can be used for both financial investments (Bichler & Nitzan, 2010; Berk & DeMarzo, 2011; Brealey et al., 2017) and capital investment (Brennan & Schwartz, 1985; Berk & DeMarzo, 2011; Brealey et al., 2017). The NPV model is presented in equation 1. Where m is the number of time periods covered, t is the number of time periods, C is the net cash flow in the specific time period and r is the discount rate. C_0 indicates the investment amount and the following net cash flows indicates the expected inflow from the investment.

Equation 1

$$NPV = C_0 + \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \dots + \frac{C_n}{(1+r)^t} = \sum_{t=0}^m \frac{C_t}{(1+r)^t}$$

The NPV method has been criticized for not reflecting the nature of flexibility and probability in a capital investment (Brennan & Schwartz, 1985; Musial, 2019). Consequently, the real options have been introduced as a tool to overcome these challenges (Brennan & Schwartz, 1985; Brealey et al., 2017). Dividend payout from a corporation could be recognized as the positive cash flow for buying their stock, which is comparable to the profit expected from a capital investment. Capital investment involves corporate investments in, for example, machines, buildings and acquisitions (Berk & DeMarzo, 2011; Rasmussen, 2020). In accounting this is often referred to as capital expenditure and further in this thesis we will refer to such investments as CAPEX and capital investments.

ii. Corporate finance and sustainability

This section presents the traditional corporate finance theory in the context of sustainability. The trade-off hypothesis states that focusing on environmental and social factors may lead to a decrease in profit (Friedman, 1962), which would be contradicting with the corporations only goal to maximize shareholder value. Later literature rather argues for a positive effect on a corporation's profit by also considering environmental and social factors (Elkington, 1994; Porter & Linde, 1995; Salzmann et al., 2005; Atz et al., 2021). Several researchers argue that the neoclassical perspective needs to be changed in order to enable more sustainable development including social and environmental aspects (Elkington, 1994; Stubbs & Cocklin, 2008; Louche et al., 2019). Louche et al. (2019) argues that the short-term view in the financial markets prevent many financial market participants from understanding the implications of the climate change, because the climate change is material over a longer period (Louche et al., 2019). The Modigliani-Miller arbitrage principle leads to an expectation of predictability of future earnings in financial markets, which is a foundation of traditional tools and evaluation methods (Modigliani & Miller, 1958; Miller, 1988; Berk & DeMarzo, 2011). This makes it challenging to reflect data for climate change, since this is highly uncertain (Louche et al., 2019).

Eckerle et al. (2020a) points out a disconnection in time between earnings call and long-term ESG data as one of the reasons for limitation of analysts' desire for ESG data and companies' desire to implement ESG data into valuation methods (Eckerle et al., 2020a). Louche et al. (2019) further argue that the trade-off theory needs to be extended to include a wider range of information to enable reflection of climate and environmental data (Louche et al., 2019). To facilitate to more low-carbon decision, Louche et al. (2019) concludes that analysis needs to reflect a long-term trend, systems need more interconnectedness, a cost on carbon needs to be implemented and active ownership that puts low-carbon decisions on the agenda (Louche et al., 2019).

In 1994, Elkington introduced the triple bottom line perspective. He argues that corporations should focus on factors concerning the environment and social together with economics (Elkington, 2013). Porter & Linde (1995) pinpoint the transition for the world economy, where companies traditionally secured competitiveness by accessing the lowest inputs (i.e., capital, labor, energy and raw materials) to a globalized economy where the competitive advantage is more depending on the utilization of accessible resources (Porter & Linde, 1995). They argue that corporations should adopt a resource-productivity framework. Instead of solely focusing on capital efficiency, corporations should also consider the efficiency and utilization of other resources (Porter & Linde, 1995). The traditional NPV method (Jensen & Smith, 1984; Berk & DeMarzo, 2011; Brealey et al., 2017) solely considers the efficiency of capital based on the estimated cash flow. The reflection of resource-productivity (Porter & Linde, 1995) could be incorporated by considering the monetized consequence and benefit in the cash flow estimate. However, this will not directly show the resource efficiency on the evaluated investment since the evaluation metric will be the rate of return or net present value of the capital efficiency.

Kimbro (2013) stresses the challenge when certain sustainable projects require higher investments and longer payback than the alternative which, consequently, will not be favored from a capital efficiency view. Museal (2019) expresses the challenges with the nature of less tangible value and difficulties to capture those values for sustainable capital investments. In our view, the focus on capital efficiency reveals some of the challenges with traditional corporate finance when trying to incorporate sustainability. Another challenge with merging sustainability and traditional corporate finance may be the existence of externalities. Externalities are costs that are not reflected in the corporations' financial statements but may indeed be a cost for the society (Kimbro, 2013). Consequently, these types of financial consequences are not, traditionally, reflected in corporate finance models. In that

respect, it may be reasonable to argue that traditional corporate finance models should be adjusted to reflect externalities. Dascalu et al. (2008) concludes that, by including external environmental costs in managerial accounting, this can guide the corporation in maximizing the long-run profitability considering environmental effects.

iii. Corporate Sustainability

The following section will present the current literature on corporate sustainability. Some of the top-rated articles on “corporate sustainability” (CS) are describing the business case for corporate sustainability (Dyllick & Hockerts, 2002; Salzmann et al., 2005). Caiado et al. (2017) present a conceptual framework towards sustainable development based on a systematic literature review of scientific articles of eco-efficiency. They suggest measuring the three dimensions of sustainability (economic, environmental, and social) through four levels of measurement (industry, organization, project, and process) using sustainable indicators. These indicators can be material consumption, emissions, toxicity potential and risk potential. Their research shows that as the use of these indicators grows on the operational level, the effect on long-term sustainable strategy increases. Salzmann et al. (2005) stress the need for more descriptive research that can examine internal sustainability management. Maas et al. (2016) pinpoints a challenge with sustainability literature – the literature broadly discusses “why” corporations are involved in sustainability issues, but rather limited to “how” they do this.

Montiel & Delgado-Ceballos (2014) presented a review of CS literature published between 1995 and 2013. They found four interesting observations; 1) “The term CS is more widely used in specialized academic literature than in practitioner and top academic management literature” (Montiel & Delgado-Ceballos, 2014, page 115); 2) “A standardized definition of CS does not exist (Montiel & Delgado-Ceballos, 2014, page 122); 3) “CS has been conceptualized using different theoretical approaches” (Montiel & Delgado-Ceballos, 2014, page 124); 4) “A standardized method to measure CS does not exist” (Montiel & Delgado-Ceballos, 2014, page 127). Regarding the third observation, they discovered three widely used organizational theories applied for CS; stakeholder theory, institutional theory and resource-based view. The former seems to be widely focusing on the shareholders’ and other stakeholders’ interests when managers are planning new strategies, which links their interests directly to CS strategies (Montiel & Delgado-Ceballos, 2014). Institutional theory has been used to understand the institutionalization processes when companies are adapting to different CS-related topics (e.g., sustainability strategies, sustainability reporting, sustainability management systems). The resource-based view considers the firms’ capabilities and has been extended with natural environment (Montiel & Delgado-Ceballos, 2014; Hart 1995), and most of the studies focus on the environmental dimension (Montiel & Delgado-Ceballos, 2014).

Corporate sustainable development involves the dimensions; value creation, CSR and environmental management (Bansal, 2005), which seems to have similarities to the triple bottom line perspective presented by Elkington in 1994. Montiel & Delgado-Ceballos (2014) found some agreement on how the environmental dimension of CS were measured. However, this was more unclear for the economic and social dimensions, which leads to the conclusion in the fourth observation (Montiel & Delgado-Ceballos, 2014). Regarding measures, most of the empirical studies on CS appear to be built on secondary sources of data. For instance, GRI and ISO-14001 are used. The authors present four existing frameworks that cover all three dimensions; economic, social and environmental; Dow Jones Sustainability Index, GRI, Bansal (2005) and Kolk, Hong and van Dolen (2010). The latter two are based on primary sources and Bansal (2005) appears to be the most detailed on environmental measures (Montiel & Delgado-Ceballos, 2014). They conclude that academic research failed to effectively inform management practitioners about sustainable development (Montiel & Delgado-Ceballos, 2014). An

important question they raise is whether scholars or business practitioners should set the standards for CS.

Stubbs & Cocklin (2008) identified a lack of research providing an understanding of how sustainable development is operationalized in corporations. In 2008 they were some of the first to conceptualize the sustainable business model (SBM). The model is based on characteristics which can be grouped in; economic, environmental, social and multidimensional or holistic. The latter is a combination of the former three. In order to attain firm-level sustainability, they found that corporations need to develop internal structural and cultural capabilities when adopting an SBM (Stubbs & Cocklin, 2008). In 2009 Lüdeke-Freund introduced the business models for sustainability innovation (BMfSi) framework, in order to understand the connection between sustainability innovation, business model and business cases for sustainability. The framework is built on the assumption that sustainability innovation motivates the development of business models, which in turn triggers creation of business cases for sustainability (Lüdeke-Freund, 2019). Joyce & Paquin (2016) further extended Osterwalder & Pigneur (2010)'s business model canvas to include the sustainability perspective. This resulted in the triple layered business model canvas (TLBMC), which includes the three dimensions; economic, environment and social stakeholders. They argue that combining life-cycle assessment (LCA) with business innovation can further accelerate sustainable solutions. However, they do not integrate the LCA in the TLBMC.

Maas et al. (2016) revealed a lack of consistency in the way corporations deal with performance assessment, management accounting, management control and reporting regarding sustainability. They identified a lack of research connecting management control systems (MCS) with sustainability development and strategies. Regarding environmental focus, the MCS research appears to be fragmented and narrowly focused (Maas et al., 2016). The term "sustainability management control" has been discussed and conceptualized, but further development is needed (Maas et al., 2016). Consequently, they presented a comprehensive integrated framework linking sustainability assessment, management accounting, control and reporting. The framework presents a clear overview of where the sustainability strategy should reflect the performance structure (inside-out view) of the sustainability management accounting, control and reporting. In addition, there should be a transparency (outside-in view) process through a sustainability assessment, which should secure constant feedback to reporting, management control and accounting. Also, the transparency process should go from reporting to management control and further to management accounting. The outside-in view should secure constant feedback from stakeholders in order to improve the decision-making and performance, which is aligning with the recommendations from the World Business Council for Sustainable Development (WBCSD) (Maas et al., 2016). Maas et al. (2016) recognize the limited knowledge of how companies use management control to support sustainability strategies, but an elaboration of how corporations can include environmental metrics in financial valuation methods for decision-making is missing. The papers presented in this section have connected the development of business models together with environmental data. However, the integration of this data in corporate finance models is not clarified.

iv. Existing tools connecting financial decision-making and sustainability thinking

In this section, we will present a selection of existing tools that connect financial decision-making and sustainability thinking. We are interested in tools that can be used as a basis for decision-making and not only reporting financial and sustainable performance. Based on a literature review, we have identified those tools we find most suitable for this purpose. We have decided to group the tools into two categories; process framework and sustainable adjusted capital budget tools. The former includes frameworks that describe a process leading to a basis for decision-making. The process frameworks

are particularly interesting in the way that they present a systematized way to identify sustainability factors for this basis. The identified capital budget tools go beyond the traditional capital budgeting (Jensen & Smith, 1984; Berk & DeMarzo, 2011) by including environmental data. Following, we will present these in more detail. In tables 1 and 2, we have presented the contributions to the literature we find particularly interesting for this paper.

Table 1 – An overview of identified process frameworks and sustainability adjusted capital budget tools.

Approach	Concept	Brief Description
Process Framework	Corporate Sustainability Management System (CSMS) (Azapagic, 2003)	<ol style="list-style-type: none"> 1. Policy development 2. Planning 3. Implementation 4. Communication 5. Review and corrective action
Process Framework	Incorporating Sustainability into NPV and DCF: Predicting Cash Flows (Kimbro, 2013)	<ol style="list-style-type: none"> 1. Identify, evaluate and measure general costs and benefits using an Initial Inventory Analysis 2. Estimate Cash Outflow required to acquire a capital investment 3. Use LCA for the initial environmental screening checklist 4. Evaluate eco-efficiency and quantify impacts 5. Estimates Cash Flows for the life of the investments 6. Estimate the sustainability risk rate and add it to the cost of capital 7. Or, in the alternative, compute the NPV of the sustainability costs and subtract it to the projects' NPV 8. Select an NPV Investment that has a positive NPV
Process Framework	The Corporate Sustainability Model, Measuring Sustainability and Political Risk (page 185) (Epstein & Buhovac, 2014)	<ol style="list-style-type: none"> 1. Calculate the benefit associated with each issue that may generate risk 2. Calculate the potential costs associated with each risk, including reputation costs 3. Estimate the probability that each risk will materialize 4. Multiply the potential cost of each risk by its expected probability of materializing to calculate the expected value of each risk 5. Estimate when, over time, the risk may emerge. Calculate the NPV of the risk 6. Aggregate the NPV's of all risks. Insert as a line item in ROI calculations 7. Calculate the expected value of the ROI
Process Framework	Return on Sustainability Investment (ROSI) (Eckerle et al., 2020a; Eckerle et al., 2020b; Atz et al., 2021; Whelan, 2022)	<ol style="list-style-type: none"> 1. Identify material sustainability strategies and actions 2. List potential benefits that might drive financial and societal value from sustainability actions 3. Quantify costs and benefits associated with sustainability actions 4. Build scenarios, document assumptions, and iterate research 5. Monetize and calculate the value for all benefits
Sustainable Adjusted Capital Budget Tools	Internal Carbon Cost (Greenhouse Gas Protocol, 2004)	Reflecting an internal cost per ton of CO2 emission in the basis for decision-making.
Sustainable Adjusted Capital Budget Tools	The Net Present Sustainable Value (NPSV) (Liesen et al., 2013)	Extend the traditional NPV method by calculating the efficiency of sustainable variables in addition to capital.
Sustainable Adjusted Capital Budget Tools	Internal waste tax (Epstein & Buhovac, 2014)	Equivalent to internal carbon cost but put on waste generation instead. They argue for a practical application of activity-based costing at an organizational level and reflecting this in the business units' financial statements.
Sustainable Adjusted Capital Budget Tools	Calculating decrease in cost of capital by decarbonization (Eckerle et al., 2020)	Based on previous literature they made a calculation in order to estimate the cost of debt and equity by decreasing carbonization.
Sustainable Adjusted Capital Budget Tools	Sustainability Cost NPV (SCNPV) (Kimbro, 2013)	<ol style="list-style-type: none"> 1. Calculate the potential costs associated with each risk category 2. Estimate the probability that each risk could materialize 3. Multiply the potential cost of each risk by its expected probability to calculate the expected value of each risk 4. Estimate when the risk may develop 5. Calculate the NPV for each risk 6. Aggregate and add the NPVs of all sustainability risks 7. Subtract the SCNPV from the NPV calculation for each capital alternative

Table 2 – An overview of identified factors and benefits and costs in selected frameworks.

Concept	Factors	Benefits and Costs	
Corporate Sustainability Management System (CSMS) (Azapagic, 2003)	Biodiversity loss Air emissions Energy use Global warming and other environmental impacts Land use, management and rehabilitation Nuisance Product toxicity Resource use and availability Solid waste Water use, effluents and leachates (including acid mine drainage)		
Incorporating Sustainability into NPV and DCF: Predicting Cash Flows (Kimbrow, 2013)	Waste Toxic waste Air pollution Indoor air quality Inspection costs Global warming potential Water acidification potential Ocean acidification Aquatic eutrophication potential Terrestrial eutrophication potential Photochemical ozone creation potential	Purchase price Taxes Transportation costs Interest/financing costs Installation costs Energy use Emissions and impacts Cost of monitoring emissions License and permit costs Calibration costs Plant or land space Maintenance costs Training costs Repair costs Material inputs Insurance Waste disposal Landfill cost Remediation/cleanup costs Shut-down costs Fines and prosecutions Capital asset disposal costs Useful life	Increase production, revenues and sales Tax rebates and savings Energy savings Water conservation savings Revenues from recycled externalities Reduced costs of inputs Waste disposal savings Remediation/cleanup costs savings Maintenance costs savings Training costs savings Repair costs savings Material inputs savings Insurance costs savings Reduced fees to cover handling of hazardous materials Landfill costs and taxes savings Shut-down costs savings Fines and prosecutions savings Disposal costs savings
Return on Sustainability Investment (ROSI) (Atz et al., 2021)	Greater customer loyalty Better employee relations More innovation Better media coverage Higher operational efficiency Better risk management Improved sales and marketing	Selling at full price Talent attraction Talent retention Innovation and better agricultural techniques Reputational risk avoidance Better cost management (inputs) Higher land productivity Operational risk avoidance Market risk avoidance Regulatory risk avoidance Price premiums Increase in demand for sustainability New revenue stream – additional land	

Azapagic (2003) presents a general management framework for corporate sustainability called the Corporate Sustainability Management System (CSMS). This is a step-by-step guide in order to

operationalize general principles of sustainable development. The system consists of five steps: 1) policy development, 2) planning, 3) implementation, 4) communication and 5) review and corrective action (Azapagic, 2003). This system has several similarities to the general management standards Total Quality Management (TQM; ISO, 2000) and Environmental Management Systems (EMS, ISO, 1996). In step two, they encourage to select sustainability indicators, set a baseline and future performance monitoring. They recommend indicators to be as quantitative as possible. For environmental measures, they have presented measures within the following areas: air emissions, biodiversity, energy use, global warming potential, noise, resource depletion, solid waste, transport and water use and discharges. Where the indicators typically are a unit consumed over a certain period. They suggest combining these indicators with a balance scorecard, and a LCA may be useful for identification of “hot spots” and comparison to relevant products, processes and business activities (Azapagic, 2003). This framework recognizes the need for measuring financial performance in order to include economic indicators. They provide a range of financial measures distributed over the GRI categories; products, customers, suppliers & contractors, employees, providers of capital, local communities and public sector. However, a combination of financial measures and environmental indicators to build a basis for an investment decision is not clear and seems to be missing.

Kimbrow (2013) presents a framework that gives a clear utilization of environmental data connected to capital budgeting tools like NPV. The 8-step process consists of 1) identify, evaluate and measure general costs and benefits using an initial investment inventory analysis; 2) estimate cash outflow required to acquire a capital investment; 3) use LCA for the initial environmental screening checklist; 4) evaluate eco-efficiency and quantify impacts; 5) estimates cash flows for the life of the investments; 6) estimate the sustainability risk rate and add it to the cost of capital; 7) or, in alternative, compute the NPV of the sustainability costs and subtract it to the projects' NPV and 8) select an NPV investment that has a positive NPV. Like the CSMS (Azapagic, 2003) framework they identify several potential metrics to be considered for identifying the investments' impact. The second step involves quantifying the cash outflow by a life-cycle costs (LCC) followed an LCA in order to fully understand the environmental effects. In the fourth step, it is about categorizing the identified environmental effects (see Kimbro, 2013, Table 3, page 111 for example). As Kimbro (2013) stressed, several of the identified costs are externalities, which do not directly affect the financial statement of the corporation. Quantifying the externality costs may be challenging, but in this framework, they propose to only include external costs if it is reasonable to expect any change in legislation that may make them internal (Kimbrow, 2013). Steps six, seven and eight connect the framework to capital budgeting by discounting the cash flow by a rate reflecting sustainability risk. This framework appears to merge sustainability thinking with financial tools. However, we might question how the corporation secure alignment with the sustainability strategy by adopting this framework.

Epstein and Buhovac (2014) present an extensive model, the Corporate Sustainability Model, in their book from 2014. Their model has a clear connection between strategy, reporting, measures and controlling and capital budgeting. Like Kimbro (2013) they specify using NPV as well as ROI. They cover a large scope of sustainability, but for this study we will only highlight a small part. Their seven stages methodology for measuring sustainability and political risk is relevant for this study. This consists of 1) calculate the benefit associated with each issue that may generate risk, 2) calculate the potential costs associated with each risk, including reputation costs, 3) estimate the probability that each risk will materialize, 4) multiply the potential cost of each risk by its expected probability of materializing to calculate the expected value of each risk, 5) estimate when, over time, the risk may emerge and calculate the NPV of the risk, 6) aggregate the NPV's of all risks and insert as a line item in ROI calculations and 7) calculate the expected value of the ROI.

New York University Center for Sustainability Business (NYU CSB) introduced the return on sustainability investment (ROSI) methodology as a method to increase companies' ability to create business cases for sustainability (Eckerle et al., 2020b; Atz et al., 2021). This is a five-step model to monetize sustainability actions: 1) identify material sustainability strategies and actions, 2) list potential benefits that might drive financial and societal value from sustainability actions, 3) quantify costs and benefits associated with sustainability actions, 4) build scenarios, document assumptions, and iterate research and 5) monetize and calculate the value for all benefits. In step 1, they recommend using an existing framework like the SASB or the GRI. For step 2, they have identified a range of potential benefits that can be relevant for other companies as well. In step 5, they do not recommend any specific financial tool, but do recommend weighing uncertainty and risk by probabilities. The ROSI methodology appears to have a clear connection from identification of environmental and financial metrics towards the financial understanding aligning with traditional capital budgeting tools. For both CSM and ROSI we miss a clear utilization of environmental data.

Capital budgeting (Jensen & Smith, 1984) consists of several different corporate finance calculations which are incorporated in corporate decision-making. However, our findings of methods challenging traditional methods to include environmental data are limited. Haessler (2020) investigated the use of tools to financially assess sustainability benefits in twelve companies in the chemical industry and two companies in the automotive sector. All of them used financial tools such as NPV and cost-benefit analysis. The majority reported no recognition of sustainability in the valuation, where complexity appears to be a major reason (Haessler, 2020). Some included CO2 emissions and energy consumptions (Haessler, 2020). A well discussed method to reflect the cost of CO2 emissions in a financial decision is the use of internal cost on CO2 emissions (Greenhouse Gas Protocol, 2004; Metzger et al., 2015; TCFD, 2017; Fan et al., 2021). The GHG protocol (Greenhouse Gas Protocol, 2004) elaborates how this methodology can be implemented. UN Global Compacts and TCFD recommend corporations to adopt this practice (Hall, 2016; TCFD, 2017). Scholars do also recommend this for corporations (Epstein & Buhovac, 2014).

Applying a cost per expected ton of CO2 emissions in the estimated cash flow will decrease the financial metrics for investments with higher emissions. Hence, this can directly affect the financial metrics and motivate for more sustainable solutions. Epstein & Buhovac (2014) further extend the application of this kind of cost to waste by presenting the internal waste tax. They argue this to be a practical application of activity-based costing at the organizational level and recommend reflecting this in the business units' financial statements. In the same way as for carbon pricing, this should also motivate managers to reduce their quantity of waste (Epstein & Buhovac, 2014). The net present sustainable value (NPSV) (Liesen et al., 2013) has been introduced as an addition to the NPV method. The NPSV calculates the efficiency for a chosen set of sustainable variables. For instance, if CO2 emission is a material variable for the company, the NPSV can be used to calculate the projects efficiency on CO2 emissions (Liesen et al., 2013). This enables the company to differentiate projects on sustainable performance in addition to financial performance. In equation 2, following Liesen et al. (2013), we have decomposed the cash flow from equation 1 to $C_t = R_t - FD_{t-1}$, where R_t indicates the expected return of the investment in period t, F is the minimum rate of return and D_t is the depreciated book value.

Equation 2

$$NPV = \sum_{t=0}^m \frac{C_t}{(1+r)^t} = \sum_{t=0}^m \frac{R_t - FD_{t-1}}{(1+r)^t}$$

Following Liesen et al. (2013), we further incorporate the effects of n number of resources in equation 3 where we see the NPV contribution of resource i . The concept is to use the efficiency of a specific resource stated by dividing the R_t on the resource performance $U_{i,t}$ and subtract the minimum targeted rate of return $F_i(1 + c_i)$ for that resource. This will indicate the value spread for each quantity of the resource i and multiplied with the quantity $U_{i,t}$ gives the total cash flow of resource i . The discounted amount of this cash flow leads to the net present value of the resource, consequently called the net present sustainable value.

Equation 3

$$NPSV = \frac{1}{n} \sum_{i=1}^n \sum_{t=1}^m \frac{\left[\frac{R_t}{U_{i,t}} - F_i(1 + c_i) \right] U_{i,t}}{(1 + r)^t}$$

Musial (2019) further examined the use of real options for sustainable investments. A challenge with sustainable project benefits is often the nature of less tangible value and that they are more difficult to capture. They conclude that a real option approach considers the specification of a sustainable investments well (Musial, 2019). The NPSV appears to be a method that fully integrates environmental data into traditional corporate finance methods. Combined with real options methodology, this can be a powerful tool for sustainable development. Eckerle et al. (2020b) consider the sustainability effect from the financing point of view. Recognizing the possibilities to gain lower cost of capital on sustainable investments, which can be due to green debt funding or equity requirements, they presented a calculation considering this effect on both debt and equity (Eckerle et al., 2020b). Research finds evidence of financial investors demanding a premium for investing in carbon intensity companies (Clark et al., 2015; Trinks et al., 2017).

In order to include sustainability in the market risk concept, Kimbro (2013) presents the Sustainability Risk Rate (SRR) and the Sustainability Cost NPV (SCNPV). The SRR requires the corporation to evaluate the environmental risk and increase the cost of capital where the risk is high. However, this appears to be the same as the already existing concept of market risk, just put in a new wrapping. The SCNPV, on the other hand, appears to be more interesting by specifying the process to calculate an own discounted cost of sustainability that should affect the cash flow. Compared to the NPSV, the SCNPV appears to have the same desire with a slightly different approach. In our opinion, the impact of sustainability's effect on cost of equity and debt and market risk can be incorporated in the WACC method (Berk & DeMarzo, 2011; Boye et al., 2018). This will affect the expected rate of return and, in that respect, have an impact on the corporation's decision-making.

In the following paragraph, we will present some of the findings from case studies where the identified frameworks and tools are tested. Eckerle et al. (2020b) applied the ROSI method to Capital Power Corporation (CPX), which is a North American power producer. They identified a range of initiatives in order to accelerate the decarbonization at CPX and quantified capital structure benefits for environmental metrics. After this case study, CPX implemented the ROSI methodology into their process for investment decision-making and reduced the internal equity hurdle rate for solar investments by 0,50% due to less risk of political and regulatory intervention (Eckerle et al., 2020b). Atz et al. (2021) applied the ROSI method for several case companies within the Brazilian beef supply chain and the automotive industry. They found the method useful for the identification of sustainability factors that normally would not be reflected in companies' business cases. As they state: *"Making the financial case for sustainability speaks the language of business managers and is necessary (yet not sufficient in itself) to change their mindsets"* (Atz et al., 2021, page 335). This

method makes it easier for managers to include sustainability in their daily business operations. For their case companies, they use NPV as a financial tool to evaluate the financial value of the potential actions (Atz et al., 2021).

3. Method

This section presents the chosen methodology, the case companies and how data was collected and analyzed in order to answer the research question.

i. Research design

The study is a qualitative study, which employs an exploratory case study with a multi-case holistic design approach following the method presented by Yin (2018). Literature search was conducted using scientific web resources with search terms, corporate finance, finance tools and corporate sustainability. In addition, references and citations from relevant articles were further examined. Literature on how sustainability and financial decision-making tools can be integrated is limited. Only a few presented tools do extend corporate finance models by integrating environmental data. This triggered the need for a more thorough examination of corporations and was the reason why we chose a qualitative research approach. The limitation of literature forced us to explore what and how corporations are doing in order to answer our research questions. This led to an exploratory case study (Yin, 2018), where the case to observe was the integration of sustainability thinking into financial tools for decision-making. In order to reveal and understand the nature of our research question, we decided to examine more than one corporation. This was expected to increase the robustness of our study (Eisenhardt & Graebner, 2007; Yin, 2018). Consequently, a multiple-case design was chosen (Eisenhardt & Graebner, 2007; Yin, 2018). The amount of work for a master's thesis puts a time restriction on the study. This restricted our choices regarding design type. Consequently, a multiple-case holistic design was chosen in order to limit the unit of analysis to the corporation. This design allows us to examine the case across several case companies where the unit of analysis is the company (Yin, 2018).

ii. Sampling

The sampling process follows selected criteria in order to get case companies that best fit our study (Yin, 2018). First, the case companies should be ranked in no worse than category number 4 in PWC's Norwegian Climate Index for 2022 (PWC, Klimaindeksen 2022), which means our sampling will include a selection of the 100 largest companies in Norway who have an open climate reporting with satisfying quality for the last three years, and the sources are clearly specified. This criterion allows us to narrow our search to companies with a proven record of putting sustainability on the agenda and communicating their approach through sustainability reports that are publicly available. Second, the case companies should be stock listed in order to ensure access to financial reporting. Third, we should be able to identify that the company has a clear focus on sustainability as part of their corporate strategy and their operations should have a significant impact on the environment. This was verified in the corporate websites and annual reports.

The following became our case companies: Entra ASA ("Entra"), Veidekke ASA ("Veidekke") and Yara International ASA ("Yara"). Through the contact with Entra the authors were recommended to contact Skanska Norge AS ("Skanska") due to their clear sustainability profile. Skanska did not appear in our original sampling because it is not stock listed in Norway. At the screening of Skanska, we identified the company as a large company, with a strongly communicated environmental focus and strategy, operating in an industry with significant impact on the environment. The company is a part of Skanska AB which gives easy access to public financial reports, and the Norwegian entity have publicly available

strategy documents and climate maps focusing on their Norwegian operations. Combined with the recommendation from Entra, we found it reasonable and rewarding to include Skanska in our sampling. These four companies were decided to be the unit of analysis for this study.

iii. Description of Case Companies

In the following section, we give a brief presentation of each case company. Both Skanska and Veidekke are a part of the construction industry which is a supplier for the real estate market where Entra is a major player. All three companies are connected in the same value chain and would be expected to share some of the same sustainable challenges. However, their focus on environmental factors may differ due to their scope of operations. Consequently, the CO2 emission classification in scope 1, 2 and 3 may differ and influence their sustainability focus and strategies. Yara operates in the chemical industry. Their main products are ammonia and fertilizer. In tables 3, 4 and 5 we have presented the case companies with selected information.

Table 3 – Industry details of the case companies.

Case Company	Industry	Core Business Operations	Significant Environmental Factors
Entra ASA	Real estate	Build, develop and own real estate.	CO2 emissions, waste, energy consumption, water usage
Skanska Norge AS	Construction	Construction of buildings and infrastructure.	CO2 emissions, waste, energy consumption, water usage, area/land use (including biodiversity and changes of gravel crushed stone)
Veidekke ASA	Construction	Construction of buildings and infrastructure.	CO2 emissions, biological diversity
Yara International ASA	Industry (ammonia, fertilizer, chemicals, etc.)	Production of ammonia and fertilizer.	CO2 emissions, waste, energy consumption, water (withdrawal, discharge, and consumption), emissions to air

Sources: Table 7 provides an overview of used sources in addition to the interview.

Table 4 – Selected accounting information of the case companies.

Case Company	Country registered	Group Stock Listed	Accounting Standard	No. of Employees ⁶	Revenue ⁷ 2021 MNOK
Entra ASA	Norway	Norway	IFRS	171	2 508
Skanska Norge AS	Norway	Sweden	IFRS, Norwegian GAAP	2 428	11 050
Veidekke ASA	Norway	Norway	IFRS	7 800	37 592
Yara International ASA	Norway	Norway	IFRS	17 800	142 805 ⁸

Sources: Table 7 provides an overview of used sources in addition to the interview.

⁶ Number of employees stated in the financial statement by 31st of December 2021.

⁷ Revenue is consolidated group revenue presented in the financial statement for Entra ASA, Veidekke ASA and Yara International ASA. For Skanska Norge AS, the revenue stated is for this legal entity solely provided by proff.no where public financial data are published for Norwegian corporations.

⁸ Yara International ASA reported revenue of USD 16 607M in their financial report from 2021. In the table we have recalculated this to NOK by using the annual 2021 FX-rate USD/NOK published by the Norwegian Central Bank (8,5991).

Table 5 – Geographical presence of the case companies.

Case Company	Where the company is present
Entra ASA	Norway
Skanska Norge AS	Norway (Group: Europe and US)
Veidekke ASA	Denmark, Norway and Sweden
Yara International ASA	Global – all continents. Sales in 160 countries and operates in 60 countries.

Source: Sources: Table 7 provides an overview of used sources in addition to the interview.

Table 6 – The case companies selected UN SDGs.

Case Company	Selected UN Sustainable Development Goals
Entra ASA	(9) Industry, innovation and infrastructure, (11) Sustainable cities and communities, (12) Responsible consumption and production, (13) Climate action
Skanska Norge AS	(7) Affordable and clean energy, (9) Industry, innovation and infrastructure, (11) Sustainable cities and communities, (12) Responsible consumption and production, (13) Climate action, (17) Partnerships for the goals
Veidekke ASA	(4) Quality education, (5) Gender equality, (8) Decent work and economic growth, (13) Climate action, (16) Peace, justice and strong institutions
Yara International ASA	(2) Zero hunger, (5) Gender equality, (6) Clean water and sanitation, (7) Affordable and clean energy, (8) Decent work and economic growth, (9) Industry, innovation and infrastructure, (19) Reduce inequalities, (12) Responsible consumption and production, (13) Climate action, (14) Life below water, (17) Partnerships for the goals

Sources: Table 7 provides an overview of used sources in addition to the interview.

Entra ASA is a Norwegian real estate company stock listed on the Oslo Stock Exchange (ticker: ENTRA). The headquarters is in Oslo. In 2021, the company had 171 employees and sales of 2,5 billion NOK. The largest owners, per 18th of November 2022 are Castellum AB (33,33%) and Fastighets AB Balder (27,45%) out of total shares. Both are Swedish based property portfolio companies. Castellum AB is the only Nordic property company included in the Dow Jones Sustainability Index (DJSI). The company's business concept is to develop, let and manage attractive and environmentally friendly premises as well as exercising active portfolio management through the purchase and sale of properties.⁹ Customers are both private and public companies. The property portfolio can be split into categories as follows (share by value in parenthesis): Property management (92 %), project development (7%) and land bank (1%)¹⁰. Entra's strategic areas of concentration are Oslo and the surrounding region, Bergen, Stavanger and Trondheim.¹¹ Selected UN SDGs: (9) Industry, innovation, and infrastructure (11) Sustainable cities and communities, (12) Responsible consumption and production, and (13) Climate action.

In their 2021 ESG report the company highlights the key strategic importance of operating their business in a sustainable manner and a prerequisite for the company's long-term results and value creation. Entra has worked towards environmentally sustainable business, being a part of their strategy since 2007. The company wishes to be seen as an environmentally leading company by the stakeholders over a period, environmentally managing their properties, and achieving competitive advantage due to this. PWC rank the company in group four in their Norwegian climate index (PWC, Klimaindeksen 2022). This indicates that the company has a public sustainability reporting with good quality but does not show all relevant CO2 emissions in scope 3. The interviewee is the CFO of Entra.

⁹ Overview of largest shareholders of Entra ASA <https://entra.no/about>

¹⁰ Cicero assessment: Shades of Green https://entra.no/storage/uploads/article-documents/3_sustainable-edge-entra-2-06-20.pdf

¹¹ Entra information about the company <https://entra.no/about>

Skanska Norge AS is the Norwegian subsidiary of Skanska AB (“Skanska Group”) which is stock listed on the Stockholm Stock Exchange (ticker: SKA B). In 2021, Skanska had 2.428 employees and sales of 11 billion NOK in Norway. The largest owners, per 30th of September 2022, are Industrivärden AB, AMF Insurance & Funds and Lundberg Group (Skanska Group homepage¹²). Skanska Group is one of the largest contractors in Scandinavia. Skanska Norge is one of the major contractors in Norway and operates within the business areas of construction of buildings and infrastructure, consultancy on building engineering and real estate development. Infrastructure projects include for instance tunnels, bridges and roads. From a value chain perspective, they do not produce their own building materials, but have their own production of prefabricated wood- and steel solutions. Beyond this, they assemble the buildings on project site and deliver turnkey buildings to their customers. In the industry operations, they have production facilities of crushed stone for gravel, sand and asphalt. Customers are both private and public companies. Selected UN SDGs: (7) Affordable and clean energy, (9) Industry, innovation and infrastructure, (11) Sustainable cities and communities, (12) Responsible consumption and production, (13) Climate action and (17) Partnerships for the goals. The interviewee is the Director of Sustainability, who is responsible for the company’s sustainability in strategy and operations in Norway.

Veidekke ASA is stock listed on the Oslo Stock Exchange (ticker: VEI) and one of the largest contractors in Scandinavia with an annual sale of over 37 billion NOK and over 7000 employees. The headquarters is in Oslo. The largest owners, per 1st of November 2022, are OBOS BBL and the Government Pension Fund Norway (Folketrygdfondet) covering over 50% of the shares (Veidekke homepage¹³). OBOS BBL is a long-term owner in Veidekke and emphasizes ESG related areas in their investments¹⁴. The Government Pension Fund Norway is one of the largest shareowners in Norway and have a focus on investing in companies that follows the Norwegian recommendation for corporate governance (Norsk anbefaling for eierstyring og selskapsledelse)¹⁵, TCFD, UNs Global Compact and OECDs guidelines (Folketrygdfondet, 2021). The company operates within the business areas of construction of buildings and infrastructure. The former consists of building houses in all sizes for both private and public customers. The latter includes, for example, roads and tunnels.

In a value chain perspective, the company does not produce their own building materials, but assemble the building on project site and deliver turnkey buildings for their customers. Regarding the construction industry, the company has some production. For instance, the production of bitumen, which is a material for production of asphalt. In addition, they have their own facilities for production of crushed stone for gravel and sand. Selected UN SDGs: (4) Quality education, (5) Gender equality, (8) Decent work and economic growth, (13) Climate action and (16) Peace, justice and strong institutions. PWC rank the company in group three in their Norwegian climate index (PWC, Klimaindeksen 2022). This indicates that the company has a public sustainability reporting with good quality including all relevant CO2 emissions but are not included in group one because they can’t demonstrate reduction in CO2 emissions. The interviewee is the CFO of Veidekke, and has experience from several different positions in the company.

Yara International ASA is stock listed on the Oslo Stock Exchange (ticker: YAR) and is one of the largest companies in Norway. The company has annual sales of over 140 billion NOK, 17.800 employees globally and operates in more than 60 countries. The headquarters is in Oslo. The largest owners, per

¹² Overview of largest shareholders of Skanska AB: <https://group.skanska.com/investors/skanska-share/major-shareholders/>

¹³ Overview of largest shareholders of Veidekke ASA: <https://www.veidekke.no/investor/storste-aksjonarer/>

¹⁴ OBOS BBL: <https://nye.obos.no/bedrift/ir/arsrapport-2021/redegjorelse-for-eierstyring-og-selskapsledelse/>

¹⁵ The Norwegian Recommendation for Corporate Governance: <https://nues.no/eierstyring-og-selskapsledelse/#:~:text=Form%C3%A5let%20med%20anbefalingen%20er%20at,det%20som%20f%C3%B8lger%20av%20lovgivningen>

31st December 2022, are The Norwegian Ministry of Trade, Industry and Fisheries (36%) and the Government Pension Fund Norway (6%) (Yara homepage¹⁶). The company is one of the world's leading crop nutrition companies where production of ammonia and fertilizers are some of the main products. The company has its own Board Audit and Sustainability Committee (BASC), who's supervising accounts, reporting, internal control, risk management and external and internal audits. The CFO is reporting to the BASC and oversees financial and non-financial performance and approves the sustainability reports. Selected UN SDGs: (2) Zero hunger, (5) Gender equality, (6) Clean water and sanitation, (7) Affordable and clean energy, (8) Decent work and economic growth, (9) Industry, innovation and infrastructure, (19) Reduce inequalities, (12) Responsible consumption and production, (13) Climate action, (14) Life below water and (17) Partnerships for the goals. PWC rank the company in group three in their Norwegian climate index (PWC, Klimaindeksen 2022), which indicates that the company has a public sustainability reporting with good quality including all relevant CO2 emissions but are not included in group one because they can't demonstrate reduction in CO2 emissions. The interviewee is the VP Sustainability Governance of Yara.

iv. Data collection

We have followed the method presented by Yin (2018) for data collection in this study. Relevant sources of evidence for our study are documentation, archival records and interviews. Because of the desire to make this study public, sensitive information has not been requested from the case companies. Only publicly available documentation has been examined in conjunction with the interviews. Sensitive information revealed in the interviews has not been disclosed in the study. However, to the author's understanding, this has not had any impact on the relevance of the study, or the presented conclusions. For the documentary analysis we used publicly available annual financial and non-financial reports from 2021. These documents were downloaded from the companies' websites. All case companies included a section of ESG in their financial report. Some present an integrated annual report, which includes both financial and sustainability reporting, like Skanska and Veidekke. Others include a brief section of ESG but presents an own ESG or Sustainability report in addition, like Entra and Yara. For Entra, Skanska and Yara we have examined their green bond framework. In addition, relevant company presentations covering sustainability strategy are included. Table 7 presents the sources for the documentary analysis for each company.

¹⁶ Overview of largest shareholders of Yara International ASA: <https://www.yara.com/investor-relations/share-and-debt-information/shareholders/>

Table 7 – Presents the sources collected from each case company.

Case Company	Sources	Brief Description
Entra ASA	Annual Report 2021	Reporting legally required annual information (Report of Board of Directors, Financial Statements, ESG etc.).
	ESG Report 2021	Reporting ESG related information in accordance with the European Public Real Estate Association Sustainability Best Practice Recommendations on Sustainability Reporting (EPRA BPR), GRI and TCFD
	Green Bond Framework	Presenting the framework for the company's green bonds. This is verified with a second opinion by Cicero with a classification of Dark Green shading.
	Green Bond Framework Second Opinion	Detailed description of Cicero's opinion of the company's green bond framework.
Skanska Norge AS	Annual and Sustainable Report 2021 Skanska Group	Reporting legally required annual information (Report of Board of Directors, Financial Statements, ESG etc.). The group extends the annual report with a detailed presentation of sustainable information in accordance with GRI.
	Norwegian financial statement 2021	The Norwegian financial statement for Skanska Norge AS is accessible at www.proff.no .
	Green Bond Framework	Presenting the framework for the company's green bonds. This is verified with a second opinion by Cicero with a classification of Medium Green shading.
	Green Bond Framework Second Opinion	Detailed description of Cicero's opinion of the company's green bond framework.
	Climate map 2022 Skanska Norge	A roadmap made for the Norwegian operation and expressing how the company will operationalize the strategy.
Veidekke ASA	Annual and Sustainable Report 2021	Reporting legally required annual information (Report of Board of Directors, Financial Statements, ESG etc.). The group extends the annual report with a detailed presentation of sustainable information in accordance with GRI.
	Climate plan "Veidekke's Klimaplan"	A plan made for the Group's operation and expressing how the company will operationalize the strategy. Not dated.
	This is how Veidekke shall reach net-zero "Slik skal Veidekke nå netto-null»	Presentation by the company's Director of Sustainability at Virke conference the 5 th of September 2022. Presenting how Veidekke will work forward in order to reach the goal of net-zero emissions in their operations.
Yara International ASA	Integrated Report 2021	Reporting legally required annual information (Report of Board of Directors, Financial Statements, ESG etc.). The group extends the annual report with a detailed presentation of sustainable information in accordance with the EU Non-Financial Reporting Directive Requirements and TCFD Recommended Disclosures.
	Sustainability Report 2021	Reporting sustainability related information in accordance with the GRI and the Corporate Sustainability Reporting Directive proposal (CSRD).
	Green Bond Framework	Presenting the framework for the company's green bonds. This is verified with a second opinion by Cicero with a classification of Medium Green shading.
	Green Bond Framework Second Opinion	Detailed description of Cicero's opinion of the company's green bond framework.
	Yara's Position on Fit for 55	Report from January 2022 where Yara elaborates their position in order to face the Fit for 55 targets set by EU.
	Tekna Conference streamed. 21 st of February 2022	Conference where Yara's VP Energy & Environment talked about carbon accounting and -reporting in the company. https://www.tekna.no/fag-og-nettverk/miljo-og-biovitenskap/bio-og-klimabloggen/yara-karbonregnskap-og-karbonrapportering/

Based on the literature findings, we created a case study protocol (Yin, 2018). In the case study protocol, we defined the mission and goals of the study, the case study question, any problem to be solved, the theoretical framework and key findings in the literature and the research design. Further, we defined the data collection procedures, the protocol questions and a tentative outline for the case study report. The main purpose of the case study protocol is to define the scope of the case study, in order to ensure that our method is aligned with an objective investigation of our case study question (Yin, 2018). This is especially important when performing a multiple-case study (Yin, 2018).

Based on the case study protocol we created an interview guide, which was distributed to the interviewees before the interview. This ensured consistency across the interviews. Before each interview, documentation for each of the case company was examined. Observations relevant to the research question, in accordance with the case study protocol, were noted and connected to the case study protocol. Each interview was held physically at the company’s headquarters and lasted for approximately 60 minutes. Table 8 shows an overview of all interviews, interviewee, date, how long the interview lasted and where it was held. All interviews were sound recorded in agreement with the interviewee. After the interview, the sound recording in conjunction with collected documentation was connected to the case study protocol.

Table 8 – Presents information about interviewee and the interviews.

Case Company	Interviewee	Date	Length	Type	Place
Entra ASA	CFO	04.11.2022	1t 18min	Physical interview	Headquarter
Skanska Norge AS	Director of Sustainability	22.11.2022	57min	Physical interview	Headquarter
Veidekke ASA	CFO	02.11.2022	49min	Physical interview	Headquarter
Yara International ASA	VP Sustainability Governance	06.12.2022	48min	Physical interview	Headquarter

The document analysis was performed before the interview in order to have a general idea of the companies before the interview. After each interview, we collected information from all sources and described the observations in an observation document. The observations included a brief introduction of the corporation, the researchers’ answers to the protocol questions with clear references to the collected data, relevant quotes desired to use in the study and a list of all sources. This was sent to the interviewee for review. This document was a further basis for analysis across the multiple case companies and the case study findings. All collected data, together with own analysis, were collected in an electronic case study database (Yin, 2018).

v. Data analysis

Yin (2018) stresses the limits of predefined procedures for the data analysis in case studies, and consequently points out this section's dependency on the researcher’s own desire and ability to design and execute the analysis. It is possible to use software designed for this purpose, which can be quite useful for large amount of data (Thomas & Harden, 2008; Yin, 2018). Regardless of the use of software, it is a possibility to start “playing” with the data by sorting the data in arrays, matrix, visual displays, tables, etc., or writing notes or memos (Yin, 2018). Thomas & Harden (2008) recommend categorizing findings in different analytical themes. This process might help to understand the data and get closer to a general analytic strategy (Yin, 2018). For this study, the data analysis consisted of three steps. First, we created the observation document for each case company, which was read and approved by the interviewees. Second, the observation documents were analyzed, and selected data were tabulated. Third, the observation documents and tables were examined across the cases for pattern matching and compared with existing frameworks and theory.

vi. Research quality

Yin (2018) presents four quality tests for case studies and recommends researchers to continually judge the quality of their research design. The four tests are as follows: 1) construct validity, 2) internal validity, 3) external validity and 4) reliability. Construct validity challenges the use of correct operational measures for studying the concept. The presented tactics to face this challenge are the use of multiple sources of evidence and have the interviewee review the case study report draft. The authors believe this master's thesis successfully satisfy this test by including several case companies, presenting all observations for each case company in a document reviewed by the interviewees and letting the interviewees review the draft of the master's theses before filing. Internal validity challenges the causality in the study but does not apply for an exploratory study. External validity challenges whether the study can be generalized. For single-case studies, this is overcome by connecting the case study with theory, and for multiple-case studies the use of replication logic is important. In respect of this study, the first foundation to satisfy this challenge is the framing of the research question, which starts with "how". In accordance with Yin (2018), this framing enables an easier generalization of the study. The use of multiple cases further supports generalization of the study. Reliability challenges the operations of the study, for instance the data collection procedures, aiming for a repeatability of the study with the same results. Tactics for satisfying reliability are; use of case study protocol, case study database and maintain a chain of evidence. The authors believe this study complies with these tactics due to the use of case study protocol, case study database and an observation document connecting all observations with the protocol and sources.

vii. Limitations

The main source of information in this study is case study interviews. Yin (2018) presents several weaknesses with this source: "bias due to poorly articulated questions, response bias, inaccuracies due to poor recall, reflexivity". The nature of these weaknesses affects the limitation of this study. However, the researchers have initiated actions in order to reduce the probability of bias by; creating interview questions based on the case study protocol, distributing the interview questions to the interviewee before the interview, sound recording of the interview and interviewees review of the observation report and case study report. Four interviews have been conducted for this case study with the four companies. The limitations of interviewees for each company also limit the detailed level of information gained for the companies and increases the potential bias. Half of the interviewees are finance experts, and the other half are sustainability experts. This may have an impact on our findings due to the different subject area expertise. By not collecting non-public information, the study might not include all relevant information. Non-public information, such as internal routine descriptions, could provide a more detailed understanding of the companies' process regarding capital investments. This could reveal differentiating variables between the case companies, and further support the information from the interviews. In that respect, this is a limitation of the study. The authors believe this study can, despite the presented limitations, be of value for industry practitioners and academics and inspire future research exploring the connection between sustainability thinking and corporate finance models.

4. Findings

i. Introduction

The following section will present relevant background information of the case companies and the findings from the case studies. Each of the companies are presented in their own sections. Sources are interviews and documents presented in table 7.

ii. Entra ASA

Sustainability goals

The company is targeting a 70% decrease in scope 1 and 2 CO₂ emissions by 2030 and a reduction of CO₂ emissions from projects by 80% by 2030. Reduction of water consumption in m³ per m² by 6% in 2021 and waste sorting, from 69% in 2021 to 70% (property management) and from 90 to 95% (development projects). Entra's overarching target is to become a Net Zero Carbon company within 2030, according to the definitions and targets set out by World Green Building Council. The company aims to continue being the environmentally leading company in their industry, reducing the overall emissions and impact of construction, refurbishment and operations of their properties. For Entra's total portfolio the target is to achieve energy consumption below 135 kWh/m² in 2020 and less than 100 by 2030. The energy is to be 100% green energy in Entra's buildings by self-produced or through guarantees of origin. For new-build projects, Entra's long-term goal is to have CO₂ emissions that are 50% below the industry average, in accordance with the criteria set in FutureBuilt Zero¹⁷ framework. A minimum of BREEAM-NOR Excellent certification on all new development projects, and minimum of BREEAM-NOR Very Good on redevelopment projects.

Identification of environmental factors

The company uses the following frameworks for identifying environmental factors; The European Public Real Estate Association Sustainability Best Practices Recommendations on Sustainability Reporting (EPRA BPR), GRI and TCFD. One of advantages of the company's adaptation to sustainable management is the expectation of access to an investor pool which has a mandate and a reporting in regards of green investment. This is reflected in the interest rates and the possibility of expansion by means of green bonds, in use by the company since 2016. Energy consumption amounts to approximately 77% of Entra's CO₂ emissions from Scope 1 and 2 and is the most important source impacting their operational carbon footprint. Reducing energy consumption in the managed assets is therefore an important part of the path towards net zero carbon by 2030. From 2020 to 2021, Entra reduced its greenhouse gas intensity from 4.45 kg CO₂e/sqm to 4.00 kg CO₂e/sqm.

Measure cards connected to Entra goals, profitability, customer growth and the environment, are used to calculate the bonus for all employees, with variations in percentages. On environment the KPIs are energy consumption measured using kilowatt-hours per square meter and level of waste sorting (above 80%) that goes on both in the operation and in the projects. The wish to make a direct measurable impact by reducing emissions is by the company done through the measure cards connecting the reward directly to every person in the company to take a responsibility in reducing the energy consumption. One example used in the interview is of the caretaker reducing the temperature in the building to reduce energy consumption if there was no need for such heating. An act both good for the company, the employee and the environment in terms of company cost reduction, the

¹⁷ FutureBuilt ZERO sets criteria for maximum emissions for a building's contribution to global warming potential over its lifetime and includes potential emission gains from carbon sequestration, reuse of materials, material recycling, and energy exports.
<https://www.futurebuilt.no/English>

caretakers KPIs measure cards improved numbers and the effect on the environment in terms of reduced emissions from energy production.

The company's environment strategy has a 360-degree view with: 1) own organization, 2) the property portfolio and property management, 3) the development projects, and 4) stakeholders (incl. suppliers and customers). The Board of Directors determines the ESG strategy and review performance. They also determine how to respond to different climate-related risks including policy, regulatory and legal risks, as well as the physical risks to Entra assets. Management responds to climate related opportunities such as investment in renewables, improvements in energy efficiency and investment in low-carbon solutions. The Board receives quarterly reports and presentations on the company's operational and financial status. The reports describe progress and status in the company's operative and administrative functions during the reporting period. The individual business units hold meetings with the CEO and CFO to review operating activities prior to and in connection with such reporting.

Sustainability in operation

The focus is on retaining and upgrading existing buildings rather than demolishing and building new ones while adapting to the requirements of the EU taxonomy. Entra's commitment to 100% compliance with the EU taxonomy impacts the financial decisions in regards of upgrading the building portfolio standard to a level that fulfills these certification requirements. Green Benefit Agreements is one of Entra's solutions to this by way of identifying the potential measures together with customers and then implementing them and providing finance. The customer has no change in the rental fee, but the financial benefit from the investment goes to Entra. Once the initial investment has been paid down by the financial benefit, the customer receives the benefit through lower common costs and Entra a building upgraded to a new standard. One issue raised by the interviewee was how far the new requirements would go and if the demand for a new building would be close to a zero-emission building. With today's technology these buildings will not be built without subsidies. The change to more environmentally friendly buildings is right, but the change should be directed in a way that makes use of the existing buildings through refurbishment. Too rigid demands will in a worst-case scenario lead to allocation of capital to building of zero-emission buildings, demolishing the older buildings unable to meet the new criteria. CO2 emissions are already in the materials used inside the building, especially concrete, and the lifetime should be prolonged if possible. Local adaptations due to climate and location could also be instrumental in the decision of choosing which building type to build together with the profitability assessment.

The company uses FutureBuilt criteria on new-build and redevelopment projects. FutureBuilt framework built on NS 3720 calculations, which is a method for greenhouse gas calculations for buildings, allows Entra to quantify the reductions in CO2 emissions by choosing among other materials and energy consumption. There is no internal framework of quantifying an internal cost of CO2 emissions as the focus is on operational factors that they can influence within scope 1 and 2. scope 3 is in this regard too generic with too little influence on the operational efficiency. The company has chosen not to include the calculations of scope 3 emissions as these data, in their opinion, don't have a good enough link between the drivers for CO2 emissions and the final CO2 consumption. The calculations for scope 3 need to become more readily available for use, considering the different stages in a building project. The company wishes to measure the CO2 emissions on a project correctly and there are several factors influencing this, such as the big difference between a new building and the rehabilitation of an existing building. The timeline is also of the essence as a normal project will go over 18 to 24 months, possibly spanning over 3 years and require reporting each year together with the yearly financial reporting. This raises a challenge with accrual CO2 emissions over the project's lifetime. The new EU taxonomy with the possibility of establishing an industry standard in regards of

reporting emissions will, in the interviewee's opinion, lead to better data and more consistent data among companies. This is because the sustainability parameter is very challenging, and it often becomes a large dose of estimates regarding the reach of the stated goals. In the interview it was stated that Entra's sustainability strategy attracts talents, but this is not used as a quantified benefit for financial evaluation.

The company employs a conservative selection of projects in accordance with the Green Bond Principles and uses financial models with an allocation of percentages towards more environmentally sustainable solutions in buildings if the investment calculations allow it. Traditional cash flow estimates with financial evaluation methods are used. Entra has adopted a slightly lower return requirement in relation to environmental investments and innovation that protects the environment. In table 9, we have presented the environmental factors we have identified in their strategy. This covers CO₂ emissions, energy consumption, water and waste. Measures reported in the annual report are also identified and presented in the table.

iii. Skanska Norge AS

Sustainability goals

The company is targeting a 70% decrease in scope 1 and 2 CO₂ emissions from 2015 to 2030, and 50% for scope 3 emissions from 2020 to 2030. By 2045 the company's goal is to achieve net zero emissions for their overall operations. In the last five years the company has reduced CO₂ emissions by 46% in their development projects. In their climate road map, they have specified five areas of focus regarding sustainability; 1) Energy efficiency, where they focus on developing cost effective and environmentally friendly concepts. A focus on continuous developing solutions for zero and plus energy buildings. 2) Use of materials, due to significant emissions connected to production and transportation of building materials, which also includes use of limited natural resources. Consequently, the company is both targeting less use of materials and favoring those with less emissions. The CO₂ footprint for materials is included as criteria when purchasing. In addition, the company contributes to the development of sustainable products and solutions through cooperation, innovation and partnerships with their supplier chain. 3) Circular economy, which the company believes will be crucial for the building and construction industry in order to decrease CO₂ emissions and consumption of limited natural resources. This involves rehabilitation of buildings instead of demolishing, if possible, reduce waste, use materials that can be reused or recycled, design and build for reuse of materials for both new and rehabilitated buildings, design and build for long living buildings, constructions and materials. 4) Machinery and transportation, where the focus is on reducing CO₂ emissions by switching to electrical solutions. This involves a focus on securing access to emission free technology through cooperation and R&D and increase the emission free share of the machinery fleet following the technological development and customer demand. 5) Areal changes, involving removing and transportation of biomasses and soil. This especially applies to infrastructure projects, and the company focuses on providing knowledge and solutions to help the customers to reduce the impact on the environment to a minimum. The company has identified four important enablers in order to realize the sustainability potential in the five focus areas; 1) Secure competence and R&D. 2) Measure, governance and documentation. There is a focus on measuring the CO₂ footprint – both volume and efficiency, in addition to establishing KPIs, where climate- and cost-effective initiatives will be prioritized. 3) Strategic partnerships, which they recognize as an important enabler to face sustainable challenges. 4) Communications in order to inspire and engage for sustainable solutions.

Financial tools

In Norway, the business unit management are responsible for the operation, performance and decision-making in their unit. Decision-making involves identification of opportunities, quantification of related benefits and costs and securing the monetization and value calculation of the decision. The Director of Sustainability, and her team, assist them on sustainability topics. For the company to approve an investment decision, the company follows traditional reporting, which includes measures of the expected profit, earnings before interest and tax (EBIT), earnings before tax (EBT), and cash flow. They have a focus on working capital ratios and gaining a positive cash flow. For financial evaluation they use tools like NPV, return on capital employed (ROCE) and IRR.

Identification of environmental factors

Regarding identification of environmental opportunities, in addition to the cooperation between the business units and the sustainability team, there is a close cooperation with external partners throughout the value chain. Upstream with equipment suppliers in order to detect opportunities in technology development. Downstream, with the customers in order to understand which technologies their ambitions will need. We have identified the following environmental factors that the company is focusing on in their strategy; CO₂ emissions, energy consumption, waste, water usage and area/land use. The company has been measuring CO₂ emissions for scope 1, 2 and 3 since 2009. The purchase systems and software are collecting this data, which is mainly collected by generic factors and, in some cases, EPDs. It is a challenge to get proper data from suppliers, due to different measures and units. Getting data in kilos appears to be a challenge. In order to overcome the challenges, the company uses a method called the spend-based method. This method collects estimated emissions data and allocates the emissions based on a secondary emission factor (GHG Protocol, 2013). However, this also leads to errors, and the industry is working on finding solutions. The CO₂ emission intensity is measured as a calculation of total ton emission divided by total revenue in million SEK. For energy consumption, the company is measuring the usage of fuel, electricity, district heating, district cooling and the share of renewable energy sources. In addition, they measure the energy intensity calculated by total energy (MWh) per revenue in million SEK. Regarding waste, they calculate the CO₂ emission generated from waste in operations and the self-generated waste to landfill. According to our interview, the company has a focus on water efficiency and the environmental impact of area/land use. However, the sustainability report does not reveal any metrics for these environmental factors.

Environmental factors in financial tools

Based on the interview, there is no formal framework for considering the environmental factors in the financial evaluation. However, environmental factors are clearly integrated in the strategy and following on the agenda when making decisions. The company does not consider CO₂ emissions, or other environmental factors directly in calculations, but they are continuously considering investments in sustainable technologies following customer demand. If the company expects a probability of customer demand, this reduces the risk and increases the willingness to invest in technology that leads to more sustainable solutions.

Focus on cooperation

There is a focus on cooperation between the business units, internal experts on sustainability and other relevant partners in the value chain. For instance, Oslo municipality, as a significant customer for this industry, has communicated a goal of net-zero emissions building- and construction sites by

2025¹⁸. This enables the company to make investments, accordingly, as stated by the interviewee: “Yes, totally dependent on predictability to make those investments [investments in technology for emission free building sites]. When Oslo municipality have been so clear in their communication toward us as supplier – in 2025 the goal is that absolutely all building sites shall be emission free. Then, we feel safe to expect a certain amount of portfolio [project portfolio]. Then we can do these kinds of investments”. For example, the project Zero Emission Digger is a cooperation between Skanska, SINTEF, Nasta, Bellona, Difi and Omsorgsbygg. The mission is to develop a net-zero CO2 emission 30tons excavator. A motivation for Skanska is increased competitiveness by presenting the company as a pioneer in the construction industry for net-zero emission technology. Another example is Bane Nor and Statens Vegvesen’s requirement of CEEQUAL certification on infrastructure projects with a contract value over 200million NOK. For Skanska to satisfy the CEEQUAL certification, their operation and solutions needs to satisfy certain sustainability requirements. Consequently, this leads to decision-making pulled by the customer demand. The Powerhouse project¹⁹ is an interesting cooperation between Skanska, Entra, the environmental foundation ZERO, the architect Snøhetta and the consulting company Asplan Viak, which aims to develop buildings generating more power than they consume. In order to provide surrounding buildings with renewable energy and decrease the need for other production and infrastructure of energy.

Climate budgets

The company has implemented climate budgets for their in-house real estate developer (Skanska Eiendomsutvikling). In this business unit they have a climate budget for the different projects aligning with their sustainability goals. The climate budget is focusing on CO2 emissions, where scope 1 and 2 are included. For scope 3, emissions from sold products and use of materials are included. Currently, the company has not applied climate budgets in other business units, but they are working on it. This might be implemented in a few years. For sustainability reporting, the company, together with the whole group, follows GRI, TCFD and World Business Council for Sustainable Development (WBCSD). Quarterly CO2 emissions are reported to the group. The company has an employee share saving program, where the next version will be connected to sustainability metrics. The company have a strategy where sustainability is clearly integrated, and at the same time they have a constant connection with their customers in order to understand the risk of future demand, which will impact the evaluation of investments for sustainability. The interviewee referred to this as push and pull effects. Where the push, is the sustainability strategy implementation and the pull is the customer demand and competitiveness. Going further, we could argue that external stakeholder requirements, like investors, NGOs, governments are recognized in the strategy and, consequently, a part of the push effect.

iv. Veidekke ASA

Sustainability goals

The company is targeting a 50% decrease in scope 1 and 2 CO2 emissions from 2018 to 2030, and 50% decrease in scope 3 emissions from 2020 to 2030. By 2045 the company’s goal is to achieve net zero emissions for their overall operations. In their climate plan, they have specified important areas where potential actions towards 2025 and 2045 should be initiated in order to reach the climate targets. Toward 2025, main areas are switching to fossil free, or non-emission, energy carriers, selection of materials and use of resources, product development and innovation and project portfolio. Toward 2045, main areas are further development and accelerating actions initiated before 2030, involve and

¹⁸ Oslo municipality report regarding fossil free construction sites <https://www.oslo.kommune.no/politikk/budsjett-regnskap-og-rapportering/rapporter-fra-kommunerevisjonen/rapport-1-2022-fossil-og-utslippsfrie-bygge-og-anleggsplasser#ref>

¹⁹ Powerhouse: a collaboration in the development of climate buildings <https://www.powerhouse.no/om-oss/>

operationalize new technology and new business models. In accordance with the annual report of 2021, the company also recognizes that their operations can have an impact on biodiversity. Especially, bulk handling and planting can involve the risk of introducing foreign species. Consequently, the company's projects are mapped for ecological value, and plans are made in order to keep and develop the ecological value.

Responsibility of sustainability

Operationalization of the company's sustainability strategy can be split into two levels; The first is the group level, where there is cooperation between the CFO and the VP for Strategy and Sustainability. These two positions are working together to handle the sustainability risk. The CFO handles everything towards the owners and other stakeholders related to funding. The VP for Strategy and Sustainability handles everything towards other stakeholders. The second level is the business units where the other executives are in charge. This level oversees the management in the business units who are managing the operational level in the company. The business unit management are responsible for decision-making in their unit. This involves identification of opportunities, quantification of related benefits and costs and securing the monetization and value calculation of a decision.

Financial tools

For the company to approve an investment decision, a quantitative evaluation of the opportunity must be presented. Traditional cash flow estimates with financial evaluation methods are used. For instance, calculating the payback is mentioned in order to evaluate financial performance. Discount rates are applied in order to reflect the cost of capital. There are no formal frameworks for identification or quantification of potential benefits and costs that drive the financial value from specific decisions. However, they do seem to reuse the way of thinking from one case to the other. Hence, some frameworks might be expected to develop over time. Even though the company does not have a formal framework for identifying environmental factors for specific investment decisions, they do follow the standards of GRI, TCFD and GHG protocol for sustainability reporting. In addition, the company initiates different internal workshops to understand the company's impact on the environment. In 2021, the company had nine workshops covering topics such as concrete, concrete elements, bitumen, steel, transportation, energy consumption in finished buildings, cross-laminated wood, and energy carriers for asphalt production.

Environmental factors

We have identified the following environmental factors that the company is focusing on in their strategy; CO2 emissions, energy consumption, waste, and biological diversity. The total emission of CO2 equivalents for scope 1 and 2 are measured, where scope 3 for the reporting fiscal year will be presented later in the following fiscal year. Scope 1 and 2 are constantly measured and collected internally. They have their own department to handle this process. The company started to report scope 3 emissions from 2020. The collection of scope 3 emissions is a challenging exercise that involves around 20.000 different suppliers. For the fiscal year of 2021, this emission data was finalized in September 2022. Scope 3 data is collected by EPDs, and other documentation provided by the suppliers. This is a time-consuming task, and the company is currently working on how to handle this process forward. The company also presents the efficiency of CO2 emissions per revenue 1.000NOK. For energy, the company presents the share of renewable energy. Production of asphalt has a special focus by measuring the share of low-temperature asphalt, the share of reused asphalt in production and the number of asphalt plants on renewable energy. The company does not have any metrics for biodiversity.

Environmental factors in financial tools

There is no formal framework, or established practice, for considering the environmental factors in the financial evaluation. However, the company has used an internal cost of CO₂ in some investment decisions. When they invested in a new bitumen production facility in the east part of Norway, they had two alternative locations. The transportation distance was a significant factor, and an internal cost of CO₂ emissions was added into the cash flow estimate. The internal cost per ton CO₂ emission was calculated by the company's own department handling all macro analysis, and the business case was developed and owned by the relevant business division. The location with the shortest distance to asphalt production was chosen. However, the cost of CO₂ emission was not the decisive factor for the decision according to the interviewee. Another investment case, in their crushed stone business they had a significant energy consumption related to drying and heating the crushed stone aggregate for asphalt production. Based on a qualitative evaluation, they decided to purchase plates to put on the top of the crushed stone in order to prevent rain and moisture. This reduced the energy needed for drying and the payback was satisfying. Environmental metrics is not considered in this case, even though the case leads to a decrease in energy consumption. A major sustainability driven investment decision for the company is the case of hydrogen in sea transportation of asphalt along the Norwegian coast. The company entered an agreement with Green Shipping program (Grønt Skipsfartsprogram) in 2020 in order to build hydrogen supply ships. The cost benefits of switching from traditional fuel to hydrogen were calculated together with the potential benefits in reduction of CO₂, but the savings were low compared with use of land transport with newest engine technology. The project was closed in 2021, due to too high financial and technological risk. In addition, the company has included the internal cost of CO₂ emissions in their purchase strategy. By adding a cost of NOK 5 per kilo CO₂ emissions to all other than the offer with the lowest CO₂ emissions, the company is reflecting the environmental factor in their decisions.

Challenges with sustainability data

A challenge that was stressed by the interviewee is that it is not easy to allocate sustainability data to certain time periods. For financial figures, we make accruals for revenue and costs in order to satisfy legislation principles of accruals and compilation²⁰. However, for sustainability data two challenges are pointed out by the interviewee: 1) scope 3 emissions are significantly lagged, 2) it is challenging to measure the consumption of the sustainability factor over time. For example, if the company is building a huge building complex over two fiscal years. They can calculate the CO₂ emissions for the whole project based on measures and generic data, but how should they be able to say that x tons of emission were released in the first fiscal year, and y tons of emission was released in the second fiscal year?

Climate budgets

An interesting observation is the introduction of climate budgets in 2020. This is not like a traditional financial budget and is aligned with the sustainability targets for CO₂ emissions. They used the CO₂ emissions in the basis year and calculated the targeted reduction to get to the desired maximum CO₂ emissions in 2030. The reduction was divided into the remaining years until 2030, which gives the required reduction of emissions per year. The required reduction is calculated per business unit, and this gives the maximum allowed quantity per year. If a unit pollutes more than allowed, they need to make an equivalent reduction in the emissions the following year. The performance is reported quarterly and is directly connected to the bonus schemes for the top management.

²⁰ The Norwegian Accounting Law §4, Lovdata: https://lovdata.no/dokument/NL/lov/1998-07-17-56/KAPITTEL_4#%C2%A74-1

v. Yara International ASA

Sustainability goals

The company has reduced its global CO2 emissions by approximately 45% since 2005 and 55% in Europe. They are targeting a 60% decrease of their global CO2 emissions by 2030 and to become climate neutral by 2050. The company aims to set science-based targets by 2022 for scope 1, 2, and 3 emissions. In their 2021 sustainability report (page 2), they state: *“We recognize the urgent nature and climate crises which are unfolding, and we are positioning Yara to play an important role in driving change and value creation for the future”*. Water may not be an issue in Norway but is an important topic in other parts of the world. The company uses water for cooling their production processes. In some cases, the company has permission to release water back into nature limiting the maximum water temperature the released water can have. If the water has too high a temperature, it may damage the habitat in that area. Consequently, if the company sets a target on reducing the need for cooling water in their production, they risk releasing too hot water back in nature that can damage the habitat. The potential implication by choosing one over the other is commented upon in the interview, quote; *“It is not straight forward to say that less water consumption is good, we need to understand the situation for each individual plant. As an example, reduced intake of cooling water will make the discharged water warmer, which can harm nature”* VP Sustainability Governance in Yara.

Triple bottom line

The company places the UN SDGs at the core of their business, believing that using them in their strategy work and operationalizing these will give the company a competitive advantage. The company focuses on three areas, People/Planet/Prosperity - a triple bottom line holistic view, where they want to make a tangible global impact. *“Climate neutrality: Reducing emissions and improving productivity at production sites, contributing to decarbonize agriculture, contributing to decarbonize transportation and energy. Regenerative farming: Improving farming productivity and nutrient use efficiency (NUE), positively impact nature in the value chain: soil health, biodiversity, water, air quality and land use change. Prosperity: Improve farmer income and sustainability, positively impact farmer diversity, contribute to zero hunger and healthy nutrition”*²¹.

The main KPIs for Planet are energy efficiency, CO2 emissions and use of digital farming tools on active hectares of crop. A carbon marketplace is a future 2025 target goal. The three areas are reflected in the companies selected projects such as clean ammonia production aiming to become a supplier of green fuel for shipping, fertilizer production and other energy intensive industries. Exposure to new business areas outside current core operations is, by the Board of Directors, reflected in their ESG report with a high-risk appetite area, a willingness to make use of their know-how in the development of green premium products. One way of doing this is partnering with other companies such as Lantmannen and Nestle to close the loop in the value chain between customer and producer. Agoro Carbon Alliance is an example of farm decarbonizing, a platform for farmers to earn additional revenue from positive climate action. By adopting these practices farmers can produce Farm Carbon Credits or climate-smart certified crops, decarbonizing food supply chains. These initiatives are clearly driven by the wish to stand out from the competitors and further confirmed under the interview quote; *“In this transition (towards a low-emission society), there will be winners and losers, and we want to be positioned so that we can profit from this change and be among those who develop solutions that are in demanded in the market over the time to come.”* VP Sustainability Governance in Yara.

²¹ Yaras stated goals and ambition <https://www.yara.com/this-is-yara/our-ambition/>

Responsibility of sustainability

VP Sustainability Governance reports to the CFO and is responsible for integrated reporting and materiality processes, ESG topics and Nature-Positive Roadmap. There is also an established cross-functional network in ensuring established accountability, processes, and systems for ESG policies and non-financial performance indicators. Representatives from Sustainability Governance, Enterprise Risk Management, Ethics and Compliance, Human Resources, Communication and Brand, HESQ, Procurement, and Project and Technology participate in this network²². This seems to ensure that the ownership to the ESG policy and indicators is distributed among the departments and facilitates, effectively dispersing the knowledge and quality assurance of the stated goals and the viability to reach these.

Financial tools

The company has a formal framework for approving capital investments - the capital value process (CVP). This consists of five decision gates, where gate zero involves screening of the idea. Gate one initiates a formal project for a preliminary study. Gate two involves more details and resources. Gate three takes it a step further involving an engineering team to take the project from paper to drawing a full technical design. The last gate involves the final decision of whether to continue the project. Every person in the company can propose a business idea and establish a project. However, the different business units are the ones with the most financial capabilities and are responsible for opportunities within their areas and in accordance with the company's overall goals. Traditional requirements for NPV and ROI apply.

Identification of environmental factors

The company uses a four-step approach for materiality assessment to identify sustainable factors: 1) identify impacts, 2) prioritize topics, 3) validate and approve material topics and 4) implement. According to their annual sustainability report of 2021 this is connected to their strategy and risk processes. The VP Sustainability Governance is responsible for systematically integrating ESG topics into the CVP. Hence, it is reasonable to conclude that Yara has a formal framework for identifying environmental factors in their decisions for capital investments. For all major investment projects, it is required that several different departments in the company evaluate the project; compliance, health, environment and safety and sustainability.

"GHG emissions is always a part of the evaluation if it's about an emission intensive process" quote interview VP Sustainability Governance. For all projects above the cost of 25million USD an internal carbon price is to be applied and if relevant present an analysis of the effect on the company's overall climate effect. *"For green ammonia projects, it is more about risk management rather than utilizing internal CO2 cost for forcing through a project, since this is such a large investment that it must be profitable"* quote interview VP Sustainability Governance. The company has stated that they will define and implement company-wide environmental compliance targets for its business units.

The company involves stakeholders such as employees, distributors and retailers, farmers, suppliers, investors and lenders, regulators and policy makers and the food industry to identify impacts and prioritize topics. The scale, likelihood and importance to stakeholders are the criteria used for this, together with a timeframe for implementation short term 0-1, medium term 2-5 and long term 6-30 years. Climate change impact is graded by the company as medium term, with the impact expected to increase in the coming years. The company is clear that they are prioritizing the topics where they can have the biggest impact in terms of reductions of emissions. The company believes that the full value chain must collaborate to succeed and has therefore introduced a new Sustainable Procurement

²² Yara Sustainability Report 2021 page 153

Policy in 2022. The chosen suppliers will share the company's values and be aligned with the goals for the company. By making these qualifications mandatory the company is using its purchasing power to effectuate a change in what is acceptable or not for the suppliers, making the environmentally friendly adjustments mandatory beyond the question of pricing of the product or services provided.

Sustainability in operation

The company's main emission sources, 80% Scope 1 & 2, are CO₂ from the use of natural gas in the ammonia process, splitting the natural gas into hydrogen atom and carbon atom, where the carbon atom is not used and becomes CO₂ emission. This is a mature process with limitations in what can be achieved production wise. Consequently, the company focuses on the green transition from fossil-based to use of renewable resources. For emission intensive processes there's always a screening of whether the project will contribute to or damage the company's climate goals. For raw materials and some of the transportation the company uses database values as the basis for calculating the emissions and energy consumption. A challenge is lack of transparency on sustainability data for raw materials. The company is working on getting more transparency upstream in the value chain. This may lead to more data from suppliers which can result in more correct data instead of average values from the database. As of today, the company is using values from a database that consists of data from LCAs, which gives average values.

In 2021 the company launched an environmental roadmap program where they assessed the production plants' performance against current and foreseen environmental regulations. By doing this, they identified short- and long-term investments needed to become compliant for the future. These projects are included in the company's CVP process and followed up by expert work groups. Today, there are about 90 different projects with an estimated investment of USD 300 million targeting the 2025 carbon intensity target.²³ The GHG portfolio team is cooperating with the production facilities to identify opportunities. Despite this being a large company with several production facilities, the core processes are limited to a few, which enables the people working directly with this process to have a pretty good overview and understanding of the sustainability challenges for these processes. Each plant has a reporting system for data collection of the most important climate KPIs such as CO₂ emissions and carbon intensity, which is aggregated further to the corporate level, and reported monthly.

Yara handles an investment in green & blue ammonia despite current challenges with profitability, as stated in the interview: "As long as we do not have a high price on carbon implemented in the market, green ammonia is not competitive compared to conventional production". This is done because the company believes they can get a green premium out of the product. These assumptions are tested by securing customer agreement, and in this way ensuring sales of the product, before making the investment in projects that otherwise would not be profitable. Customer demand seems to be the main driver here as their customers are using the company's products with the lower emissions to build the brand. Brand and marketing communication are the key drivers here. The company is global and wishes to be a first mover in this market, strategically positioning itself as the green alternative in the market. As stated in the interview "Yara shall be future fit, we shall not only be a company that has existed in 100 years, but we shall continue to exist for the next 100 years".

²³ Yara sustainability report p.85 <https://www.yara.com/sustainability/sustainability-performance/latest-sustainability-report/>

Table 9 – Environmental factors reflected in the companies’ strategies and annual reports.

Case Company	Environmental Factors Identified in the Strategy	Reported measures in annual report
Entra ASA	CO2 emissions	-Annual tons of CO2 emissions in Scope 1, 2 and 3 -CO2 emission intensity (kg CO2e per sqm. Per year)
	Energy consumption	-Fuel usage (annual kWh) -Electricity usage (annual kWh) -District heating and cooling usage (annual kWh) -Energy intensity (annual kWh per sqm.)
	Water	-Water usage (annual m3) -Water intensity (annual m3 / sqm.)
	Waste	-Waste generation (annual tons – hazardous and non-hazardous) -Proportion by disposal route (reuse, recycling, incineration, landfill, biodiesel production)
Skanska Norge AS	CO2 emission	-Annual tons of CO2 emissions in Scope 1, 2 and 3 -CO2 emissions intensity (CO2 emissions per SEK Million)
	Energy consumption	-Fuel usage -Electricity usage -District heating usage -District cooling usage -Share of renewable in energy usage -Energy intensity (total energy MWh/SEK M revenue)
	Waste	-Calculate the CO2 emission generated from waste in operations -Self-generated waste to landfill ²⁴
	Water	N/A
	Area/land use	N/A
Veidekke ASA	CO2 emission	-Annual tons of CO2 emissions in Scope 1, 2 and 3 -CO2 emissions intensity (kg CO2 per sales NOK 1000) -CO2 emissions intensity (kg CO2 per ton produced asphalt) -Number of fossil/emission free building- and construction sites
	Energy consumption	-Share of renewable energy -Share of low-temperature asphalt -Share of asphalt plants using renewable energy
	Waste	-Share of reuse in asphalt production
	Biological diversity	N/A
Yara International ASA	CO2 emission	-Annual tons of CO2 emissions in Scope 1, 2 and 3 -CO2 emissions intensity (tCO2e/t N)
	Energy consumption	-Energy efficiency (GJ/t NH3)
	Area/land use	-Active hectares = MHa (cropland with digital farming user activity within defined frequency parameters). -Sites in flood hazard areas
	Air pollution	-Emission to air in tons (NOx, SOx and dust)
	Raw materials	-Natural gas in MMBtu -Phosphate in tons P2O5 -Potash in tons K2O
	Water	-Million m3 -% of which freshwater withdrawal in water stressed areas

²⁴ Noted in Skanska Group’s Annual and Sustainability Report 2021 (page 93): “The definition of this indicator is subject to change as it is currently under review to improve alignment with relevant frameworks and standards.”

5. Data Analysis

i. Introduction

In the following section, we will present the analysis of the findings from section four. This section consists of four main parts. In the first part, we will analyze organizational factors influencing the focus on sustainability. The second part will analyze how the case companies identify environmental factors affecting their potential capital investments and quantify relevant benefits and costs accordingly. The third part presents an analysis for how the various sustainable factors are reflected in the companies' financial evaluation of the capital investment. In the end, there will be a summary of the findings. Table 11 presents the highlights from these three processes per case company. In table 12, we have identified the companies' procedures for integrating environmental factors in capital budgeting methods for decision-making.

ii. Organizational factors influencing focus on sustainability

In this section we will analyze the organizational factors we have identified to influence the organization's focus on sustainability. Traditional corporate finance theory has been criticized for a focus on maximizing shareholder value (Elkington, 1994; Porter & Linde, 1995; Stubbs & Cocklin, 2008; Louche et al., 2019). In that respect, we should expect finance professionals to be focused on shareholder maximization (Friedman, 1962) and capital efficiency due to the Modigliani-Miller arbitrage principle (Modigliani & Miller, 1958; Jensen & Smith, 1984; Berk & DeMarzo, 2011), which could lead to a challenge to understand and accept certain sustainability concepts.

Acceptance and knowledge of sustainability and profitability from both finance and sustainability experts

The two CFOs interviewed showed an extensive knowledge of how their companies impact environmental factors and the importance of considering sustainability in decision-making. First, the CFOs in Entra and Veidekke have responsibility for handling the sustainability risk in their organizations. Second, they are deeply involved in the sustainability reporting processes. The requirements for sustainability reporting have been increasing in the last few years, and especially in these days with the EU Taxonomy being further extended. Third, they are highly focused on both shareholder value and sustainability. They demonstrate an understanding of the relationship between these. The CFO in Entra perfectly demonstrates this in the following quote: *“Profitability and sustainability are both target requirements, but without profitability you will not invest in or prioritize sustainability. If we can't build sustainable buildings, then we shouldn't build them.it will punish itself cruelly in the long run, if you have an energy class worse than C, then it might not be rented out according to new EU legislation. Meaning destruction of the property values”*. On the other hand, we might expect limited focus on finance related issues from the sustainability leaders. However, both reveal a great understanding of profitability and sustainability for decision-making. The VP Sustainability Governance in Yara is reporting to the CFO and is involved in the capital investment decisions of Yara. The Director of Sustainability in Skanska refers to the importance of predictability in customers' demand contributing to risk reduction on the cash flow for capital investments. Consequently, we find acceptance and knowledge of sustainability and profitability from both finance and sustainability experts.

Organization culture and structure triggers motivation for focus on sustainability

In all the companies, there are cooperation across the organization for identification of opportunities and risks, and to a certain degree for capital investment decisions. Skanska and Yara have their central sustainability experts supporting business units for these topics. Veidekke initiates group work across

the company to identify environmental impact on different topics. Stubbs & Cocklin (2008) stressed the need to develop internal structure and cultural capabilities within the companies in order to attain sustainability on firm-level. Our observations indicate that the organization culture puts sustainability on the agenda and organizational structure seem to enable inter-organizational cooperation that are supporting knowledge building across expertise. One example is Entra, putting sustainability on the agenda since 2007, integrating it in the organization culture and spreading the knowledge across the different departments of the company. This might have culminated in the CFO becoming responsible for the sustainability processes, in effect connecting the financial decision-makers with sustainability. In Yara the VP Sustainability Governance is reporting to the CFO, consequently merging the financial decision-making with sustainability. The same merger practice is observed at Veidekke where the CFO and VP Strategy and Sustainability share the sustainability risk responsibility. Consequently, organization culture and structure seem to have an important impact on the organization's focus on sustainability.

iii. Procedures for identification of environmental factors

In this section, we will analyze our findings on the following processes regarding capital investments: 1) the company's process for identifying environmental factors, 2) the company's process for quantifying benefits and costs. The case companies are, according to regulations, required to report ESG information in their annual reports, where identification of environmental factors is considered on a corporate level. The GRI framework includes requirements for identification of material factors. Consequently, when the companies are reporting in accordance with this sustainability reporting framework, they apply an identification process accordingly. Table 10 gives an overview of the frameworks for sustainability reporting implemented in the companies. In table 9 we identified environmental factors and related metrics considered in the strategies and reporting. However, we find limited evidence for any formal framework when it comes to identifying environmental factors related to capital investments.

Table 10 – Presents sustainability reporting frameworks in use in the case companies.

Case Company	Implemented frameworks for reporting sustainability factors
Entra ASA	GRI, TCFD, EPRA
Skanska Norge AS	GRI, TCFD, WBCSD
Veidekke ASA	GRI, TCFD, GHG protocol
Yara International ASA	GRI, TCFD, Universal Standards, Sector Standards, Topic Standards

Identification of environmental factors

It appears that the building and construction industry is focused on sustainability classifications as BREEAM and CEEQUAL, which directly affect the selection of materials, machinery and solutions. Entra, as a real estate owner and developer, is focusing on the classification of buildings in order to deal with sustainability. They believe this directly affects their balance sheet valuation if capital allocation is restricted to this classification - i.e., potential effects of the EU taxonomy. The company identifies opportunities for decreasing energy consumption and increasing waste recycling. Even though there is no formal framework for identifying environmental factors, it is obvious that the company does identify factors and continuously make decisions accordingly. Their ESG report and communicated sustainability strategy support this assumption. This is further supported by the Green Benefit Agreements with their customers, and their system for connecting employees' bonus schemes with sustainable performance. The industry classifications also put requirements on the operation for Skanska and Veidekke. Neither of them appears to have a formal framework for identifying the environmental factors, but in both organizations, the business unit's management is responsible for

identifying opportunities. In Skanska, they have central expertise on sustainability working closely with the business units. Veidekke arranges workshops to understand the environmental impact on topics highly relevant for their operation. Both initiatives seem reasonable to assume contribute to identifying environmental factors. Yara have their materiality assessment consisting of four steps to identify material topics. Investments for decarbonization are managed by a dedicated team who assist the production facilities in identifying opportunities. For all major investment projects, it is required that different departments evaluate the project (compliance, health, environment & safety and sustainability). Regarding industry classification, Yara have initiated and participates in a sectorial decarbonization approach (SDA) for their industry²⁵. Consequently, in the future this may put restrictions for allowed maximum levels of CO₂ emissions in the Nitrogen fertilizer sector²⁶, and therefore, lead to maximum allowed levels of emission for the companies. Currently, this has no impact on Yara, but is obviously something they are highly focused on and impact their decisions.

Entra, Skanska and Yara have a clear focus on cooperation with external partners in the value chain – both upstream and downstream, to increase the probability of identifying sustainable factors. Downstream, they all appear to be working closely with the customers to reduce risk in demand. Entra with their Green Benefit Agreements with their customers. Skanska cooperate closely with their customers to understand the technological need in their demand, for instance when Oslo municipality announce zero-emission building- and construction sites by 2025. Yara with their green premium, niche market focus for prototypes and their partnerships and collaborations in order to secure agreements before making capital investment. Upstream, the companies work closely with partners to increase the probability of access to new technologies that support more sustainable solutions. Entra, with their cooperation with Skanska on Powerhouses. Skanska with their participation in the project Zero Emission Digger, which also includes machinery producer Nasta. Yara with their cooperation with Northern Lights for CO₂ transportation and storage²⁷. Consequently, all the companies are working in order to identify environmental factors, but only Yara has a formal framework.

Limited formal frameworks for the identification process of environmental factors for capital investments

All the companies are using GRI as a framework for identifying environmental factors on the corporate level, which is an ideal basis for the identification process according to the ROSI framework (Atz et al., 2021). Only Yara appears to utilize this identification framework beyond reporting as they use the materiality assessment for their strategy and risk processes linked further to their CVP for capital investments. However, all companies seem to have established well defined responsibilities who are delivering on these processes to a certain degree. Two of the companies have reflected CO₂ emissions, which are in accordance with the Greenhouse Gas Protocol (2004) and Kimbro (2013). Factors like energy consumption, water use, waste and biological diversity are mentioned in the sustainability reporting and strategy for several of the companies. However, we do not find evidence that the companies reflect these environmental factors in their calculations. The CFO in Veidekke stressed the following challenges with sustainability data; 1) scope 3 data is significantly lagged, 2) a challenge to measure the consumption of the sustainability factor over time and 3) inconsistency in sustainability data. The former is solely connected to CO₂ emissions and the effort to get all data from suppliers.

²⁵ <https://www.wbcsd.org/Overview/News-Insights/Member-spotlight/Yara-ready-to-enable-the-hydrogen-economy-with-historic-full-scale-green-ammonia-project>

²⁶ Yara emission reduction goals <https://www.yara.com/news-and-media/news/archive/2020/yara-to-align-emission-reduction-goals-with-paris-agreement-targets/>

²⁷ Yara CO₂ decarbonisation strategy: CO₂ transport and storage <https://kommunikasjon.ntb.no/pressemelding/major-milestone-for-decarbonising-europe?publisherid=17848025&releaseid=17939729>

Number two and three are also related to CO2 emissions in our interview, but it is reasonable to think these applies to other sustainability factors as well. Yara mention water usage in their reporting, but do not include any metrics, which appears to be the fact that reduction in input of cooling water to the plants will increase the temperature of the water released into nature. This will damage the habitat in that area. Hence, a measure to motivate for decrease in water usage may not be in favor of the environment in this case. It seems likely that the challenges with environmental data and complexity of how environmental factors are connected to nature are preventing a further integration of such factors into the capital investment processes.

Quantification of benefits and costs

Considering the quantification of benefits and costs, Entra's building investments differ from the others because their investments have a clearly formalized tender process. The tenders will require the subcontractors to specify the cost according to the classification requirements. Entra uses LCC for their buildings. For other capital investments, there does not appear to be a formal framework for quantification of benefits and costs in our case companies. This does not mean they do not have requirements for a quantification, but they do not appear to have a written document specifying which benefits and costs to consider and how to calculate the value effect. Skanska and Veidekke have clear expectations that their business units, who own the decisions, quantify any pros and cons that may arise from the investment. Yara has a clear expectation for quantification of benefits and costs as a part of the CVP and decarbonization investments is the responsibility of the portfolio team and the relevant production facility.

All case companies report CO2 emissions, but only Veidekke and Yara are using an internal cost of CO2 emissions in their calculations. The data for CO2 emissions appears to be a combination of generic and actual data, where the sources are a mix of average estimates, EPD/LCA and other information provided by suppliers. However, this does not seem to apply to all investment decisions. In Veidekke, this was specifically applied to a case where transportation distance was a significant factor. The internal cost was calculated by their own central department who oversee all macroeconomic reports. In Yara, this is at least applied to all projects with a value above USD 25M. Additionally, Veidekke is including internal cost for CO2 emissions in their purchase strategy. They are adding a cost of NOK 5 per kilo CO2 emissions to other than the offer with the lower emissions in order to favor sustainable solutions²⁸. Whether this methodology is adopted into the process of capital investments is unclear, but it seems reasonable to assume that this will indirectly affect decisions by favoring solutions with the lowest emissions.

Limited quantification of benefits and costs from environmental factors for capital investments

We identify the use of cost calculation of CO2 emissions, using an internal cost following the Greenhouse Gas Protocol (2004), as a quantification of benefits or costs. For environmental factors such as energy consumption, water, waste, land use, air pollution and biodiversity, the interviewees state that there is no quantification of such factors related to capital investment. However, we assume the companies are recognizing normal operating expenses for energy consumption, water fees and waste handling despite that they do not recognize this as a special sustainability focus. Yara's challenge with cooling water points out the complexity related to some of the environmental factors. The ROSI framework (Atz et al., 2021) points out several factors that go beyond the quantifications set in the sustainability reporting (i.e., GRI and SAASB). One of those factors is improved sales and marketing, including price premiums, increased demand and new revenue streams.

²⁸ Veidekke ASA presentation 5th of September 2022: This is how Veidekke shall reach net-zero ("Slik skal Veidekke nå netto-null").

In our study we have identified that several of the companies actively seek possibilities for increased demand due to sustainability. Yara is actively exploring green premium possibilities. The calculation of expected green premium and customer demand appears to be a well-used approach. We do not find this approach in the other companies, but we quote Entra’s CFO from the interview: “*Environmental buildings attract tenants that we wouldn’t otherwise get*”. Hence, there clearly seems to be a benefit from their sustainability strategy. Entra has also found a new revenue stream with their Green Financing Agreement which enables Entra to initiate capital investments that they otherwise would not initiate. In addition, this benefit both Entra and their customers. Consequently, it is reasonable to assume that this also affects Skanska and Veidekke as well, due to their existence in the upstream value chain for Entra. For both Skanska and Veidekke, the expectation of customer demand is crucial for what investments they are willing to approve. However, Skanska and Veidekke do not quantify the benefits in the same way as Entra and Yara. Their approach is, in most cases, by a qualitative recommendation coming from the business units which is considered and potentially given approval in regards of it furthering an investment or not. Another interesting observation from the interview is that Entra states they attract talent due to their sustainability focus. This benefit aligns with the ROSI framework, but Entra does not perform any quantified benefit from this. Several of the factors and quantifications presented by the ROSI framework can be recognized as less tangible than those included in sustainability reporting. For instance, the measure of CO2 emissions is based on calculations following the GHG protocol. Energy consumption can be measured as actual consumption of electricity per kWh. Calculating the benefit from talent attraction is not straight forward, and there is no standard approach to follow. Hence, the benefit from talent attraction is less tangible than CO2 emissions and energy consumption. Based on our findings, we can only identify the internal cost of CO2 emissions, price premium and new revenue streams applied for quantifying benefits and costs related to capital investments.

Table 11 – Presents findings per case company.

Case Company	Formal frameworks 1 Identification environmental factors	2 Quantification of benefits and costs	3 Monetizing and calculating the value of the decision
Entra ASA	<p>Follows industry standards (FutureBuilt, NS3720) and classifications (BREEAM), which directly considers the most sustainable solutions for house buildings.</p> <p>Formalized system of measure cards (KPIs) enabling the employees to identify the environmental factors that can be effective in their work area, increasing environmental awareness and responsibility among the employees.</p> <p>Close cooperation with external partners in the value chain, upstream and downstream, to identify opportunities.</p>	<p>For investing in buildings, the enterprise cost is quantified by the supplier. Cost depends on the type and level of building certification.</p> <p>New revenue streams with the Green Financing Agreement.</p> <p>Environmental data is gathered using actual measurements by reports from the suppliers (electricity/waste).</p> <p>CO2 emissions are measured and reported aligned with the GHG protocol but are not reflected in these calculations.</p>	<p>Formal investment calculation for investing in buildings. Estimate cash flow and use financial tools like payback.</p> <p>Calculating LCC for buildings is a part of Entra’s own building specifications.</p> <p>Green benefit agreements. Formalized system of cooperation between company and customer identifying possible new development potential, reducing environmental impact.</p>
Skanska Norge AS	<p>Not formal, but this is a part of the business unit’s management responsibility to identify opportunities.</p> <p>The business units get support from central experts on</p>	<p>Not formal, but expectations aligned with traditional procedures for quantifying benefits and costs associated with decisions.</p> <p>The close cooperation with different partners in the value</p>	<p>The business units own the process and performance.</p> <p>Calculates EBIT/EBT and cash flow. Focus on working capital ratios and a positive cash flow.</p>

Case Company	Formal frameworks 1 Identification environmental factors	2 Quantification of benefits and costs	3 Monetizing and calculating the value of the decision
	<p>sustainability in order to secure maximum sustainability effect.</p> <p>Close cooperation with external partners in the value chain, upstream and downstream, to identify opportunities.</p>	<p>chain helps identify and quantify benefits and costs.</p> <p>CO2 emissions are measured and reported aligned with the GHG protocol but are not reflected in these calculations.</p> <p>Environmental data are a combination of generic factors and actual measurements, but the latter is only a few exceptions.</p>	<p>Uses financial tools like NPV, ROCE and IRR for investments and other decisions requiring capital.</p>
Veidekke ASA	<p>Not formal, but this is a part of the business unit's management responsibility to identify opportunities.</p> <p>In addition, the company arranges cross-organization workshops in order to understand the environmental impact on different topics.</p>	<p>Not formal, but the business units are expected to quantify benefits and costs related to their identified opportunities.</p> <p>The internal cost for CO2 emissions to be used is calculated by their own central department who oversees all macroeconomic reports.</p> <p>Environmental data are a combination of measures and estimates.</p>	<p>The business units own the process and performance.</p> <p>Requirements of a quantitative evaluation for decisions.</p> <p>Cash flow estimates combined with financial evaluation methods like payback. Discount rates are applied to reflect the cost of capital.</p>
Yara International ASA	<p>A formal materiality assessment process connected to strategy and risk. A central GHG portfolio team works together with the production facilities in order to identify opportunities for decarbonization projects.</p> <p>For all major investment projects, it is required that different departments evaluate the project (compliance, health, environment & safety and sustainability).</p>	<p>Internal cost for CO2 emissions is required for investments with costs over 25 million USD. Overall climate effect required if relevant. Green premium and customer demand expectations appears to be a well-used approach for understanding the demand.</p> <p>Not a formal framework to include other factors, but the cooperation for identification also quantifies benefits and costs.</p>	<p>The capital value process (CVP) is formalized and consists of 5 steps to get an approval.</p> <p>Requirements of NPV and ROI.</p> <p>Portfolio of decarbonizing project managed by own portfolio manager and team.</p>

iv. Sustainable factors integrated in financial decision-making tools

In this section, we will analyze our findings on how the case companies monetize and calculate the value of the decision for capital investments.

Entra has a formal investment calculation for investing in buildings, which includes an estimate for cash flow and evaluates based on payback. In addition, they calculate the LCC for the buildings. For investments in buildings, like solar panels, they use the same calculation methods. The green benefit agreements are interesting in the way they enable the company to reduce risk in the cash flow, enabling capital investments and resulting in benefit for Entra and the customer. Most of the company's debt is financed by green bonds following their green bond framework. Whether they distinguish between sustainable or non-sustainable investment is not clear.

In Skanska, they calculate the EBIT/EBT and cash flow. They have a particular focus on working capital ratios and a positive cash flow. For financial evaluation they apply tools like NPV, ROCE and IRR for decision requiring capital investments. The business unit management is responsible for the financial evaluation in the same way as for identification of environmental factors and quantification of benefits

and costs. This responsibility delegation applies in Veidekke as well, where they also require a quantitative evaluation for capital investments. They estimate cash flow and evaluate with the payback method. Discount rates are applied to reflect the cost of capital, but there appears to be no distinguishing between sustainable and non-sustainable investments. Yara have their formalized capital value process, which are specified in five steps to get an approval. The last step requires cash flow estimates and NPV and ROI calculations. All decarbonization projects are monitored and managed by the GHG portfolio team.

Limited use of existing sustainability adjusted capital budget tools

Our analysis shows that the case companies apply financial evaluation following the traditional tools presented in the corporate finance literature, but the only sustainability adjusted tool in use is internal cost on CO₂ emissions. This is a consequence of the observations presented above. However, despite this observation, the companies are allocating capital to capital investments for improved sustainability performance. Skanska has acknowledged that electrifying their machines and vehicles will lead to a significant reduction in their CO₂ emissions. However, they do not transform 100% of their assets overnight, but invest for the transition following the customers' requirements. They use traditional capital budgeting tools without reflecting environmental factors for justifying these investments. Hence, the company found these investments profitable regardless of the use of sustainability adjusted capital tools. The motivation for these investments seems to be driven by the expectation of the customer's need and consequently pulled through the organization regardless of any adjustment in capital investment evaluation. This pull-effect seems to be the same for sustainability classification desired by their customers as well. Looking at Entra, these sustainability classifications seem motivated by lower cost of capital due to green bond financing and risk reduction on the balance sheet value. Supported by the statement from Entra's CFO: "What we see is that the valuations of green buildings are higher than those of non-green buildings. (...) Matters a lot as it is the property values that are the driver here. Provides a high balance with the possibility of more loan financing". Hence, the motivation for sustainable solutions seems more driven by strategic choices and consequently forced, or pushed, through the organization.

The need for sustainable adjusted capital budget tools is not obvious since we should expect management to align with the strategy when selecting capital investments. The capital source will impact the discount rate, but still no specific need for adjusting capital budget tools for sustainability reflection. Even though Yara is quantifying the cost of CO₂ emissions and price premiums, according to the interview, they also make investments from the decarbonization portfolio that are not profitable today with an expected future carbon price in mind. We must comment that their total portfolio of decarbonization investments is expected to be profitable. However, it seems like their belief of future competitiveness consequently of their current strategy is so great, that they do not need to adjust any capital budget tools in order to allocate capital properly, for more sustainable solutions. Veidekke, and Skanska to a certain degree, are using climate budgets for CO₂ emissions in order to secure consciousness for needed action in order to successfully face their CO₂ emission targets. The climate budget puts restrictions on the allowed CO₂ emission per business unit and requires them to initiate actions accordingly. Consequently, it does not seem to be obvious that sustainable adjusted capital budget tools are needed in order to motivate management to make sustainable decisions in these companies.

However, we raise two challenges here. 1) A company must choose between different capital investments, because these are mutually exclusive or have limited access to capital. How do they identify the best option considering both financial and sustainable performance? 2) How does the company consider the effectiveness of the potential capital investment if they have no other

alternative to compare with? The former question relates to the capital investment tool's ability to differentiate between potential investments. The latter relates to the corporate finance use of discount rates, which says an investment should not be initiated if the potential return is lower than the discount rate. Skanska, Veidekke and Yara includes efficiency measures of CO2 emissions in their sustainability reporting. Skanska calculates the CO2 emission per SEK million in sales, Veidekke calculates the kg CO2 emission per NOK 1000 in sales and per ton produced asphalt and Yara calculates the ton CO2 emission per produced quantity. Consequently, like traditional NPV and ROI calculates the capital efficiency of an investment, these measures should be applicable to calculate the efficiency of the environmental factors of a capital investment. Calculating the potential output per invested dollar seems reasonable for differentiating. Regarding the latter question, the NPSV method (Liesen et al., 2013) provides a more complex method, which considers a minimum rate of return for the selected environmental factor, which is CO2 emission in this case. This rate, which is determined by the company, will enable the company to evaluate the impact of this investment even though they have no alternative investments to compare with.

Limited knowledge of sustainability adjusted capital budget tools

The companies appear to have incorporated traditional financial tools in their decision-making and demonstrate knowledge regarding the application of such tools for capital investments. The interviews and reports demonstrate a significant understanding of the internal cost of CO2 emissions, climate budgets and metrics for environmental factors. However, the interviews and document review show no use of tools like the NPSV (Liesen et al., 2013), internal waste tax (Epstein & Buhovac, 2014), calculation of decrease in cost of capital by decarbonization (Eckerle et al., 2020) or SCNVP (Kimbro, 2013).

Table 12 – Presents environmental factors and capital budgeting methods per case company.

Case Company	Environmental Factors Identified in the Strategy	Reflected in Capital Budgeting Methods	Use of other tools
Entra ASA	CO2 emission	N/A	
	Energy consumption	Assume reflected as normal cost in financial statement.	
	Water	N/A	
	Waste	Cost for waste handling assumed reflected as normal cost in the financial statement.	
Skanska Norge AS	CO2 emission	N/A	Climate budget in a few business units.
	Energy consumption	Assume reflected as normal cost in financial statement.	
	Waste	Cost for waste handling assumed reflected as normal cost in financial statement.	
	Water	N/A	
	Area/land use	N/A	
Veidekke ASA	CO2 emission	Internal cost per ton	Climate budget Internal CO2 cost reflected in purchase strategy
	Energy consumption	Assume reflected as normal cost in financial statement.	
	Waste		

Case Company	Environmental Factors Identified in the Strategy	Reflected in Capital Budgeting Methods	Use of other tools
	Biological diversity	Cost for waste handling assumed reflected as normal cost in financial statement. N/A	
Yara International ASA	CO2 emission	Internal cost per ton Price premium	
	Energy consumption	Assume reflected as normal cost in financial statement.	
	Area/land use	N/A	
	Air pollution	N/A	
	Raw materials	Purchase cost and waste handling assumed reflected as normal cost in financial statement.	
	Water	N/A	

v. Summary of data analysis

Based on the analysis of the findings, we highlight six observations in order to answer the research question.

- 1) Acceptance and knowledge of sustainability and profitability from both finance and sustainability experts. We find both finance and sustainability experts to fully accept the sustainability challenges we are facing. In addition, they all have a great understanding of those challenges in their organization and how this relates to their company's profitability.
- 2) Organization culture and structure triggers motivation for focus on sustainability. We observe a profound conviction of the need for sustainable solutions, and the organization's obligation and will to act. Together with cooperation across the organization this is affecting the organization's focus on sustainability in a positive direction.
- 3) Limited formal frameworks for the identification process of environmental factors for capital investments. We observe that there are challenges with environmental data, especially with the collection of Scope 3 data in the value chain, and therefore the sheer complexity of how environmental factors are connected to nature, are preventing more integration in evaluation of capital investments.
- 4) Limited quantification of benefits and costs from environmental factors for capital investments. We identify the quantification of internal cost of CO2 emissions, price premiums and new revenue streams. Other than that, there is limited use of established metrics from sustainability reporting and factors presented in the ROSI framework (Atz et al., 2021).
- 5) Limited use of existing sustainability adjusted capital budget tools. Regardless, the cases initiate capital investments for improving their sustainability performance. We raise two important challenges which will be further discussed in the next section; 1) how do companies prioritize between potential sustainable capital investments, 2) how does the company evaluate the effectiveness of a potential capital investment when there are no comparable alternatives. 6) Limited knowledge of sustainability adjusted capital budget tools. We only find the use of internal cost of CO2 emissions.

6. Discussion

i. Introduction

The following section is divided into four parts. The first intend to discuss how the data analysis answers the research question. The second part discusses the main observations from the analysis by relating these to existing theory and the challenges as presented in the introduction and theory sections. The final part will present a summary of the discussion.

ii. Answering the research question

This part aims to discuss how the analysis answers the research question and the overall purpose of this study. The mission and goal of the study is to understand how sustainable environmental thinking and data is reflected in financial tools in corporations that have a significant impact on the environment.

Research question: How are financial decision-making tools and sustainable thinking connected in Norwegian corporations?

Our study reveals an acceptance and knowledge of the need for connecting financial decision-making and sustainable thinking from finance and sustainability professionals. However, we observe limited use of formal frameworks for identifying environmental factors and quantifying benefits and costs from those factors related to capital investments. In addition, we observe limited use of sustainability adjusted capital budget tools, which we argue relates to the lack of knowledge of those tools. At the same time, our cases are initiating capital investments aligned with their sustainability strategy. Which might be a consequence of increasing focus on sustainability in these organizations. Our findings indicate that organization culture and structure influence the organization's focus on sustainability, which align with Stubbs & Cocklin (2008) in order to attain sustainability on the firm-level.

However, we identify several challenges that prevent companies from fully connecting financial decision-making tools and sustainable thinking. The identification process appears to be affected by challenges with environmental data. Combined with the complexity of how this connects to nature, these seem likely to prevent the companies from including more environmental factors in their financial evaluation processes. The quantification of benefits and costs only includes obvious financial benefits such as new revenue streams and price premiums, in addition to the highly discussed cost of CO2 emissions. The benefit of talent retention is mentioned in one of the interviews and specified in the ROSI framework, but not quantified in the financial evaluations. We question whether the nature of benefits from talent retention being less tangible than, for instance CO2 emissions, are preventing the companies from including such factors. If that is the case, what about other environmental factors included in sustainable reporting? Water consumption and waste are highly tangible because these are measurable variables. However, these are not impacting the financial statement beyond the potential fees and handling costs associated with them.

Consequently, our study provides an understanding of how the cases connect financial decision-making tools and sustainable thinking. At the same time, we raise challenges preventing the companies to facilitate a stronger connection and improved incorporation of environmental factors in their financial evaluation.

iii. Discussion of findings

In this part, we discuss the main observations from the analysis enlightened by existing theory and the challenges raised in the introduction and theory sections. Based on the challenges presented in observation 2 and limitations in observation 3, we believe the presented process frameworks in table

1 can be highly relevant for enabling companies to improve their identification of environmental factors. Based on observation 4 we believe the presented sustainability adjusted capital budget tools in table 1 can support the companies to properly allocate capital considering both sustainability and profit. We raise four challenges we believe prevents the companies in order to fully connect sustainability thinking with financial decision-making.

The Externality Challenge

The companies include several environmental factors in their sustainability reporting and strategy, but do not reflect these in the consideration of capital investments. Whether a factor is impacting the financial statement or not highly varies. Some of them are externalities (Kimbrow, 2013) which do not affect, some are fully affecting and other may partly affect the financial statements. Kimbro (2013) states that quantifying externalities can be challenging, and only externalities that are expected to be internalized, by legislation or other reasons, should be considered in the evaluation of the capital investment. One of the companies, Yara, is looking ahead towards the implications government regulations such as EUs new regulations Fit for 55, where one of the policies involves a higher CO2 emissions pricing. By adapting their processes with stated strategy of decarbonization, Yara is internalizing the externality as something that they believe will come, and in this way making it a future competitive advantage.

Dascalu et al. (2008) concludes that, by including external environmental costs in managerial accounting, this can guide the corporation in maximizing the long-run profitability considering environmental effects. We believe it is important to understand the whole impact of an environmental factor. For instance, Skanska is creating CO2 emissions from their fossil fuel machinery. The cost of fuel is clearly impacting on the financial statement as we assume they are paying for this themselves. CO2 emissions rarely affect a company's financial statement without a specific tax or quote system. However, a focus on sustainability actions such as reduction of CO2 emissions might trigger talent attraction, which can enable a benefit in lower employee turnover cost directly on the financial statement (Atz et al., 2021). For this example, we would argue that the fuel has a high impact, the CO2 emissions have a low impact and employee attraction would be closer to high impact on the financial statement. However, regardless of whether a company includes all impact of CO2 emissions the planet still gets impacted. Hence, whether an environmental factor is an externality or not may not be important after all, but this may influence the management's ability to recognize the environmental factor. Consequently, we raise the externality challenge as a potential reason for limiting corporations' identification of environmental factors. On the other hand, the different classifications (BREEAM, CEEQUAL) and green bond frameworks are specific regarding which factors to consider in order to reduce the externality challenge. Anyway, we propose that the inclusion of environmental factors should be linked to the corporations' sustainability strategy and included, if necessary, regardless of the nature of external or internal. In our opinion, this will to a larger extent motivate management for sustainable solutions.

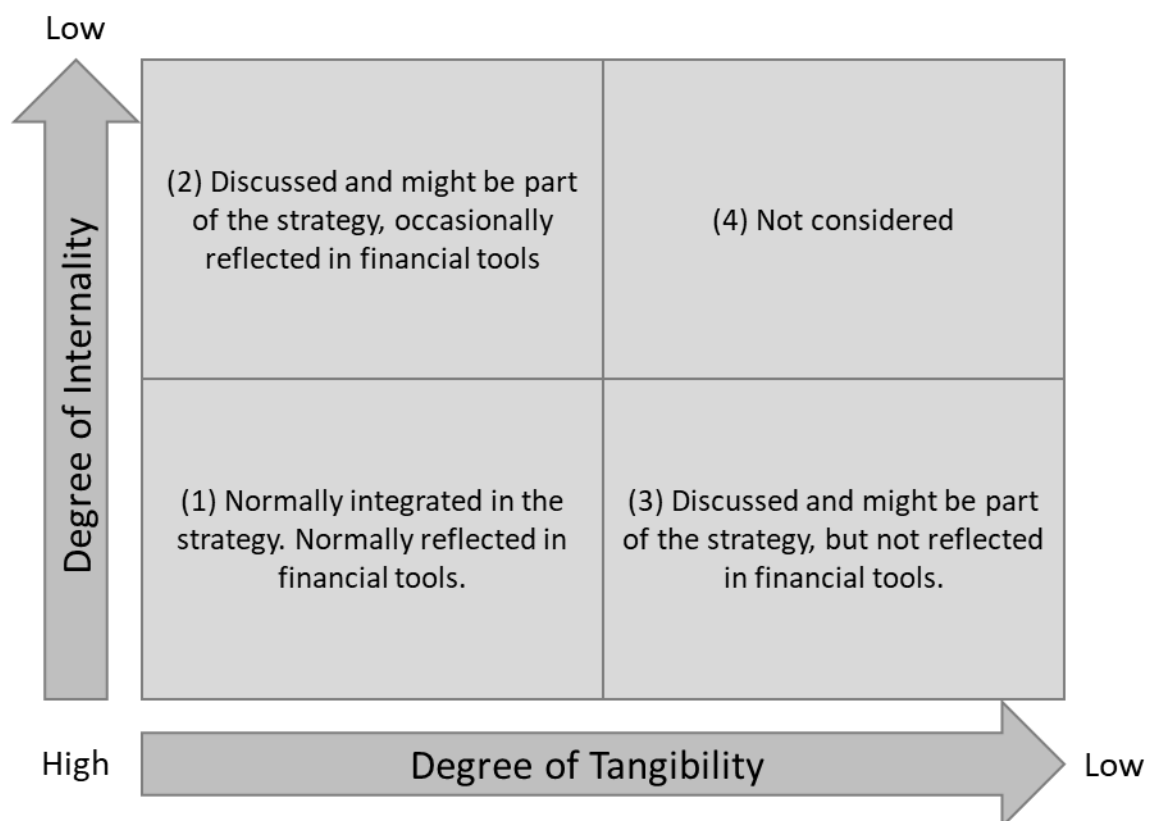
The Tangibility Challenge

The tangibility challenge is based on the lack of identified quantification of benefits and costs for additional factors presented by the ROSI framework. The environmental factors degree of tangibility makes it challenging to quantify a financial benefit or cost. Measuring fuel consumption, waste generation and CO2 emissions per ton are tangible measures, even though the CO2 emission data can have some challenges. Measuring employee attraction is less straightforward despite its clearer impact on the financial statement. The challenge with tangibility in sustainable projects has previously been discussed by Musial (2019), who concludes that a real option approach is suitable due to the nature of less tangible value and the challenge to capture that value. This involves considering

different cash flow scenarios over time aligned with different probability. As we discussed earlier, the ROSI framework includes several low tangible factors; greater customer loyalty, better employee relations, more innovation and better media coverage. By including those factors, they increase the probability of the company to consider those in the evaluation. Based on our findings, we find it reasonable to raise the degree of tangibility as a factor preventing companies from integrating environmental factors in financial decision-making.

Based on our observations 2 and 3, we propose to categorize environmental factors based on the degree they impact financial statements and the degree of tangibility. In figure 1, we have presented what we call The Internality & Tangibility Matrix. We propose the following categorization: 1) factors with high impact and tangibility, 2) factors with low impact and high tangibility, 3) factors with high impact and low degree of tangibility and 4) factors with low impact and tangibility. We believe group 1 is the easiest factor to consider in financial evaluation and should be expected to be included in accordance with the existing capital budget tools. Group 2 and 3 are slightly more challenging, due to their limits caused by externality and tangibility. Group 4 are challenging to quantify and with a low impact on the financial statement the motivation for quantifying this factor might be low or missing. We believe this categorization can provide management with more awareness for the underlying challenges of including environmental factors in financial evaluation and help to improve the implementation of a formal framework for this identification process. In our opinion, this can contribute to decreasing the potential negative effects from the externality and tangibility challenges.

Figure 1 – The Internality & Tangibility Matrix



The Complexity Challenge

Former studies have stressed complexity to prevent the recognition of sustainability in financial valuation (Haessler, 2020). Louche et al. (2019) stressed that climate changes are material over a long period, and consequently are not understood by short-term view in the financial market. This was

later supported by Eckerle et al. (2020a)'s study on earning calls. Entra and Veidekke stressed the challenge of aligning financial and sustainability reporting. Entra points out the challenge of interpreting the EU taxonomy requirements, due to variations in a national and international context. Veidekke raised the challenge of lagging, accrual and inconsistency in sustainability data which increases the complexity. Skanska pinpoints the challenge with correct sustainability data, as the current emission calculations are to an extent flawed due to discrepancies in data quality.

All companies express the same challenge of collecting CO2 emissions data from their suppliers. The main reasons being missing data due to lack of transparency, data quality and data time lag. Developing targets and measures without understanding this complexity may cause the company to make investments that damage their sustainable performance. Yara's use of cooling water, as described above, stresses the need to fully understand the impact of an environmental factor when developing targets and measures. We believe the complexity challenge may prevent companies from initiating measures and implementing these as performance indicators in capital budgeting. Based on observation 1, we recognize that cross-organizational cooperation can be an important trigger to improve understanding of the complexity. Making people with different knowledge and areas of interest work together is important since sustainability is a challenge across different disciplines. In addition, all the companies are focused on cooperation across the value chain. This seems to be fruitful in several dimensions to support an increased understanding, like understanding the customers' needs and knowledge about and access to the newest technology.

The Knowledge Challenge

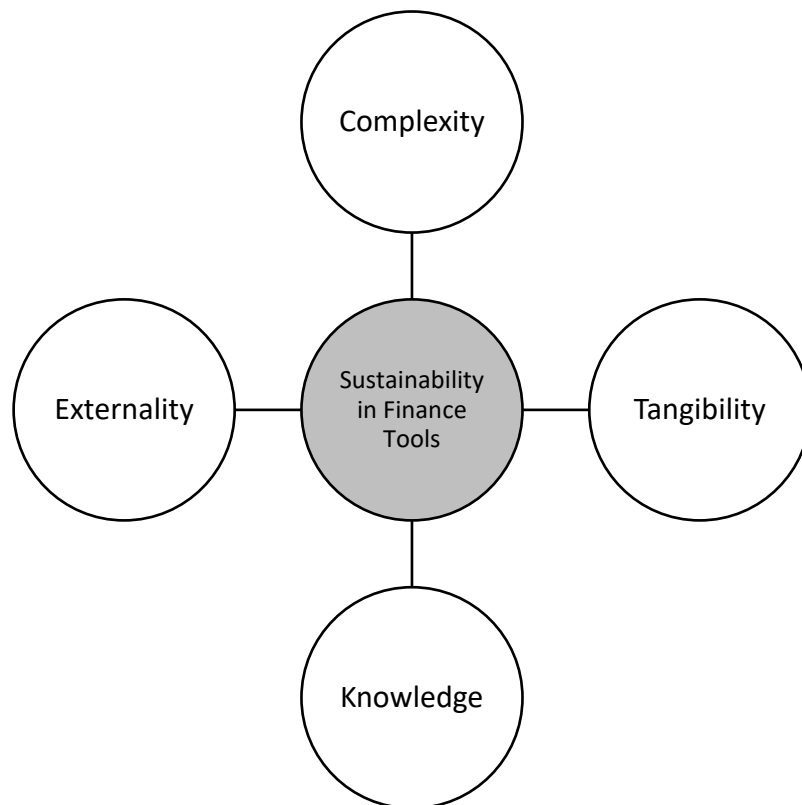
The only sustainability adjusted capital budgeting tool we find evidence of is the use of internal cost on CO2 emissions, which is supported by academics (Epstein & Buhovac, 2014; Louche et al., 2019) and other organizations (Metzger et al., 2015; TCFD, 2017). A potential challenge preventing companies from implementing such tools might be the lack of knowledge. Knowledge about tools such as the NPSV (Liesen et al., 2013) and SCNPV (Kimbrow, 2013) seem to be limited. On the other hand, internal cost on CO2 emission has been heavily discussed the last decade. CO2 emissions might suffer from the externality challenge discussed above. Montiel & Delgado-Ceballos (2014) raise the challenge of academics not effectively informing management practitioners about sustainable development. Sustainability reporting has significantly developed over the last decade (KPMG, 2022), which is reasonable to believe is increasing the awareness of the companies' effect on the environment. Development of standardization regarding environmental data reporting combined with technological improvements, that enable better measurement of environmental data, might increase the knowledge in the organization. Consequently, it is reasonable to assume that the knowledge challenge will decrease over time. Also, when the process of producing sustainability reports becomes more efficient, the desire and motivation for understanding how to implement this in capital budgeting will in our opinion increase.

Do we need formal frameworks?

We have presented four challenges that affect how the company connects sustainability in their finance tools, as presented in figure 2. We believe this raises the important discussion of the need for formal frameworks systemizing the process of identifying environmental factors and the benefits and costs related to capital investments emerges. Despite the lack of evidence of such among our case companies, the companies are clearly making decisions that improve their sustainability performance. Epstein and Buhovac (2014) argue that sustainability demands urgent attention due to 1) regulations, 2) community relations, 3) cost and revenue imperatives and 4) societal and moral obligations. The former involves stricter regulation and consequences of violation. Community relations and goodwill from society are critical for some companies. Cost and revenue imperatives involve discovering

opportunities emerging due to the transition towards more sustainable solutions. The latter focuses more on personal responsibility. We believe these four arguments are valid for financial tools, due to the rapidly changing environment we are operating in. New regulation is continuously considered and legislated. Society's climate agenda can also change rapidly. Consequently, customer demand can change rapidly, and technological development is progressing. We believe a formal framework will reduce the risk for a company of missing out on any of these factors that should be considered when deciding on capital investments. Former studies support the idea that implementing a framework enables the companies to discover new opportunities and factors highly relevant for their operations (Epstein & Buhovac, 2014; Eckerle et al., 2020b; Atz et al., 2021). Montiel & Delgado-Ceballos (2014) question whether scholars or business practitioners should set the standards for CS. In our opinion, this question is irrelevant because we are facing the same environmental challenges with a desire to find solutions. There is a need for scholars and business practitioners to cooperate in order to identify and implement the best practices. How this should be done in order to make the application of the models in scientific papers more accessible for the companies should be a subject for future research.

Figure 2 – Challenges impacting corporations' ability to connect sustainability in finance tools



Do we need sustainability adjusted capital tools?

Considering sustainability adjusted capital tools, the actual need for such tools should be discussed. In observation 4, we found limited use of such tools. We identified different push and pull effects that appear to enable the companies to make capital investments supporting their sustainability targets without the use of such tools. However, following Kimbro et al. (2013)'s argumentation, we should expect companies to be missing out on important decisions and perform even better if they adapted such tools in their decision-making. Kimbro (2013) stress the risk of traditional capital budgeting tools creating a bias against the best sustainable solutions, and consequently recommend the use of SCNPV. Epstein & Buhovac (2014) argue for implementation of an internal cost on waste in order to motivate

managers to reduce waste. Liesen et al. (2013) states that their NPSV is an addition to the traditional NPV in order to help improve decision-making. The neoclassical perspective in traditional capital budget tools have been criticized for not favoring sustainable investments due to shareholder value maximization (Friedman, 1962), the short-term view (Louche et al., 2019) and the Modigliani-Miller arbitrage principles desire for predictable future earnings (Modigliani & Miller, 1958; Louche et al., 2019; Eckerle et al., 2020a), where we particularly have stressed the sole focus on capital efficiency as a challenge. The NPSV is calculating the efficiency of other resources in addition to capital. The SCNPV reflects the sustainability risk of the investment. Internal cost on CO2 emissions, waste or other environmental factors will incorporate effects on the cash flow estimates.

Consequently, in our opinion, the sustainability adjusted capital tools directly face the challenges with capital efficiency and shareholder maximization by incorporating the efficiency of other resources. In addition, this gives management an improved basis for evaluating the performance differences in alternative investments. This may be crucial if the company must choose between capital investments. The nature of uncertainty is challenging to solve in these models, especially considering the externalities such as environmental regulations. However, this risk may be decreased by formalizing the identification process as discussed above and using a real option approach (Musial, 2019) together with the sustainability adjusted NPV models. The short-term view may not be directly solved in these tools and is more likely a subject to the organization culture and strategy. We question whether the missing use of such tools is related to lack of knowledge about these tools or due to difficulties obtaining data required to use these tools. However, this is beyond the scope of this study. We believe the connection between implementation of sustainability adjusted capital tools and sustainable and financial performance should be subject to future research.

iv. Summary of discussion

We have raised four challenges, as presented in figure 2, that can lead to limited reflection of environmental factors in capital budgeting: 1) the externality challenge, 2) the tangibility challenge, 3) the complexity challenge and 4) the knowledge challenge. The externality challenge may prevent the corporation acknowledging that a potential benefit or cost from environmental factors is relevant for their potential capital investments. The tangibility challenge may prevent the corporation's ability to quantify potential benefits or costs. The complexity challenge stresses the need for corporations to fully understand the effects from their environmental factors. The knowledge challenge may hinder management from implementing the sustainability adjusted capital tools today, but we argue this to be a temporary challenge. We have argued the importance of categorizing environmental factors and formalizing a framework for quantifying the benefits and costs related to capital investments in order to consider the effects from these challenges. The Internality & Tangibility Matrix, presented in figure 1, presents the categorization of environmental factors. Finally, we argue that the sustainability adjusted capital budget tools present adjustments mitigating some of the critics for traditional capital budget tools.

7. Conclusion

Sustainability is on top of the agenda in Norwegian companies due to the implications it poses for the future of the companies' competitiveness. The importance of proper allocation of capital to support the transition towards a more sustainable society has never been more important. Traditional financial literature has been criticized for not supporting, and rather preventing this need. Based on four cases of Norwegian companies, we present six observations in order to understand how financial decision-making tools and sustainable thinking are connected in Norwegian corporations.

1) acceptance and knowledge of both finance experts and sustainability experts

- 2) organization culture and structure triggers motivation for focus on sustainability
- 3) limited formal frameworks for the identification process of environmental factors for capital investments
- 4) limited quantification of benefits and costs from environmental factors for capital investments
- 5) limited use of existing sustainability adjusted capital budget tools
- 6) limited knowledge of sustainability adjusted capital budget tools

Based on these observations we find a connection between financial decision-making tools and sustainable thinking. All the cases in this study have a clear sustainability strategy, which seems anchored in the organization. However, we are only able to reveal a formal framework for identifying environmental factors for capital investments in Yara. On the other hand, all cases seem to have a clear delegation of responsibility and environmental factors are identified to a certain degree. Regarding quantification of benefits and costs, we are only identifying the use of internal cost of CO₂ emissions, price premium and new revenue streams. Internal cost of CO₂ emissions is occasionally used in Veidekke and is a formal requirement for investments over a certain monetary threshold in Yara. In Yara, they also include price premiums and new revenue streams. New revenue streams are also an enabler for some of Entra's capital investments. All cases have quantitative requirements for benefits and costs, and they use traditional financial tools, like NPV, ROI, payback and ROCE for decision-making.

We believe there are possibilities to further develop this connection by an improved integration of environmental factors in their financial tools. We raise four challenges we believe reduce this integration; 1) The externality challenge, which reduces the probability of including environmental factors that are not affecting the financial statement. 2) The tangibility challenge, which reduces the probability to include these factors due to the challenge to quantify their financial impact. 3) The complexity challenge, where the challenge of fully understanding how the company's operations affect the environmental factors and vice versa reduces the probability to initiate measures and considering the factors in decision-making. 4) The knowledge challenge that raises the question of whether lack of knowledge about existing sustainability adjusted financial tools prevent the companies in implementing such tools.

We believe companies should implement a formal process framework, like those identified in table 1, to reduce the potential negative effects of the raised challenges. In addition, the companies should consider incorporating a formalized process to secure consideration of the different groups of environmental factors as presented in the Internality & Tangibility Matrix in figure 1. Further a formal framework should be designed to facilitate cooperation within the organization and with external stakeholders, to increase the probability of understanding the complexities of environmental impact. This, we believe, will lead to internal knowledge exchange across the departments. Combined with a framework including relevant sustainability adjusted capital budget tools, this should reduce the risk of the knowledge challenge. The challenge of externality and tangibility may be partly solved by cooperation and knowledge exchange. However, we believe, in accordance with the presented process frameworks, that environmental factors should be specified. It is important to stress the need to include externalities and intangible factors as presented in the ROSI framework (Atz et al., 2021). The frameworks by Azapagic (2003) and Kimbro (2013) should be extended to include externalities. Not to restrict the inclusion of those specific factors, but to make sure they are included with potentially other factors. This should also be supported by the data from EPD, LCA or LCC in accordance with the process frameworks presented by Azapagic (2003) and Kimbro (2013). Finally, we

recommend companies to consider the inclusion of sustainability adjusted capital budget tools as presented in table 1. This will enable a full connection of sustainability thinking and financial decision-making tools by incorporating the efficiency of other resources in addition to capital and improve the companies' ability to allocate properly between capital investments considering both sustainability and financial performance.

Further research

This study suggests several topics for future research. First, this study includes four cases, which limits the possibilities for generalization. We encourage more studies – both quantitative and qualitative to investigate this research question. This study only includes some of the largest corporations in Norway, which may not be representative for smaller corporations. In addition, a broader inclusion of industries might reveal other findings. It would be of great interest to perform an embedded case study with multiple units of analysis covering different roles and departments within the organization. This could further examine the organizational culture and structure effects on motivation for sustainability as discussed in observation 1. Interviews with different department roles and experts can help us improve the understanding of the cooperation's effect on the complexity and knowledge challenge.

Another subject to examine further is the integration of sustainability adjusted capital budget tools. What competence and roles are necessary, and how should it best be organized? Which data sources should be included? How should these tools be integrated in ERP (Enterprise Resource Planning) systems and other systems, to reach full potential for both sustainability and financial performance?

One topic of research is following up companies that have implemented such tools to see if this has led to improved sustainable and financial performance? This will potentially help scholars with identifying the best practices for integrating sustainability in financial tools.

In the end, we hope this research will put integration of sustainability in financial decision-making tools on the agenda for corporations. We look forward to future studies investigating implementation of such tools to their full potential.

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9. APPENDIXES

i. Appendix 1: Interview Guide

Questions	Follow-up questions
Part One – Introduction (5 minutes)	
Introduction of ourselves and the project	<ul style="list-style-type: none"> Name, age, where from, school, work Introduction of the thesis topic
Introduce yourself	<ul style="list-style-type: none"> Your role and responsibility in the company How long have you been working in the company? Description of the company's organization of the relevant departments
Part Two – Interview questions (40 minutes)	
Company's sustainability strategy, goals (10 minutes)	
What is the company's sustainability strategy?	<ul style="list-style-type: none"> Which environmental factors are most material to the company and stakeholders? How does the company address these issues in its business strategies? Following a specific framework for this identification? Who is responsible for this process? (role/department) Teams crossing the departments?
What are the company's environmental sustainability goals?	<ul style="list-style-type: none"> Specific measures/KPIs for the material environmental factors? How does the company collect environmental data? How does the company report this environmental data internally and externally?
Monetizing and calculating the value for the decision (10 minutes)	
How does the company consider the financial value of the decision?	<ul style="list-style-type: none"> Formal framework? Required calculations to be used? Are the material environmental factors considered here? E.g., calculate the efficiency of environmental variables together with capital? How does the company handle risk? Who is responsible for this process? (role/department)
Benefits that drive financial value from decisions (10 minutes)	
How does the company identify potential benefits that drive financial value from decisions?	<ul style="list-style-type: none"> Formal framework/business case? Are the material environmental factors considered here? Who is responsible for this process? (role/department)
Quantification of benefits and costs associated with decisions (10 minutes)	
How does the company quantify the benefits and costs associated with decisions?	<ul style="list-style-type: none"> Formal framework? Requirements for estimates? Are the material environmental factors considered here? Use any environmental data? Who is responsible for this process? (role/department)



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