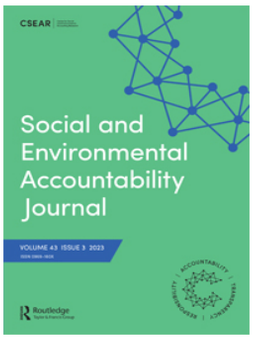

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Taking Carbon into Account in Capital Budgeting: A Field Study of Municipal Energy Companies in Finland

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ABSTRACT

Climate change represents a fundamental challenge for human societies. The use of fossil fuels (e.g. coal, oil, gas and peat) in industry, transportation and energy production plays a substantial role in accelerating global warming. This qualitative field study draws on interview data to explore how Finnish municipal energy companies, which are often dependent on fossil fuels, take carbon into account when planning long-term investments. The study focuses on six middle-sized local energy companies, all of which have recently made substantial investments in their power plants. Our results indicate that carbon emissions have emerged as a significant environmental consideration for these organisations. Drawing on the theoretical approaches of institutional isomorphism and epistemic communities, we discuss how different institutional pressures, as well as social and technological carriers of ideas, have influenced the development of practices in the sector. Given the need for a major sustainability transition across the economy, the findings of this study point to the importance of understanding the role of epistemic communities and various carriers of ideas in different settings, as well as of exploring how these elements could be used to accelerate change in key organisational fields.

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capital budgeting; carbon accounting; qualitative research; epistemic communities

Introduction

Anthropogenic climate change is creating fundamental challenges for human societies (Folke et al. 2021; IPCC 2014; Richardson et al. 2023). Alongside the immediate and expected future effects of global warming, the various political decisions and policy programmes seeking to mitigate it have brought about new requirements and increased uncertainty for business organisations. A substantial number of political initiatives relate to the aspiration to curb the constant increase in carbon emissions across the globe. These prominent societal aims have tangible consequences for enterprises in general and industrial corporations in particular. Within the European Union (EU), many

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companies are included in the EU Emissions Trading System (EU ETS), which mandates that they report their carbon emissions to the authorities on an annual basis, acquire emission allowances either through free allocation or from the market, and eventually pay additional fees should their annual emissions exceed the allowances they surrender in due time (Bebbington and Larrinaga-González 2008; Garcia-Torea et al. 2022; Schiemann and Sakhel 2019). Moreover, organisations are also expected to alter their processes so as to become less emission intensive. An essential part of this change happens through investments in new, more efficient and environmentally less harmful technologies and production processes.

A key driver of the carbon emissions of industry is high energy consumption (Cadez and Guilding 2017). For a very long time, decision-making in organisations has been driven by economic rationality; consequently, most choices concerning energy use and fuel sourcing have been steered towards the least expensive available fuels and energy technologies. However, in many societies, including Finland, where this study was conducted, various climate-related policy programmes and political decisions now affect business through new criteria for decision-making concerning energy use – those related to carbon intensity and climate change (Thomson and Charnock 2022; Vesty, Telgenkamp, and Roscoe 2015). Despite this, there is relatively little research on how corporations and their managers take these types of environmental issues into account in their decision-making processes (Bebbington et al. 2021; but see Bui, Wang, and Tekathen 2024; Mikes and Metzner 2023).

Therefore, with this study, we seek to shed light on the field-level dynamics related to evolving practices of integrating carbon and climate change into capital-investment planning. The qualitative data for this field study came from interviews conducted at six middle-sized municipality-owned local energy companies in Finland. Each of these companies produces heat and power for local businesses and households. In Finland, municipal energy companies such as the ones we examined have traditionally been heavy users of fossil fuels (oil, coal, gas and peat), thereby causing substantial amounts of greenhouse gas emissions.

Analysing this sector is a useful opportunity to understand how carbon considerations feature in investment planning since the firms in question are heavily dependent on long-term investment decisions; therefore, investment planning plays a key role in their success. Furthermore, it is typical for these companies to make investments that are notably large relative to the size of their balance sheets. The sheer volume and significance of these investments, which might entail constructing new power plants or refurbishing old ones, also imply that it is usually difficult to reverse such decisions or make fundamental changes to the projects they initiated over their life cycle, which often exceeds 30 years. The six companies we investigated have all recently made substantial investments, which is why we selected them as suitable cases.

The aim of this explorative field study was to determine how environmental matters in general and carbon emissions in particular are considered during capital-budgeting and investment decision-making. In addition, we sought to create a meaningful interpretation to explain the similarity in the practices of energy companies. The latter aim emerged over the course of our empirical investigation as we started to come across similar practices in different organisations. The study asked the following two research questions:

1. How do carbon emissions feature in the capital-investment planning of municipal energy companies in Finland?
2. Why are the investment-planning practices of these energy companies so similar?

By focusing on these research questions, we make two main contributions. First, concerning the relatively understudied area of environmental management accounting (Bouten and Hoozée 2022; Järvenpää and Länsiluoto 2016; Mikes and Metzner 2023; but see Baker, Gray and Schaltegger 2023), our results show how carbon considerations feature in capital budgeting in a set of middle-sized firms. Given that investment planning has not received much attention in the sustainability accounting literature, this article advances our knowledge of how the growing relevance of climate change influences investment planning; hence, it sheds light on the interplay between financial and environmental matters in relation to a core organisational function of capital-investment planning (Bennett and James 1998; Deegan 2008; Huikku and Lukka 2016; Steinmeier & Stich 2019). Second, to interpret the findings of our study, we draw on two theoretical approaches – institutional isomorphism (DiMaggio and Powell 1983) and epistemic communities (Himick and Brivot 2018). This allows us to provide new insights into the field-level dynamics of evolving carbon accounting practices (Ascui 2014; Bui, Wang, and Tekathen 2024; Kazemian et al. 2021). Therefore, our results help us consider the significance of different social and technological carriers of ideas (Haas 1992) as we seek to understand why the practices of a given sector tend to change or remain stable.

The remainder of the article is structured as follows. In the second section, we briefly introduce previous studies of capital budgeting and investments and the role of environmental aspects in such investment processes, as well as relevant sustainability and carbon accounting research. The third section describes the theoretical framework, while the fourth one focuses on the data and methodology. The fifth section presents our empirical findings, with the final section containing the discussion and some concluding remarks.

Literature Review

Investments and Capital Budgeting

Questions of capital budgeting and investment decision-making have for a long time been at the centre of business scholarship. Theories concerning investments originated in the need to find answers to the basic problems of microeconomics, such as finding ways to use scarce resources efficiently and rationalise how markets seek balance. By the 1950s, the methods of investment analysis were well developed and widely used in business education (Bromwich 2007). The management accounting literature on investments is diverse and employs a range of approaches, including focusing on the use of information in decision-making based on experimental research designs (Hirsch, Reichert, and Sohn 2017), utilising survey data (Abdel-Kader and Dugdale 1998) and exploring strategic investment decision-making through case studies (Carr, Kolehmainen, and Mitchell 2010). However, recent work by management accounting researchers has shown that practices of investment decision-making in real-life organisational settings have received limited attention, especially in small and medium-sized enterprises (see Morales Burgos, Kittler, and Walsh 2020).

According to existing research, managers often use several investment appraisal methods simultaneously, and the results of these different analyses complement each other in decision-making (Abdel-Kader and Dugdale 1998). Recent case studies have focused on post-investment analysis, which, interestingly, has long remained an understudied part of the investment process. Huikku (2007) and Huikku and Lukka (2016) noticed that even when companies have developed sophisticated investment processes and employ several calculation models (e.g. net present value [NPV] and internal rate of return [IRR]), they very often neglect the post-completion audit of their investments. This means that they give up substantial opportunities to learn from past experiences and potential failures. Given the rising significance of sustainability issues, including climate change, for organisations and their decision-making, we see another gap in the literature with regard to the role of environmental considerations in investment decision-making processes. Therefore, this study set out to explore the evolving practices related to how carbon emissions feature in organisations' capital budgeting and investment choices.

Carbon Accounting

In general terms, within the realm of accountancy, carbon accounting can be seen as a subset of the broader sustainability accounting scholarship, which has developed rapidly over the past few decades (see Bebbington et al. 2021). Carbon emission reductions have become a key objective of environmental policy programmes across the world, even though global climate negotiations have not always proceeded smoothly (Thomson and Charnock 2022). The significance of climate change is also reflected in sustainability accounting research, in which carbon accounting has recently evolved into a specific area (Bebbington and Larrinaga-González 2008; Charnock, Brander, and Schneider 2021).

Carbon accounting is a complex field with multiple meanings; neither the terms used in it nor the practices implemented can be assumed to be uniform across different settings. In some contexts, carbon accounting can primarily refer to the scientific practices of measuring greenhouse gas emissions in the atmosphere; in others, the focus might be on the political processes aiming at controlling emissions and carbon sinks as agreed at the national or supranational level. Elsewhere, carbon accounting links to the market-enabling processes related to the creation of a carbon credit (Ascui and Lovell 2011). In other words, when speaking of carbon accounting, we could be focusing on physical metrics, political processes or market mechanisms, to name but a few possibilities (Ascui 2014). Therefore, it is necessary to provide sufficient detail to allow the positioning of a given study in a specific context. In this article, our primary interest is understanding how carbon accounting features in organisational practices; hence, we position our study in the accounting scholarship that focuses on carbon emissions and climate change (e.g. Ascui 2014; Bebbington and Larrinaga-González 2008; Bui, Wang, and Tekathen 2024; He et al. 2022).

Within the accounting scholarship, research on carbon accounting is diverse. In a recent literature review of corporate carbon accounting, He et al. (2022) identified four major strands of discussion: carbon disclosure, carbon management, carbon performance, and carbon assurance. Other scholars have presented similar themes, although with slight

variations in the exact categories and emphases (e.g. Ascui 2014; Charnock, Brander, and Schneider 2021; Stechemesser and Guenther 2012). It is worth noting that similarly to sustainability accounting research in general (Bebbington et al. 2023; Cho et al. 2015), carbon accounting research is also dominated by studies focusing on corporate disclosures (Borghei 2021; Garcia-Torea et al. 2022), with the CDP database being a popular source of data in this area (e.g. Ott & Endrikat 2023; Schiemann and Sakhel 2019). At the same time, and again similarly to the broader domain of sustainability accounting (Baker, Gray, and Schaltegger 2023; Garcia-Torea, Larrinaga, and Luque-Vílchez 2023; Hopwood 2009; Laine forthcoming), there remains a relative paucity of qualitative research on organisational practices. Hence, there have been calls for further studies that can provide intra-organisational insights into carbon accounting (Hartmann, Perogo, and Young 2013; but see Bui, Wang, and Tekathen 2024 and Mikes and Metzner 2023).

Accordingly, this paper could be positioned within carbon management accounting research, which we would describe as being interested in how organisations take carbon information into account in their (financial) decision-making processes. Prior work in this area can be divided into two bodies of scholarship. First, there has been a substantial amount of research based on case studies focusing on the various tools and potential technical issues related to the calculation of carbon footprints for different products and services (e.g. Schaltegger and Csutora 2012). While interesting, this stream of research has limited bearing on the present article. The second body of scholarship tries to explain evolving corporate and managerial practices with the help of organisational theories (Ascui 2014). In a relatively early contribution, Vesty, Telgenkamp, and Roscoe (2015) presented an interpretive case study based on the sociology of quantification in which they explained how the numbers relating to carbon emissions gained considerable and permanent visibility in a state-owned water company. The numbers in question were used in the calculation of carbon emission costs. The authors focused on the analysis of internal change in one organisation and the agency of the carbon number. More recently, several articles have focused on exploring what types of management accounting and control tools organisations employ when seeking to engage with carbon and climate change. For instance, Mikes and Metzner (2023) conducted a field study to investigate how management control tools are utilised in managing decarbonisation strategies in large European firms. Bui, Wang, and Tekathen (2024) drew on field-study evidence from New Zealand to analyse how companies make use of carbon toolmaking in seeking to engage with climate change and develop their strategies concerning it. Furthermore, in another study based on field data from New Zealand, Bui and de Villiers (2017) looked at carbon management accounting in the context of business strategies and climate risk exposure. They highlighted how firms design and use different types of carbon accounts to support internal decision-making and coordinate action across organisational functions. Taking a different methodological approach, Kazemian et al. (2021) reported survey data showing divergent carbon management accounting practices in Australia's high carbon-emission industries. However, despite there being considerable interest in several areas at the interface of accounting and carbon, we maintain that research investigating carbon management accounting with an organisational approach remains relatively scarce. Also, it is evident that the question of capital budgeting has mostly been overlooked (Hartmann, Perogo, and Young 2013).

Therefore, despite rapidly increasing interest, there is clearly a need to better understand the field-level dynamics related to the evolving practices of carbon management accounting in general and investment planning in particular (see Garcia-Torea, Larrinaga, and Luque-Vílchez 2023). Accordingly, the present article draws on a qualitative field study of Finnish municipal energy companies to provide further insights into how carbon emissions are considered in the capital budgeting decision-making processes of these organisations. Before analysing the data, we will briefly discuss the theoretical ideas of institutional isomorphism and epistemic communities, which will be used in the interpretation of our findings.

Epistemic Communities and Institutional Isomorphism

Institutional theory is one of the building blocks of organisation studies. While a range of theoretical approaches have over the years brought plenty of nuance to the family of institutional thinking (Greenwood et al. 2017), at its core institutional thinking helps us understand how the beliefs and actions of human beings are institutionally conditioned (Meyer and Rowan 1977). A significant early strand of institutional theory is institutional isomorphism, which refers to how organisations in a given field have the tendency to become increasingly similar due to isomorphic pressures (DiMaggio and Powell 1983). Subsequently, other approaches, such as institutional logics, have enriched our understanding of how different social, cultural and institutional factors enable and constrain the actions of individuals and organisations (Ocasio, Thornton, and Lounsbury 2017). For instance, Thornton and Ocasio (1999, 804) noted how human agency is embedded in institutional logics or 'the socially constructed, historical patterns of cultural symbols and material practices, assumptions, values, and beliefs by which individuals produce and reproduce their material subsistence, organise time and space, and provide meaning to their daily activity' within a particular organisation or institutional field.

The formation and maintenance of institutional logics require that individuals exercise agency with regard to both material practices and related vocabularies, language, values, and forms of cognition. Further, while in studies drawing on the institutional logics it has often been highlighted that there is a tendency towards institutional pluralism in many settings, it does not rule out the possibility of isomorphic pressures in some circumstances. For example, an active exchange of ideas and experiences that results in a shared commitment to institutional logics within a group of experts can lead to isomorphism among organisations (Ocasio, Thornton, and Lounsbury 2017).

Relatedly, studies focusing on politics of ideas have paid attention to the role of groups of experts or epistemic communities, and the carriers of ideas that may change or stabilise the shared beliefs in a given field (Haas 1992). Therefore, to critically understand the similarity of practices present among the energy companies we investigated, we draw on the theories of institutional isomorphism and epistemic communities (Wilmott 2015). In previous accounting research, a similar framework has been used to analyse agenda-setting and policy-making processes related to accounting standard setting (Himick and Brivot 2018).

The companies we explored in this study are all part of the municipal energy sector; hence, despite their different geographical locations, they face similar pressures because they operate in the same institutional field. The EU and Finland are creating

coercive pressures by requiring all municipality-owned energy companies to comply with emission trading regulations and be prudent in their investment decisions. Furthermore, all municipalities expect dividends from the energy companies they own, which imposes the same obligation to justify and document investment decisions based on profitability calculations. However, internal organisational practices may still differ across companies. One example is the situated practices of investment planning and the choices concerning capital budgeting decision criteria, as well as the sources of information in economic feasibility analyses. The potential quantification, commensuration and integration of environmental issues into investment planning also remain at the discretion of each company's management.

In general, accounting in the public sector is characterised by developments in which new standards or norms are created at the multinational or national level, and these norms subsequently create pressures on individual organisations to adapt their practices (Modell 2009). At the level of an individual organisation, actors have the freedom to change practices, but only to the extent that the existing institutional logics in the field and the routines within the organisation allow it (Lounsbury 2007; Ter Bogt and Scapens 2019).

Moreover, in companies, management decision-making is usually subject to major uncertainties (Elmassri, Harris, and Carter 2016). Typically, to resolve uncertainties related to the choices of different administrative structures and accounting methods, a firm will select one of the solutions adopted by similar organisations, or it will follow the practices of organisations considered to be the best in the industry. This is the *mimetic pressure* of isomorphism. When management lacks the prerequisites for rational decision-making in finding solutions, the second-best approach is often considered to imitate the practices of other organisations (DiMaggio and Powell 1983; Meyer and Rowan 1977).

Experts and managers working in the same sector usually often communicate with each other, which creates a general understanding of good corporate or industry practices. This *normative pressure*, despite being at times informal, can have a similar effect to that of coercive and mimetic pressures in terms of isomorphism of organisational practices (DiMaggio and Powell 1983; Laine 2009). Notwithstanding the existence of these pressures, in many cases, efficiency is the main criterion for rational decision-making on administrative solutions, which suggests that organisations lean towards decisions they consider optimal for themselves no matter what similar organisations are doing. However, sometimes, one or more of the three social pressures discussed above lead to isomorphic patterns. While favouring similar solutions may seem like an irrational choice when observed from the outside, this might not be the case. Legitimate and generally accepted administrative solutions create trust and can also help an organisation obtain funding.

Heugens and Lander (2009) identified a few moderating mechanisms that may affect the impact of institutional pressures on isomorphic behaviour in an organisational field. According to these authors, the scarcity of alternative templates for organising, the relative isolation of the field from other fields, and the regular interaction of the field's organisations with government agencies may intensify isomorphic pressures. Given the limited evidence on this phenomenon, though, Heugens and Lander (2009) encouraged further research on these moderators of institutional isomorphism, which would be helpful for

understanding field-level dynamics as well as the relative importance of social structures and organisational agency in different settings.

Institutional theory provides us with a useful starting point, but it hardly deals with issues of power or politics (Wilmott 2015), and it does not help us to engage in a more nuanced discussion of these matters. However, it is worth noting that industry decision-makers usually share institutions, interests, and ideas that make organisations' activities and collaboration more coordinated, especially in a relatively small setting such as the Finnish municipal energy sector. Thus, to supplement the ideas of institutional isomorphism, we draw on the notion of epistemic communities, which has been used to highlight the agency of small but cohesive groups in the formation of shared interests, policies and institutions in a social field. Haas (1992, 3) defines an epistemic community as 'a network of professionals with recognised expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area.' The unified thinking in the community empowers the experts, especially in situations that decision-makers find complex and difficult to grasp.

An epistemic community may consist of professionals from different backgrounds but with very similar minds who help decision-makers learn (Dunlop 2013; Haas 1992). According to Haas (1992, 3) the members of the community share 1) a set of normative beliefs and a value-based rationale for social action, 2) causal beliefs regarding the possible solutions to a central set of problems in their domain, 3) intersubjective criteria for evaluating knowledge in their area of expertise and 4) a set of common practices associated with a set of problems. The analytical focus of research on epistemic communities has changed over time from identifying experts as a network of like-minded actors, as well as discourses of expertise and knowledge generation, to investigating the practices that produce authoritative expertise (Bueger 2014). The latter approach analyses expertise in working through its arrangements or epistemic infrastructures and expert technologies, such as statistics, indices and benchmarking or risk registers. In other words, in addition to experts, specific discourses and technologies can also be understood as carriers of ideas, which influence how certain practices or ways of thinking diffuse in a field.

In this study, we looked specifically at how carbon issues are integrated into capital budgeting processes in one field – Finnish municipal energy companies. We found considerable similarity in the practices of the firms we investigated, and we have sought to understand the causes of this phenomenon. To interpret our data, we draw on the two theoretical approaches discussed above (institutional isomorphism and epistemic communities), which provide us with the conceptual resources to examine the investment planning of municipal energy companies. In combination, these tools allow us to scrutinise the actors and artefacts that are shaping the belief system of the field in question.

Data and Methodology

This study focused on six middle-sized municipal energy companies and adopted a qualitative field study design (Ahrens and Chapman 2006; Lillis and Mundy 2005). This design was chosen as our purpose was to understand how investment-planning practices emerged in the organisations in question and explain the dynamics of practice formation across these organisations. In a qualitative field study, relatively few cases are observed in

order to capture the complexity of real life while not compromising the depth required for qualitative research (Lillis and Mundy 2005, 13).

We chose an exploratory method as there were only limited studies on the topic; therefore, we believed it was justified to keep our approach relatively open when entering the field (Covaleski, Dirsmith, and Samuel 2017). Our methodological approach is interpretive as we focused on meaning, have emphasis on studying actors in their natural work settings and made use of analytical induction (Baxter and Chua 2003; Eisenhardt 1989).

To prepare the data collection, we relied primarily on our extensive knowledge of the subject matter as well as on related accounting research, whereas the theoretical frames used for analytical induction (i.e. institutional isomorphism and epistemic community) were defined only during the empirical process based on the interpretation of the observations we made in the field (Lukka and Vinnari 2014). One of the starting points of our interpretative study was the need to respect the views of the interviewees as well as their common sense interpretations of social reality, which was emergent, subjectively created and objectified through interaction. In theorising our empirical observations and interpretations, we sought not only to explain practices but also to understand how new requirements concerning carbon information produced order and continuity in the social context under investigation (Chua 1986).

When selecting our cases, we concentrated on middle-sized companies; we ruled out both the largest and the smallest firms due to their different market positions and organisational characteristics. By looking at 'average' firms in the sector and using multiple sources of data, we aimed to enhance the validity of our study (Lillis and Mundy 2005, 10). Despite some organisational differences, the municipal energy companies we examined are fairly similar in that the combustion process is a central part of their operations; this process creates the heat that is distributed to nearby areas. In Finland, heat production is essential due to the country's cold climate, especially in winter. The six companies we studied have traditionally used coal, oil, gas, wood and peat in varying proportions as their main fuels. Electricity is usually generated as a by-product of district heat production at combined heat-and-power generation plants, but some of the companies are also turning to nuclear power and/or wind energy production by either operating sites themselves or via shared ownership. At the time of data collection, however, these alternative sources played only a marginal role in the firms; hence, they do not feature in this study. In addition to producing energy, some of the companies also maintain the local electricity network.

Regarding the firms' size, we can look at their turnover, number of employees and amount of investments in the fiscal year of 2021. The largest company had a turnover exceeding EUR 200 million, with over 200 employees and EUR 50 million in investments. Two firms belonged to this size tier. The next tier consisted of companies with net sales of approximately EUR 100 million, which employed between 90 and 160 people and had yearly investments of EUR 10–20 million. Three firms were in this size tier. The smallest company had a turnover of EUR 10-15 million, 20-30 employees and investments worth approximately EUR 2 million. As is evident from these figures, the volume of investments was substantial when compared to the organisations' turnover and personnel, which highlights the significance of capital budgeting processes for these types of firms.

We collected data through semi-structured interviews lasting between 45 minutes and one hour. The interviews took place at the organisations' premises, with the exception of

one, which was conducted remotely. One or two researchers visited the sites between March and June 2019. At each company, we sought to interview one person from the accounting and finance function and one from the production or general management, although this was not always possible (see Appendix 1). Relatively standardised data collection was employed to enhance reliability (Lillis and Mundy 2005, 10). The list of themes and questions we were interested in exploring was sent to the informants in advance. Our interview guide focused primarily on a processual view of investments, the objectives and scope of investment planning, and the methods used in capital budgeting (see Appendix 2). The interviews also covered sustainability, with a particular emphasis on environmental aspects and carbon accounting. Furthermore, we enquired about how environmental issues were integrated into the investment planning process and management control systems more broadly. All but one of the interviews were recorded and transcribed soon after they took place. All interviews were carried out in Finnish. Both the interview guide and the quotes included here have subsequently been translated into English by the authors of this paper.

The protocol for analysing the interviews had three main phases. First, after each interview, notes were made and discussed to capture the first impressions. Second, after the data collection was completed, each member of the research group read the interview transcripts and constructed their analytical categories, descriptions and interpretations of the practices. At this stage, the categories and interpretations were emergent, which indicates that we had not chosen our theoretical approach in advance. In the third and final phase, we combined our individual views during a series of discussions to form a shared understanding. At this point, we began to draw on institutional isomorphism; subsequently, we also employed the notion of epistemic communities in our analysis. The field study setting enabled us to produce descriptive results from six organisations in one institutional field, while the above-mentioned theories helped us to compare and contrast the investment planning practices of each company as well as the reasoning behind these practices. In essence, we sought to interpret the investment planning practices and associated thinking in the firms we studied. Interpretation is not about saying the same thing with different concepts; rather, it is about 'the giving of new meanings by interpreting events and data through (or perhaps into) a theoretical frame, which provides insight to the actors in the field as well as to the researchers' (Berry and Otley 2004, 244). The role of theories is to help explain the findings. In our study, this referred in particular to the similarities we observed concerning the capital budgeting practices of the firms in question.

Field Study Findings

Capital Investment Planning in the Cases

In our discussions with the interviewees, it became evident that in general terms, the investment planning processes and applied investment appraisal methods in the six companies were very similar. The same holds for the justifications given for following certain practices. In addition to economic goals, the overarching objectives of each investment included increasing the share of renewable fuels and improving the safety of employees. Furthermore, a highly technological orientation and very long

lifespans were characteristic features of the planning for power plant investments across the field.

Despite these similarities, it became clear that a uniform approach was not followed in all types of investments. For instance, the planning processes for obligatory investments, i.e. those that simply must happen, differed from investments aimed primarily at performance improvements. Examples of such unavoidable investments included incidents requiring technical replacements as well as decisions concerning regulatory changes and requirements. The planning of these types of investments was part of annual budgeting. Concerning the performance improvement investments, which were the focus of our study as firms have more leeway with them, the rationale was usually to seise potential opportunities for enhancing profitability. However, in addition to this financial objective, the companies also aimed to increase the share of renewable fuels they used and improve workplace safety. Planning for such optional investments proceeded in two phases. In the initial, pre-planning one, the needs, ideas, opportunities and options for potential new investments were defined. Given that detailed investment appraisals and scenario analysis took time and resources, only a limited number of options were advanced to the second stage, in which the most promising investment opportunities were more closely analysed based on detailed calculations.

In general, these calculations followed the standard investment appraisal practices described in accounting textbooks, which means that they were based on the costs of the initial investment and the expected benefits over a certain period. These appraisals were based on some key estimates, including the price of electricity, the demand for heating capacity, the efficiency of new technology, the cost of fuel and the estimated price of emission allowances. For municipal energy companies, the planned lifespan of a power plant ranges between 20 and 40 years. During the planning process, investment appraisals were made for the first 10, 15 or 20 years, depending on the firm. The organisations also prepared scenarios for the subsequent years, though these had lower priority.

In all the companies we examined, the investment appraisal methods were the internal rate of return supplemented by either NPV or payback time. The combination of these methods varied. One interviewee explained the following:

> This is our potential option A, which entails that we do not make the investment, and here are the annual costs for this option. Our option B is that we make the investment. The difference between these options shows up in the cash flow, net present value and internal rate of return. Emissions trading is included in all our investments. (Case A, technical manager)

After the planning was completed and an investment approved, the projects were controlled both during and at the end of their life cycle. Project managers were expected to prepare a report near completion. In addition to internal reporting, external reports concerning how the project met its objectives were required when external investment subsidies were used. However, post-completion audits (Huikku 2007) were seldom used in the management control of the organisations we studied.

Among the six firms we investigated, the two largest ones made use of company-wide software (Invest for Excel), with the aim of having it guide and standardise their capital budgeting processes. In some cases, the services and methods provided by consultancy firms were employed to increase the validity and reliability of investment planning.

> Normally, we use ready-made calculation templates, which we have received from planning consultants. (Case F, environmental manager)

The use of consultants and templates signalled the presence of mimetic and normative pressures, as well as carriers of ideas, which play a role in institutional isomorphism (Bueger 2014; Heugens and Lander 2009). Municipal energy companies form a small and specialised field in which informal networks exist and the whereabouts of peers are followed regularly (Hyvönen et al. 2012). Many employees work in the field for extended periods. For example, one of our interviewees said they had worked for the same company 'for way too long – 28 years and counting.' The specialised nature of the industry also means that there are a limited number of consultants working regularly in the field, which amplifies the role of those who shape how practices evolve in these organisations. We should also note the importance of annual meetings such as Municipal Company Day and Emissions Trading Day, both of which feature presentations on sector-specific matters and offer professionals in the field an opportunity to meet and network with colleagues from similar organisations. Emissions Trading Day has been repeatedly organised by the Finnish Energy Authority, with the full-day programme covering both regulatory updates and practical insights provided by experts. These types of events often offer the consultants who are invited to them the chance to give presentations on topics linked to their expertise, which gives them substantial visibility.

The Role of Environmental Aspects in Investment Processes

All the companies in our sample were located in Finland; hence, they had to abide by the same environmental legislation. While the practices related to traditional financial investment appraisal processes were largely similar, there was more variety concerning environmental matters. The organisational practices and the views expressed by the interviewees differed regarding the need to produce dedicated environmental reports on investment planning and processes. In some of our cases, qualitative and non-financial information was considered of lower relevance; thus, investment decision-making was mostly based on financial calculations. In other organisations, environmental considerations were taken into account with the aid of separate non-financial analyses that complemented the economic profitability calculations. In these cases, non-financial and qualitative information were seen as sources of additional information for decision-making.

> Environmental considerations might be brought into the decision-making [process] through qualitative arguments. (Case B, CFO)

> Environmental responsibilities are integrated into the economic decision-making largely through the emissions trading instruments. (Case D, CFO)

When designing its management-accounting practices, a firm can largely focus on the needs arising from inside the organisation. At times, however, there are also external demands that must be considered. In our empirical setting, the companies were expected to provide information on their environmental protection expenditures and related investments for the national statistics compiled by Statistics Finland annually. This caused coercive pressures (DiMaggio and Powell 1983) for the firms to include such information in their data collection. It is worth noting that none of the six energy companies that we examined monitored such environmental expenditures as separate objects in

their internal cost calculation processes. The interviewees stated that they considered the accounting judgements needed for the calculation of such environmental expenditures to be more or less questionable; hence, these aggregate figures were not taken into account in their internal decision-making.

> No, we do not make use of environmental expenditures; there is no such measurement. (Case B, head of energy unit)

> We don't bring environmental matters into our internal financial calculations. I think this would be arbitrary. I am a bit old school perhaps, but in my view, we should only consider real money in operational activities. Emissions allowances, in contrast, have value, so emissions trading is included and serves as a metric. (Case D, CFO)

Instead, the firms focused on a more granular level. The cost of carbon emissions, condensation-water purification and fuel transportation; the latter's emissions; and the efficiencies of different devices were considered in order to provide the necessary information for environmental management. To comply with the statistical requirements of the state authorities, a rough estimate of the company's environmental expenditures and the share of environmental investments in its total investment expenditure was considered sufficient.

> There is a box to tick regarding the share of environmental investment compared to all investments. That means improving our carbon footprint or water footprint in some way. In the template, the options are 0%, 33%, 66% and 100%. (Case B, head of the projects)

During our interviews, it became evident that carbon emissions had emerged as a significant issue for the companies in recent years; as a result, they had also risen to prominence in their environmental management and investment planning processes. With most other environmental matters, such as water discharges and noise levels, the authorities set clear thresholds and criteria to fulfil. However, with carbon, the approach is different due to the EU ETS. Both an increase and a decrease in total carbon emissions have potentially direct financial implications, regardless of the level of emissions the organisation is currently at. Therefore, carbon emissions were taken into account in the annual cash flow calculations on which investment appraisals were based. Likewise, both absolute carbon emissions and various efficiency indicators of the process were monitored during the production phase of the investment. Furthermore, if a company received state funding for an investment, it was mandatory to report the emissions and energy-efficiency indicators to the authorities.

> We have twice received financial support [from the Ministry of Economic Affairs and Employment]. This support requires that those [effects] should happen after two years. (Case E, head of development)

The examined firms presented both similarities and differences in terms of environmental considerations. Regarding the former, information on environmental costs or investments in general as a separate object for control did not seem relevant to management. Instead, environmental costs, especially CO_2 costs, were actively monitored as specific issues related to management's decision-making. There was variation in how environmental issues with no direct cash flow effects were taken into account in investment planning. In some of the companies, the cost estimates of environmental effects were included

in the calculations, while in others, the planning focused only on the direct cash flows caused by the investment.

Having now described how the municipal energy companies that we studied conducted capital investment processes both in general terms and regarding environmental issues, we will discuss carbon emissions, which turned out to play a significant role in the organisational lives of the firms in question.

Estimating and Valuing the Cost of Carbon Emissions

Carbon emissions and related societal practices were relatively novel topics for the firms, which thus faced uncertainty in dealing with them. The EU ETS implies that emissions are a cost item; hence, they need to be managed. However, apart from this, there were only limited knowledge and established practices for the organisations to draw on. For this reason, it is interesting to understand whether the practices followed in the field were uniform and what kind of explanations can account for this situation.

As noted above, the municipal energy firms were interested in following and forecasting their carbon emissions as these had clear financial implications. The fairly standard combustion processes of a power plant represented a good starting point for predicting the carbon emission levels of a site. Carbon-emission measurements and calculation practices were founded on science and applied techniques that enabled sufficiently accurate measurements (MacKenzie 2009). The calculation of emissions could be based on the consumption of a certain mixture of fuels and the known effects of their burning (e.g. heat and various other emissions, also known as emission factors). Following the stipulations of the EU ETS, the resulting data were also externally monitored by independent parties to assure accuracy and objectivity.

> We follow what goes into the plant, and we calculate the emissions on that basis. Obviously, there is also a range of measurements we take constantly. Due to emissions trading, emission verifiers visit us regularly. (Case B, head of energy unit)

Small and medium-sized municipal energy companies operate with limited resources and are not in a position to employ in-house experts to follow all the aspects of carbon markets. Regarding this aspect, the complexity of the EU ETS was challenging for the firms. While it is somewhat easier for large energy companies to navigate the system, smaller firms might not even have the necessary resources to apply for the free emission allowances they are entitled to, even though obtaining these would be financially beneficial for them.

> The system is extremely bureaucratic, rigid and laborious. (Case F, project manager)

> The smaller [energy companies] do not necessarily have the resources to begin that process. They would need to hire a consultant and verifiers, and the timetable is tight as hell. If you know that the benefit will only be two thousand euros, it does not make any sense. (Case E, CEO)

As the relevance of carbon emissions has grown with the development of the European carbon markets, it has become increasingly significant for firms to consider how these markets will behave over the life cycles of investments. However, companies face great

uncertainty when it comes to how carbon market practices, the market prices for emissions, and the regulation of combustion processes will evolve. Concerning these ambiguous variables, the firms in our sample employed mathematical models to forecast expected changes in the demand for municipal district heating, the potential effect of climate change on temperature patterns in the region, forthcoming improvements in energy efficiency, and the limits of different fuels for heating boilers. Alternative scenarios were constantly planned based on estimates of emission volumes and the prices of emission rights.

> We monitor them all the time. We have a meeting every month during which we plan out and play with the decisions. (Case B, head of energy unit)

While the companies had experience creating scenarios for many key variables (e.g. fuel markets in their region and potential technological developments), making credible carbon-related estimates only with in-house expertise was a challenge. Therefore, they typically acquired these estimates from between one and three external service providers offered forecasts of the market prices of electricity, fuels and carbon over 10, 20 and 30 years.

> CO_2 estimate, or how many free [emission] allowances we get now and what we expect to get in 2040. What is our estimate on free allowances? We also calculate emissions based on fuel consumption; then, we estimate the development of CO_2 prices on the basis of the Norwegian report. Base scenarios, together with the high and low alternatives. (Case A, technical manager)

Despite the substantial uncertainty referred to above, the carbon emission prices used in the investment appraisals were notably similar across the companies we studied. This was partly because all the firms obtained their forecast information from the same consultancy companies. The use of such a small pool of consultants and forecast data can be explained by mimetic and normative isomorphism. The annual Emissions Trading Day organised by the Energy Authority of Finland may also have played a role here. The event is attended by a fair number of professionals from municipal energy companies, and the programme usually features presentations and discussions concerning potential developments in emissions markets and carbon prices. Facing uncertainty, firms can seek to cope with the situation by closely following how peers in the field are resolving management challenges (DiMaggio and Powell 1983).

> However, we are involved in the energy industry, which has some relevant institutions. For example, concerning the expected development of the price of emissions allowances, there is the view of the field and that of the energy industry in general. (Case C, head of energy unit)

We conducted our interviews in 2019; at the time, the companies expected the carbon price to increase to EUR 30–40 or even EUR 40–50 per tonne by 2030. At the same time, it was evident that in all companies the managers understood there was uncertainty in these carbon price estimates. However, this uncertainty could be made governable by purchasing information as a consultancy service from a firm whose estimates are used by most companies in the industry. By doing so, the trustworthiness of and the responsibility for this information was outsourced to external experts.

> No one can say what the price of electricity will be in three years, but it is often more certain if we say that this estimate comes from a group of consultants. Sometimes, these private equity investors are international firms that have access to global forecasts, which they use also elsewhere. We have got estimates from there too, which use this as the emission price. [Pause] I wonder how many consultancy firms there might be who would like to sell their estimates for 5,000–10,000 [euros]? Their responsibility for that is zero, but the more often people come across the price forecasts they have fabricated, the bigger their trustworthiness becomes around the world. (Case A, CFO)

As alluded to above, uncertainty was not only related to emission prices. One way of coping with this constant vagueness was to resort to the best available technologies. This was considered a rational approach when the conditions pertaining to emissions trading and emissions prices were expected to become more challenging and when the lifespan of the power plants reached several decades. The companies faced substantial uncertainty also in other matters, such as the allocation of free emissions allowances, the regulation of other climate emissions, the use of technology, and the rules local authorities set for construction permits. Using the best available technologies helped to limit the vagueness concerning a certain issue to questions of how quickly and to what extent the situation would change.

> Emissions go into the air, the water or the soil. [The regulations] come from the legislator. They are very precise and usually demand the best available techniques [BAT] or the most recent good stuff. (Case E, CEO)

By focusing only on carbon emissions and their trading, other relevant environmental issues might be sidelined both in general and in investment appraisal processes in particular. This concern was expressed by some of the interviewees, who thought it was problematic that emissions pricing was limited to carbon emissions. The calculations and emissions trading ignored other harmful gases, such as nitrogen and sulphur oxides.

> All those [gases] do not receive a monetary value. Think about nitrogen oxides. In some large energy plants, they are kept within the emission limits, but in smaller plants, they are not at all within the limits. In a sense, they are not measured, and all emissions are thus allowed. It makes no sense for such a company to mention in an investment proposal the implications of nitrogen oxides when the authorities have no interest in them. CO_2 is the only gas that has a global or European price. It is included in every calculation. Nitrogen and sulphur are mentioned in investment calculations only if the plant has strict emissions limits for them. In that case, we may have to think about whether to invest in a filter for removing the nitrogen or sulphur oxides. (Case A, CFO)

Summary of Empirical Findings

Table 1 summarises the results concerning the inclusion of environmental and carbon considerations in investment planning. A number of actors influenced the shared ways of thinking and harmonised the practices mentioned above.

The investment planning rationales and practices of the energy companies were influenced by a dynamic structure consisting of social and technological elements. Through our empirical investigation we were able to identify some key factors in the isomorphic processes in the field. The most important social structures that conveyed ideas in the field appear to be the various annual events, such as the Emissions Trading Day

Table 1. Shared rationales and carriers of ideas in the municipal energy field

	Rationale; what and how?	Carriers of ideas
Investment planning	– Standard practices with multiple assessment methods. – Key rationales included increasing profitability, increasing the share of renewable fuels and improving employee safety.	– Software and templates to calculate the IRR. – Network of peers, public servants and consultants.
Role of environmental aspects	– Various practices in the field, either monetised and integrated into investment calculations or presented as supplementary material. – Carbon costs were seen as economically relevant, while other environmental costs were not.	– Reporting requirements set by the authorities and state institutions. – Network of peers, public servants and consultants. – Annual meetings as platforms for connecting with peers and networking.
Consideration of carbon costs	– Invest in BAT to decrease carbon emissions and reduce uncertainty. – Use industry models to forecast the demand for energy. – Use valid price estimates.	– ETS and associated infrastructure of monitoring and verification. – Network of peers, public servants and consultants. – Annual meetings as platforms for connecting with peers and networking. – Expert presentations and estimates.

organised by the Finnish Energy Authority, and the active presence of key experts and consultancy services. There were also important technical structures conveying ideas, including special software and planning templates. The small and medium-sized energy companies we examined have had to adapt to a changing social context and regulatory environment; this has contributed in various ways to their practices becoming similar. It should be noted that the same intermediary mechanisms that seemed to uphold and harmonise the thinking and practices described above may also serve, in some situations, to alter such thinking and practices.

Concluding Discussion

As societies have become increasingly (though painstakingly slowly) aware of the gravity of environmental problems, accounting scholars have become interested in sustainability accounting and reporting (Bebbington et al. 2021; Hopwood 2009). However, most sustainability accounting research deals with issues of sustainability disclosures and reporting (Cho et al. 2015; Laine forthcoming), while studies exploring environmental management accounting practices and those using qualitative cases and field approaches are still relatively scarce (e.g. Garcia-Torea, Larrinaga, and Luque-Vílchez 2023; Järvenpää and Länsiluoto 2016; Järvinen et al. 2022; but see Baker et al. 2023). Therefore, the present field study investigated one of the core areas of management accounting – capital budgeting decisions – from an environmental perspective. As noted in our introduction, while there is an emerging literature on how organisations incorporate carbon considerations into their management accounting and control practices (e.g. Bui, Wang, and Tekathen 2024; Bui and de Villiers 2017; Mikes and Metzner 2023), there is a need to better understand how carbon emissions and emissions trading are considered in the capital budgeting and investment planning processes of organisations. Our study has limitations

because it relies on a relatively limited sample and looks at a specific context. However, we believe it makes a number of contributions to the social and environmental accounting literature.

First, this study documented the investment planning practices in the Finnish municipal energy companies. The starting point for planning investments in energy production was usually the opportunity for efficiency improvements offered by new technologies. Energy and heat production, workplace safety and emissions levels are all strongly regulated issues; thus, they set the initial conditions and boundaries for investment planning in the sector. The importance of technology in this industry explains why investment planning was usually carried out by individuals with technical expertise, which limited the role of accounting and financial-management professionals to considerations of financial reporting and financing. Furthermore, specific software and templates for investment planning made it easy for engineers to make economic feasibility calculations by themselves. This relates to an ongoing conversation within the accounting literature regarding the potential (non-)role of accountants in sustainability initiatives (see Rodrigue and Picard 2023). In the field we examined, there seemed to be a role for accounting professionals in planning financing as well as overseeing the correctness of profitability calculations; still, the leading role in investment planning was clearly that of operational and business management, who possessed knowledge of energy production. This finding offers an alternative explanation for why economic calculations may be secondary compared to energy technology investment planning (Moya, Pardo, and Mercier 2011). In addition, given the relatively small size of the companies in the sector, it was normal to use external consultancy firms to access expertise that was not available in-house.

Our results show that carbon emissions have emerged as a significant issue for the companies in question. From an accounting perspective, these emissions are made tangible through the EU ETS, which attaches financial implications to them. We noted that carbon emissions and their associated costs were considered relevant and were closely monitored. Both actual and estimated carbon costs were discussed on a monthly basis in managerial meetings. Moreover, our informants thought that the environmental aspects of the firms' operations would be primarily taken into account by focusing on carbon emissions and their costs. As in Vesty, Telgenkamp, and Roscoe's (2015) study, the carbon numbers in the energy companies we studied were central mediating instruments (see also Jordan, Jörgensen, and Mitterhofer 2013). However, we would caution that the performative nature of accounting may lead to a situation in which the prominence of carbon figures causes other environmental issues to lose relevance. In other words, the metrics on the dashboards and in the management reports are the aspects that receive the attention of management, while the issues that are not visible tend to be overlooked (Hopwood 2009; Miller and Power 2013).

Second, the present study advances the literature on the role of epistemic communities and carriers of ideas in shaping accounting practices (Himick and Brivot 2018). Epistemic communities harmonise practices through their social arrangements and expert technologies. In our case, this entailed investment calculation templates and specific software, annual meetings as platforms for accessing experts and ideas, the requirements of national statistics bodies and state support, and the EU ETS. The Emissions Trading Day organised by the Finnish Energy Authority has had a notable role as a social platform where peers from energy companies, public servants from relevant fields and consultants

can meet to exchange ideas and technologies. The network of experts in the Finnish energy sector has slowly come to a shared rationale that is maintained by using the same investment planning templates and software, forecasts of heat and energy demand, standardised carbon measurement and reporting, and price estimates for energy, fuel and emissions. This rationale consists of making combustion plants profitable by increasing the share of renewable fuels and decreasing emissions through new investments in BAT. As the main criterion for investment decisions is profitability, price forecasts in investment calculations play a crucial role.

The lifespan of power plants is typically considered to be between 30 and 40 years, but investment appraisals estimate the net cash flows for the first 10 or 20 years of the investment and compare the different options based on their NPV or the internal rate of return and payback time. The length of the investment alone creates significant uncertainties related to the estimated costs used in the profitability calculations. How these assumptions are set can have great consequences for subsequent decisions. In practice, in our empirical setting, the price estimates were acquired from a few selected consultancy firms. At the same time, the managers we interviewed knew that regardless of who made the price estimates for energy, fuel and carbon for the next 10, 20 or even 30 years, the numbers in question were nothing more than guesswork. In other words, the reliability and trustworthiness of these estimates were socially constructed (see Järvinen et al. 2022). The more trustworthy the information was generally considered to be, the more often energy companies used the estimates of the same consultancy firms. This pressure from institutional isomorphism drove investment planning.

Overall, our findings illustrate the presence of isomorphism in the investment appraisal processes of Finnish energy companies seeking to cope with the uncertainty caused by accelerating climate change and the policy processes associated with it. The similarity between the consideration of the environmental issues relevant to investment planning (in general) and that of carbon allowance price forecasts (in particular) was maintained by a well-established mindset shared by the sector's key actors. In addition to talking about diffusion in the field, we should also consider how practices and the specific ways of thinking that sustain them have become institutionalised. Based on our observations, there were significant moderating mechanisms involved in the formation and continuity of institutionalisation in this context, such as the Emissions Trading Day organised by the Finnish Energy Authority and the relatively influential role of selected specialist consultancy firms, which were pivotal in making the managers' cognition more consistent (see Heugens and Lander 2009). Therefore, the results also indicate the potential importance of different social and technological carriers of ideas in the effort to bring about change or stabilise practices in a particular field.

Given the need for a major sustainability transition across the economy, future studies could explore whether and how the above-mentioned carriers of ideas either slow down or, more importantly, accelerate change in key organisational fields. As illustrated in this paper, key carriers of ideas for different sectors could include expert networks, institutional events, specific software and dedicated calculative practices. A better understanding of these mechanisms could help find ways to speed up the much-needed sustainability transition.

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References

Abdel-Kader, M.G., and D. Dugdale. 1998. Investment in advanced manufacturing technology: A study of practice in large U.K. companies. *Management Accounting Research* 9, no. 3: 261–84.

Ahrens, T., and C.S. Chapman. 2006. Doing qualitative field research in management accounting: Positioning data to contribute to theory. *Accounting, Organizations and Society* 31, no. 8: 819–41.

Ascui, F. 2014. A review of carbon accounting in the social and environmental accounting literature: What can it contribute to the debate? *Social and Environmental Accountability Journal* 34, no. 1: 6–28.

Ascui, F., and H. Lovell. 2011. As frames collide: Making sense of carbon accounting. *Accounting, Auditing & Accountability Journal* 24, no. 8: 978–99.

Baker, M., R. Gray, and S. Schaltegger. 2023. Debating accounting and sustainability: From incompatibility to rapprochement in the pursuit of corporate sustainability. *Accounting, Auditing & Accountability Journal* 36, no. 2: 591–619.

Baxter, J., and W.F. Chua. 2003. Alternative management accounting research – whence and whither. *Accounting, Organizations and Society* 28, no. 2-3: 97–126.

Bebbington, J., M. Laine, C. Larrinaga, and G. Michelon. 2023. Environmental accounting in the European accounting review: A reflection. *European Accounting Review* 32, no. 5: 1107–28.

Bebbington, J., and C. Larrinaga-González. 2008. Carbon trading: Accounting and reporting issues. *European Accounting Review* 17, no. 4: 697–717.

Bebbington, J., C. Larrinaga, B. O'Dwyer, and I. Thomson, eds. 2021. *Routledge handbook of environmental accounting*. Abingdon: Routledge.

Bennett, M., and P. James, eds. 1998. *The green bottom line. environmental accounting for management control practice and future trends*. London: Routledge.

Berry, A.J., and D.T. Otley. 2004. Case-based research in accounting. In *The real life guide to accounting research – A behind-the-scenes view of using qualitative research methods*, eds. C. Humphrey, and B. Lee, 231–55. Oxford: Elsevier.

Borghei, Z. 2021. Carbon disclosure: A systematic literature review. *Accounting & Finance* 61, no. 4: 5255–80.

Bouten, L., and S. Hoozée. 2022. Hybridity in a hotel chain: Designing a package of controls to sustain a hybrid mission. *Accounting, Auditing & Accountability Journal* 35, no. 8: 1862–91.
Bromwich, M. 2007. Economics in management accounting. In *Handbook of management accounting research*, edited by C. S. Chapman, A. G. Hopwood, and Shields, 137–62. Oxford: Elsevier.
Bueger, C. 2014. From expert communities to epistemic arrangements: Situating expertise in international relations. In *International relations and the global politics of science and technology*, edited by M. Mayer, M. Carpes, and R. Knoblich, 39–54. Heidelberg: Springer.
Bui, B., and C. de Villiers. 2017. Business strategies and management accounting in response to climate change risk exposure and regulatory uncertainty. *The British Accounting Review* 49: 4–24.
Bui, B., Z. Wang, and M. Tekathen. 2024. Carbon toolmaking: Responding to multiple interacting logics in carbon management. *Accounting, Auditing & Accountability Journal* 37, no. 1: 227–56.
Cadez, S., and C. Guilding. 2017. Examining distinct carbon cost structures and climate change abatement strategies in CO2 polluting firms. *Accounting, Auditing & Accountability Journal* 30, no. 5: 1041–64.
Carr, C., K. Kolehmainen, and F. Mitchell. 2010. Strategic investment decision making practices: A contextual approach. *Management Accounting Research* 21, no. 3: 167–84.
Charnock, R., M. Brander, and T. Schneider. 2021. Carbon. In *Routledge handbook of environmental accounting*, eds. J. Bebbington, C. Larrinaga, B. O'Dwyer, and I. Thomson, 353–64. Abingdon: Routledge.
Cho, C.H., M. Laine, R.W. Roberts, and M. Rodrigue. 2015. Organized hypocrisy, organizational façades, and sustainability reporting. *Accounting, Organizations and Society* 40, no. 1: 78–94.
Chua, W.F. 1986. Radical developments in accounting thought. *The Accounting Review* 61: 601–32.
Covaleski, M.A., M.W. Dirsmith, and S. Samuel. 2017. Analyzing and interpreting qualitative data in management accounting research. In *The routledge companion to qualitative accounting research methods*, eds. Z. Hoque, L.D. Parker, M.A. Covaleski, and K. Hayness. London: Routledge.
Deegan, C. 2008. Environmental costing in capital investment decisions: Electricity distributors and the choice of power Poles. *Australian Accounting Review* 18, no. 1: 2–15.
DiMaggio, P.J., and W.W. Powell. 1983. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review* 48: 147–60.
Dunlop, C.A. 2013. Epistemic communities. In *Routledge handbook of public policy*, edited by E. Araral, S. Fritzen, M. Howlett, M. Ramesh, and X Wu, 229–43. Abingdon: Routledge.
Eisenhardt, K.M. 1989. Building theories from case study research. *The Academy of Management Review* 14, no. 4: 532–50.
Elmassri, M.M., E.P. Harris, and D.B. Carter. 2016. Accounting for strategic investment decision-making under extreme uncertainty. *The British Accounting Review* 48, no. 2: 151–68.
Folke, C., S. Polasky, J. Rockström, V. Galaz, F. Westley, M. Lamont, M. Scheffer, et al. 2021. Our future in the anthropocene biosphere. *AMBIO* 50, no. 4: 834–69.
Garcia-Torea, N., S. Giordano-Spring, C. Larrinaga, and G. Riviére-Giordano. 2022. Accounting for carbon emission allowances: An empirical analysis in the EU ETS phase 3. *Social and Environmental Accountability Journal* 42, no. 1-2: 93–115.
Garcia-Torea, N., C. Larrinaga, and M. Luque-Vílchez. 2023. Bridging the understanding of sustainability accounting and organizational change. *Organization & Environment* 36, no. 1: 17–38.
Greenwood, R., C. Oliver, T.B. Lawrence, and R.E. Meyer. 2017. *The SAGE handbook of organizational institutionalism*. London: Sage.
Haas, P.M. 1992. Introduction: Epistemic communities and international policy coordination. *International Organization* 46, no. 1: 1–35.
Hartmann, F., P. Perogo, and A. Young. 2013. Carbon accounting: Challenges for research in management control and performance measurement. *Abacus* 49, no. 4: 539–63.
He, R., L. Luo, A. Shamsuddin, and Q. Tang. 2022. Corporate carbon accounting: A literature review of carbon accounting research from the Kyoto protocol to the Paris agreement. *Accounting & Finance* 62, no. 1: 261–98.
Heugens, P.P.M.A.R., and M.W. Lander. 2009. Structure! agency! (And other quarrels): A meta-analysis Of institutional theories Of organization. *Academy of Management Journal* 52, no. 1: 61–85.

Himick, D., and M. Brivot. 2018. Carriers of ideas in accounting standard-setting and financialization: The role of epistemic communities. *Accounting, Organizations and Society* 66: 29–44.
Hirsch, B., B.E. Reichert, and M. Sohn. 2017. The impact of clawback provisions on information processing and investment behaviour. *Management Accounting Research* 37, no. 1: 1–11.
Hopwood, A.G. 2009. Accounting and the environment. *Accounting, Organizations and Society* 34: 433–9.
Huikku, J. 2007. Explaining the Non-adoption of post-completion auditing. *European Accounting Review* 16, no. 2: 363–98.
Huikku, J., and K. Lukka. 2016. The construction of persuasiveness of self-assessment-based post-completion auditing reports. *Accounting and Business Research* 46, no. 3: 243–77.
Hyvönen, T., J. Järvinen, L. Oulasvirta, and J. Pellinen. 2012. Contracting out municipal accounting: The role of institutional entrepreneurship. *Accounting, Auditing & Accountability Journal* 25, no. 6: 944–63.
IPCC. 2014. Climate change 2014: Synthesis report, fifth IPCC report on climate change [core writing team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
Järvenpää, M., and A. Länsiluoto. 2016. Collective identity, institutional logic and environmental management accounting change. *Journal of Accounting & Organizational Change* 12, no. 2: 152–76.
Järvinen, J., M. Laine, T. Hyvönen, and H. Kantola. 2022. Just look at the numbers: A case study on quantification in corporate environmental disclosures. *Journal of Business Ethics* 175: 23–44.
Jordan, S., L. Jörgensen, and H. Mitterhofer. 2013. Performing risk and the project: Risk maps as mediating instruments. *Management Accounting Research* 24: 156–74.
Kazemian, S., T. Djajadikerta, K. Trireksani, Z.N. Sohag, Z.M. Sanusi, and L. Said. 2021. Carbon management accounting (CMA) practices in Australia's high carbon-emission industries. *Sustainability Accounting, Management and Policy Journal* 13, no. 5: 1132–68.
Laine, M. 2009. Ensuring legitimacy through rhetorical changes? A longitudinal interpretation of the environmental disclosures of a leading Finnish chemical company. *Accounting, Auditing & Accountability Journal* 22, no. 7: 1029–54.
Laine, M. forthcoming. Accounting, reporting and verification of impact: Implications for sustainability: A commentary on adams et al. (2023) "styles of verification and the pursuit of organisational repair: The case of social impact. *Accounting, Organizations and Society* 101540.
Lillis, A.M., and J. Mundy. 2005. Cross-Sectional field studies in management accounting research-closing the gaps between surveys and case studies. *Journal of Management Accounting Research* 17: 119–41.
Lounsbury, M. 2007. Institutional rationality and practice variation: New directions in the institutional analysis of practice. *Accounting, Organizations and Society* 33, no. 4-5: 349–61.
Lukka, K., and E. Vinnari. 2014. Domain theory and method theory in management accounting research. *Accounting, Auditing & Accountability Journal* 27: 1308–38.
MacKenzie, D. 2009. Making things the same: Gases, emission rights and the politics of carbon markets. *Accounting, Organizations and Society* 34, no. 3-4: 440–55.
Meyer, J.W., and B. Rowan. 1977. Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology* 83: 340–63.
Mikes, A., and M. Metzner. 2023. Lightening the carbon load: Using management control systems to manage decarbonization strategies. *Journal of Management Accounting Research* 35, no. 3: 121–51.
Miller, P., and M. Power. 2013. Accounting, organizing, and economizing: Connecting accounting research and organization theory. *Academy of Management Annals* 7, no. 1: 557–605.
Modell, S. 2009. Institutional research on performance measurement and management in the public sector accounting literature: A review and assessment. *Financial Accountability & Management* 25, no. 3: 277–303.
Morales Burgos, J.A., M. Kittler, and M. Walsh. 2020. Bounded rationality, capital budgeting decisions and small business. *Qualitative Research in Accounting & Management* 17, no. 2: 293–318.

Moya, J.A., N. Pardo, and A. Mercier. 2011. The potential for improvements in energy efficiency and CO2 emissions in the EU27 cement industry and the relationship with the capital budgeting decision criteria. *Journal of Cleaner Production* 19: 1207–15.
Ocasio, W., P.H. Thornton, and M. Lounsbury. 2017. Advances to the institutional logics perspective. In *The SAGE handbook of organizational institutionalism*, eds. R. Greenwood, C. Oliver, T. B. Lawrence, and R. E. Meyer, 509–31. London: Sage.
Ott, C, and J Endrikat. 2023. "Exploring the association between financial and nonfinancial carbon-related incentives and carbon performance." *Accounting and Business Research* 53 (3): 271–304.
Richardson, K., W. Steffen, W. Lucht, J. Bendtsen, S.E. Cornell, J.F. Donges, M. Drüke, et al. 2023. Earth beyond six of nine planetary boundaries. *Science Advances* 9: eadh2458.
Rodrigue, M., and C.-F. Picard. 2023. Non-accountants and accounting: On the emancipatory mobilization of accounting by sustainability managers. *European Accounting Review* 32, no. 5: 1217–45.
Schaltegger, S., and M. Csutora. 2012. Carbon accounting for sustainability and management. status quo and challenges. *Journal of Cleaner Production* 36: 1–16.
Schiemann, F., and A. Sakhel. 2019. Carbon disclosure, contextual factors, and information asymmetry: The case of physical risk reporting. *European Accounting Review* 28, no. 4: 791–818.
Stechemesser, K., and E. Guenther. 2012. Carbon accounting: A systematic literature review. *Journal of Cleaner Production* 36: 17–38.
Steinmeier, M, and M Stich. 2019. "Does Sustainability Assurance Improve Managerial Investment Decisions?." *European Accounting Review* 28 (1): 177–209.
Ter Bogt, H.J., and R.W. Scapens. 2019. Institutions, situated rationality and agency in management accounting: A research note extending the burns and scapens framework. *Accounting, Auditing & Accountability Journal* 32, no. 6: 1801–25.
Thomson, I., and R. Charnock. 2022. Engaging with the IPCC on climate finance: A call to action and platform for social and environmental accounting scholars. *Social and Environmental Accountability Journal* 42, no. 1-2: 1–10.
Thornton, P.H., and W. Ocasio. 1999. Institutional logics and the historical contingency of power in organizations: Executive succession in the higher education publishing industry, 1958– 1990. *American Journal of Sociology* 105: 801–43.
Vesty, G.M., A. Telgenkamp, and P.J. Roscoe. 2015. Creating numbers: Carbon and capital investment. *Accounting, Auditing & Accountability Journal* 28, no. 3: 302–24.
Wilmott, H. 2015. Why institutional theory cannot be critical. *Journal of Management Inquiry* 24, no. 1: 105–11.

Appendices

Appendix 1. List of interviews

Company	Position	Date
Case A	Technical manager	15.3.2019
Case A	CFO	28.3.2019
Case B	Head of energy unit	29.3.2019
Case B	Environmental manager	4.4.2019
Case B	Head of projects	4.4.2019
Case B	CFO	26.4.2019
Case C	Head of energy unit	21.3.2019
Case D	CFO	25.3.2019
Case E	CEO	22.5.2019
Case E	Development manager	22.5.2019
Case F	Project manager	28.6.2019
Case F	Environmental manager	28.6.2019

Appendix 2. Interview guide

Background questions

- How many years have you worked for the company?
- What is your current position and job description? What are your main responsibilities?
- How many investment decision-making situations have you been involved in?
- What did these investments entail? What are the most common types of investments in your company?
- What do you feel are the most important things to consider when making investments?

General questions about investments

- How would you describe the investment process at your organisation?
- What is the typical time span for the investments you make?
- What kind of investment calculation methods are used in your company? Who prepares the calculations?
- How are the calculations used at different stages of the investment process?
- What kinds of different decision-making criteria have you used to support the final decision-making?

General questions about corporate responsibility

- What is your understanding of corporate responsibility? What about environmental responsibility?
- What role does corporate responsibility play in your company?
- Do you think the role of corporate responsibility is more important as part of operational or strategic decision-making?
- What benefits do you think corporate responsibility may bring to you? What are its biggest challenges?

Investments and environmental calculations

- What kind of environmental calculations are in use at your company?
- What is the time span for environmental calculations?
- Based on what type of information do you prepare environmental calculations?
- Who is responsible for making environmental calculations?
- What kind of post-investment calculations are in place at your company?
- How do you check whether the environmental objectives set for the investment have been met?
- What type of non-monetary indicators does your company use for its investments?
- How do you consider emissions trading and CO_2 emissions in an investment situation?
- Do you use scenario calculations related to the price of CO_2 emissions? If so, how?