HONG KONG JOURNAL OF SOCIAL SCIENCES

香港社會科學學報

第一的第 60 期 (2022 春/夏) Vol. 60 Autumn/Winter 2022

Open Access Article https://doi.org/10.55463/hkjss.issn.1021-3619.60.91

A Systematic Literature Review on Carbon Financial Accounting

Shuwen Li, Zarina Zakaria, Saidah Abas Azmi

Department of Accounting, University of Malaya, Kuala Lumpur, Malaysia

Received: January 17, 2023 ▪ Reviewed: January 29, 2023

▪ Accepted: February 13, 2023 ▪ Published: March 30, 2023

Abstract:
The economic consequences of climate change and the function of carbon accounting in climate change have attracted increased attention from the research community. Although various studies have investigated climate change and carbon accounting, no systematic literature analysis has been conducted to provide a comprehensive overview of carbon financial accounting. Thus, the current paper gains insights into the key research domains and outlines future research directions and opportunities for carbon financial accounting by using systematic literature review. This paper adopts a methodological approach of systematic literature review, as suggested by Linnenluecke et al. (2020) with a final sample of 43 academic papers published from 2002 to 2022. Papers in this domain discuss seven topics: debates on IFRIC 3, the diversity of approaches to accounting practices, redefining emission allowance, valuation of emission allowance, a high level of non-disclosure, carbon accounting for sustainability governance, and responses of accountancy professionals. There are several issues to explore in future research, including investigating the interactions among different carbon accounting frames, applying new theoretical views and empirical methods to develop how decisions around carbon financial accounting are made, and providing more research on less developed countries. This paper conducts a systematic literature review of the theories and practices of carbon financial accounting. It makes contributions to the academic community by highlighting several key topics and research avenues that may impact the theory and practice related to carbon financial accounting and climate change.

Keywords: carbon financial accounting, systematic literature review, carbon emission allowance, climate change.

碳金融会计系统文献综述

摘要：
气候变化的经济后果和碳核算在气候变化中的作用越来越受到研究界的关注。尽管各种研究已经调查了气候变化和碳核算，但还没有进行系统的文献分析来提供碳财务核算的全面概述。因此，本文通过系统的文献回顾，深入了解了关键研究领域，并概述了未来碳财务会计的研究方向和机会。正如林嫩吕克等人所建议的，本文采用了系统文献综述的方法论方法。(2020)以及 2002 年至 2022 年发表的 43 篇学术论文的最终

样本。该领域的论文讨论了七个主题：关于国际财务报告解释委员会 3 的辩论、会计实务方法的多样性、重新定义排放津贴、排放津贴估值、高水平 不披露、可持续治理的碳核算以及会计专业人士的回应。在未来的研究中有几个问题需要探索，包括调查不同碳核算框架之间的相互作用，应用新的理论观点和实证方法来制定围绕碳财务核算的决策，以及对欠发达国家进行更多研究。本文对碳财务会计的理论和实践进行了系统的文献回顾。它通过突出可能影响与碳财务核算和气候变化相关的理论和实践的几个关键主题和研究途径，为学术界做出了贡献。

关键词：碳财务核算，系统文献综述，碳排放配额，气候变化。

1. Introduction

The consideration of Greenhouse gas (GHG) emissions is attracting growing attention in corporations' decisions, primarily due to the construction of carbon markets proposed by the Kyoto Protocol, which aims to lower GHG emissions and redistribute the costs associated with climate change policy, attributing the climate change obligations to companies that have the responsibility and power to transform and effect GHG emissions and their competitive environments (Ascui & Lovell, 2011; Borghei, 2021; Ferguson et al., 2016; Garcia-Torea et al., 2021; Mete et al., 2010; Ratnatunga et al., 2011; Naranjo Tuesta et al., 2021).

Understanding the implications of carbon financial accounting for corporate governance and social sustainability has become increasingly important. Especially with the withdrawal of the International Financial Reporting Interpretations Committee (IFRIC) 3 - Emission Rights, little guidance concerning these issues is provided for emitting entities. Companies have adopted various methods to account for tradeable emission rights and the obligations to deliver them because of the lack of international accounting standards, which may make financial statements less comparable (Gallego-Alvarez et al., 2016; Garcia-Torea et al., 2021; Giner, 2014; Montero et al., 2020; Stechemesser & Guenther, 2012; Warwick & Ng, 2012). Therefore, this study considered that a review of carbon accounting theory and practices is extremely useful in understanding carbon accounting treatment and guiding future developments in current carbon financial accounting research.

With this systematic literature review, we hope to comprehensively review the research on emerging carbon financial accounting theory and practice, and intend to help accounting researchers understand the current carbon financial research status and guide future developments. From this perspective, this research explored the literature on carbon financial accounting to answer the following research questions: "What are the emerging issues in research on carbon financial accounting" "How does carbon financial accounting apply to improve accountability?" and "What are the main paths for further research on the carbon financial accounting?" For this literature review, we adopt the definition of financial carbon accounting stressed by Stechemesser and Guenther (2012), which defines the term carbon financial accounting as accounting for emission rights or emission permits. Based on this definition, this systematic literature review used a keyword search of Scopus, Web of Science, and other electronic databases to find carbon financial accounting publications for this literature review. This review chose 43 studies as the source data after the computer-aided and manual screening.

The rest of this systematic literature review is structured as follows. Section 2 presents the methodology for the literature review. Section 3 provides an overview of carbon financial accounting studies and a detailed review of carbon financial accounting research. Section 4 discusses the avenues for future research. Finally, Section 5 concludes the paper.

2. Research Methodology

Effectively conducted literature review determines where more research is needed, allowing for more efficient theory development. A systematic literature review is a method that uses a precise, transparent, and explicit strategy that involves a series of phases to guarantee that the literature review process is conducted with adequate rigor and transparency (Linnenluecke et al., 2020; Roberts et al., 2021). Going through the systematic review process in detail is essential, especially the literature section and the decisions about the search terms and databases to use. To conduct a systematic literature review, this study follows the recommendations of Linnenluecke et al. (2020); the main steps are summarized in Figure 1. In the first step, we selected keywords as search strings and the bibliographic article databases. Next, we conducted data cleaning for the inclusion and exclusion of relevant literature. In the third step, we synthesized and analyzed our findings. Finally, we present the results.

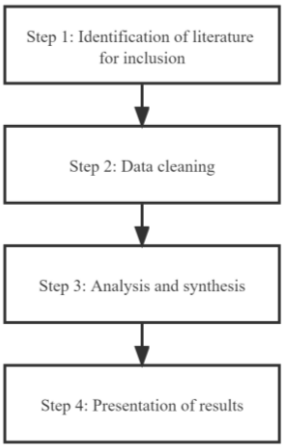

Figure 1. Research methodology (Linnenluecke et al., 2020)

2.1. Identification of Literature for Inclusion

A relevant set of keyword combinations is necessary to help identify relevant papers for inclusion. To capture the "carbon financial accounting" status, the following keywords were identified: "carbon" and "financial accounting," "greenhouse gas emissions" and "financial accounting," "climate change" and "financial accounting," "emission right" and "financial accounting," "carbon trading" and "financial accounting," and "emission allowance" and "financial accounting." Each combined one carbon or climate change keyword and one accounting keyword with the Boolean operator AND. The keyword search was limited to the abstract, title, or keywords of the databases. The search results were imported into Mendeley, and duplicate papers were deleted.

The keyword search was performed in two major databases: ISI Web of Science and Scopus. Additionally, more publishers' electronic databases were employed to find publications relevant to the scope of the review, including Elsevier, Emerald, Taylor & Francis (T&F), Springer, and Wiley. Although this created an overlap with the previously used databases, it confirmed the previous searches, ensuring that all relevant articles that met the search criteria were included. The articles were finalized on May 12, 2022. This review limited the search for journal papers and conference proceedings to the English language to avoid bias or a preference for one language. Both empirical and conceptual/theoretical publications were accepted because this review provides a comprehensive overview of carbon financial accounting.

The debate over emission rights accounting dates back to the 1990s, when Wambsganss and Sanford (1996) proposed an accounting method for the USA SO2 emissions trading scheme, leading to a series of heated debates. The International Accounting Standards Board (IASB) issued IFRIC 3 in 2004, which referred to Wambsganss and Sanford's method of recognizing and measuring allowances on the balance sheet (Bebbington & Larrinaga-Gonzaléz, 2008). Therefore, the search period was established from 1996 to 2022. This method identified a total of 76 studies. Each paper was downloaded for analysis.

2.2. Data Cleaning

Once studies were identified, a manual search of references within the selected articles' lists were evaluated against the review objective (Aldieri et al., 2019; Borghei, 2021; Garza-Reyes, 2019; Mengist et al., 2020; Roberts et al., 2021; Stechemesser & Guenther, 2012) to ensure all relevant studies were captured. One author and an external reviewer independently assessed these documents to determine whether the publication was appropriate for the review. According to the inclusion and exclusion criteria (Table 1), each reviewer manually reviewed each paper and then compared the selected papers to determine which ones should be included. Consequently, 43 papers were chosen from the initial 76 after disagreements were resolved through discussion.

Table 1. Inclusion and exclusion criteria for the data cleaning

Criteria	Decision
Studies that provide empirical and conceptual/theoretical evidence	Inclusion
Studies that are written in English	Inclusion
Relevant studies cited in selected papers	Inclusion
Studies that are repeated in the search results	Exclusion
Studies that are no longer available	Exclusion
Studies that unilaterally discussed climate change or financial accounting	Exclusion
Studies published before 1996	Exclusion

2.3. Analysis, Synthesis, and Presentation of Results

When conducting a systematic literature review, Analysis, synthesis, and results presentation are crucial components of the research methodology when conducting a systematic literature review. First, all articles were classified by the year of publication. This is to examine the trend of this topic in academia. Second, articles were categorized by publishing agencies. Third, the authors examined research methods. Finally, this review searched the literature based on the categories of Ascui and Lovell (2011) and Stechemesser and Guenther (2012), inductively identifying new structural categories that formed the analysis themes and aided in refining the research goal. All materials were evaluated in structural categories to discover and explain critical themes.

Carbon financial accounting is an emerging strand of accounting literature, and there are a limited number of publications. Figure 2 shows the number of publications per year. Generally, the results indicate that the carbon financial accounting topic stimulated researchers' interest in 2002 and has rekindled a lively debate since 2011. The most productive year was 2011, with six articles published. However, from 2015 to 2018, there was a low tide in publications, and then the number of publications increased in 2020.

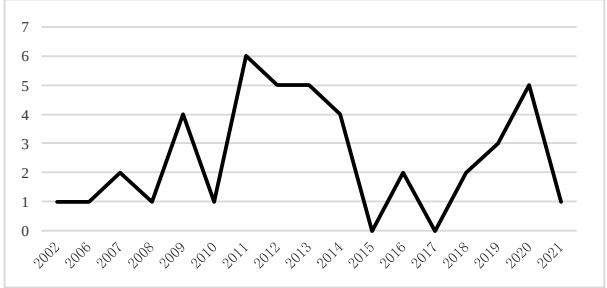

Figure 2. Number of articles published per year (Developed by the authors)

The most relevant sources are the publications in this study (Figure 3). From this systematic literature review, this subject matter 2has been extensively discussed across multiple functional domains that a

range of fields were among the 43 articles published by 30 different publication agencies (Haupt & Ismer, 2013). To collaborate and develop solutions, research relies on shared knowledge from various disciplines, including ecology, science, sustainability, accounting, and other fields (Ascui, 2014). Notably, the Journal of Cleaner Production and Social and Environmental Accountability Journal are influential journals that have piqued interest from scholars in this field.

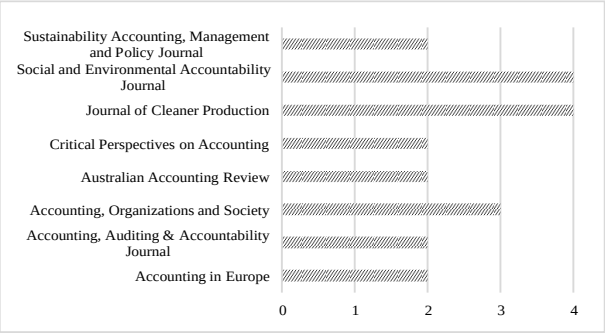

Figure 3. Most relevant sources (Developed by the authors)

Concerning the research method applied (Figure 4), approximately 37% of the articles were conceptual/theoretical studies (16 articles), with others representing quantitative secondary data/document analysis work (10 articles), qualitative interviews, and case studies (8 articles), and literature reviews (6 articles). The conceptual/theoretical studies are heavily dominated by discussions about carbon financial accounting standards and their development; conceptual/theoretical papers have always been the research focus in the literature review period. The majority of conceptual/theoretical papers focus on critically discussing the accounting attributes of carbon emission rights from the perspectives of the market, government, society, and nature to provide a practical accounting solution. Fewer empirical quantitative (model method) analyses are observed in the literature, which is a limitation. Only Griffi (2013) examined the impact of different carbon accounting treatments on the balance sheet and net income; Gallego-Alvarez et al. (2016) and Kashyap et al. (2020) examined the determinants of corporate accounting choices for the emission rights treatment.

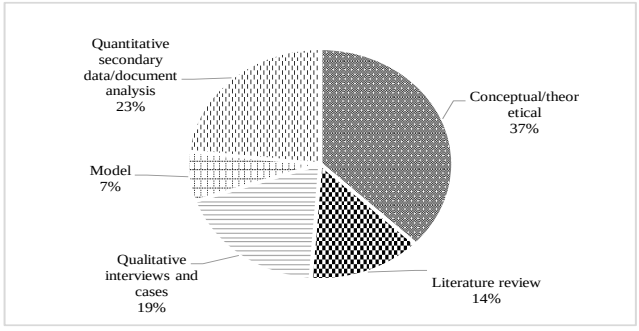

Figure 4. Publications based on the research methodology (Developed by the authors)

Following that, the publications were examined to identify common themes based on research questions or similar subjects. Seven key themes were identified from this procedure, and they were categorized according to their main field of study. Discussions with an independent expert served as the foundation for verifying the seven themes. The findings of prior studies were reviewed, summarized, and analyzed in this study using a theme-based methodology. First, to highlight the current state of knowledge for each theme, the publications were systematically reviewed. Second, similar findings were grouped and synthesized to understand how they collectively contribute to the theme. Finally, the key findings of publications were critically analyzed to gain knowledge and to identify potential directions for future research.

3. Major Themes in the Carbon Financial Accounting Literature

Based on the preliminary classifications by Ascui and Lovell (2011) and Stechemesser and Guenther (2012), this study divided the review into three groups: debates on IFRIC 3, current carbon financial accounting practices, and responses of accountancy professionals. Regarding the current carbon financial accounting practices, the main discussions focus on the attributes of the carbon emission allowance and the different approaches under intangibles and inventories. Therefore, the group of "current carbon financial accounting practices" can be broken into four categories: "diversity of approaches to the accounting practices," "redefining emission allowance," "valuation of emission rights," and "a high level of non-disclosure." Moreover, as a policy tool, carbon accounting also undertakes accountability and governance functions. Therefore, it created a cluster that explores how carbon accounting plays its governance function. The final groupings reflect the authors' observations of emergent themes rather than priori expectations, which have broadened Ascui and Lovell's and Stechemesser and Guenther's conceptualization of carbon financial accounting. The following subsections have been organized around the seven themes.

3.1. Debates on IFRIC 3

The USA SO2 emission trading plan, established in 1990, has influenced much of the research on pollution allowance accounting. Wambsganss and Sanford (1996) criticized it and proposed that granted allowances be recognized as donated assets valued at the market on receipt to provide consistent accounting for granted and acquired allowances. Furthermore, they claimed that allocating the cost of all polluting emission allowances to profit and loss would reduce externalities. The proposal of Wambsganss and Stanford has received numerous comments, which have continued to play an important role even after IFRIC 3's entry and exit.

The IASB adopted Wambsganss and Sanford's viewpoint with the publication of IFRIC 3 in 2004. Consequently, IFRIC 3 provoked a lot of criticism and discussions (Black, 2013; Buben, 2019; de Aguiar, 2018; Ertimur et al., 2020; Haupt & Ismer, 2013; Karai

& Bárány, 2013; Warwick & Ng, 2012), that it has led to accounting mismatches in terms of reporting mismatches, accounting value mismatches, and recognition time mismatches. These inconsistencies would cause artificial volatility in company results and would not reflect the economic reality of organizations (Giner, 2014).

Given the committees' and scholars' negative comments, and a request from the European Commission, IFRIC 3 was withdrawn in June 2005, leaving a gap in international accounting standards for emission allowances. Hereafter, accounting academics have contributed to the extensive carbon financial accounting regulation discussions.

Although IFRIC 3 turned out to be a failed attempt, it has provided some possibilities for improving carbon financial accounting standards. Based on IFRIC 3's approach, Karai and Bárány (2013) suggested presenting the assets and grants at a fair value or showing the assets and grants at a nominal amount. According to Black (2013), as free allocations decrease, standard-setters must reflect the potential that corporations would increasingly keep allowances in a long term to meet compliance. Bebbington and Larrinaga-Gonzaléz (2008) moved the debates into the non-financial reporting area, such as climate change risks and uncertainties, to ensure that the financial effects of pollution allowances are accurately and fairly depicted in the accounts. Notably, de Aguiar (2018) highlighted to redefine emission allowances, potentially by examining the life cycle of emissions. Overall, the studies above added to the literature by discussing alternatives or paths to proper carbon financial accounting standards, which are discussed more specifically in the next section.

3.2. Diversity of Approaches to the Accounting Practices

In the absence of an international carbon accounting standard, there is a significant divergence in the accounting treatment of emissions rights (Gallego-Alvarez et al., 2016; Montero et al., 2020). Allini et al. (2018) investigated the accounting practices in the EU Emission Trading Scheme (ETS) Phase 3 program in 2013. They found that companies do not comply with local emission accounting standards and have developed their own solutions, which is consistent with Montero et al.'s (2020) research. According to Qian et al. (2016), China's power sector should acknowledge carbon emission rights as inventories. Since the Chinese carbon trading market is not yet stable and the trend of monetizing carbon emission rights is unclear, companies hold carbon emission rights for licensing emissions rather than trading. Griffi (2013) examined the emission allowance trading behaviors in the US; the lack of uniform accounting rules implied that many companies will report sizeable economic benefits or obligations off the balance sheet. It is challenging to compare and evaluate organizations' carbon accounting behaviors due to the diversity of accounting methodologies.

According to Garcia-Torea et al. (2021), there are two different carbon accounting methods: the gross and the net methods. The gross method seeks to fully account for the financial impacts of carbon trading, whereas the net method allows firms to offset assets and liabilities. Black (2013) identified three common approaches in practices: a net approach based on intangibles, an approach based on IFRIC 3, and a net approach based on inventories. Buben (2019) found that the most common accounting approach is based on the withdrawn IFRIC 3.

More studies have indicated that corporate carbon accounting practices have departed from IFRIC 3 (Kashyap et al., 2020; Warwick & Ng, 2012). Garcia-Torea et al. (2021) and Warwick and Ng (2012) identified among these approaches, the net method (recognizing intangibles or inventories with nil value) being the most widespread option in all industries. Compared with the most popular method in the practice (the net method), the gross method is expected to generate more transparent financial results (Garcia-Torea et al., 2021), as it provides a more accurate account of the financial impact of emission allowances and a more thorough picture of the environmental harm caused by a corporation. Therefore, determining proper and uniform carbon accounting policies based on the gross method is of significant impact.

3.3. Redefining Emission Allowance

One effective solution for determining uniform carbon accounting standards is to redefine emission allowances (de Aguiar, 2018). Part of the emission allowances owned by organizations are granted by the government, and part is acquired by purchase; thus, discussions on emission allowances are concentrated on granted allowances and purchased allowances and their distinctions (Zhang-Debreceny et al., 2009).

Granted emission allowances are usually considered as assets or liabilities. The supporters of the liability view criticize carbon permits as a right to pollute the environment (Grinnell & Herbert, 2002). Hopwood (2009) and Martineau and Lafontaine (2020) stated that the ethical concerns of environmentalists do not appear to have been transferred to the economic marketplace. As a result, the emitting entities received more emission permits than necessary and were commonly paid for their emitting behaviors.

Although academia critically discusses the asset attributes of emission rights, many scholars still agree with the asset view (Black, 2013; Cook, 2009; Giner, 2014; Haupt & Ismer, 2013; Karai & Bárány, 2013; Warwick & Ng, 2012; Ertimur et al., 2020). In line with IFRIC 3, emission allowances are recognized as intangible assets and are accounted for using IAS 38, which has been proven as the most popular method by Black (2013), Warwick and Ng (2012), and Garcia-Torea et al. (2021). The view of intangibles is also supported by Tušan (2014), who argued that emission allowances fit the conception of intangible assets in IAS

38. It is a non-monetary property item with no physical substance and held for producing reasons, and it is best measured at fair value for trading purposes.

Regarding the views of other assets, Karai and Bárány (2013) argued that displaying emission rights as assets in inventories and that emission rights obtained through a government grant are permissible, the government grant and the provision should be provided using the gross method. Allini et al. (2018) suggested that the IASB takes a different method of treating emission rights as payment instruments, one that does not transmit the reporting inconsistencies heavily condemned in IFRIC 3. The comprehensive reporting of assets and liabilities associated with emission rights is supported by this method, ensuring greater transparency in the financial statements. Ertimur et al. (2020) argued that even though there are similarities between emission allowances and financial instruments, inventories, and intangible assets, there are always conflicts between emission allowances and the regulations of these assets; hence, emission allowances cannot be included in any of these assets. Additionally, for the phenomenon of corporate recognizing exceeding emission allowances as a production cost, Giner (2014) criticized the conceptualization of emission rights as a production cost because organizations are not forced to pollute. Organizations can pollute without these rights. Giner also questioned recognizing emission rights as payment instruments with the difficulties of widening the definition of financial assets.

Due to the particularity of emission rights, there are still many controversies regarding the attributes of emission rights, which are still a topic worthy of accounting study in the future. The failure of IFRIC 3 indicates that conflicts remain in putting the transaction of emission right into the existing financial standards. Further research could focus on the possibility of issuing a new standard (creating new assets and liability for emission right) and further changes to related standards (Ascui, 2014; Giner, 2014).

3.4. Valuation of Emission Allowance

The failure of IFRIC 3 allows market participants to treat carbon invisibly with a nil valuation of free (granted) allocations. There are two common approaches in practice: the first one is to adopt a market value (nil) and offset by a liability, thus presenting a net liability by year-end; the second approach is to record the allocations at a nil value and only create a provision of expense when emissions exceed the allocation (Allini et al., 2018; Black, 2013; Garcia-Torea et al., 2021; Haupt & Ismer, 2013; Kashyap et al., 2020; Montero et al., 2020; Lovell et al., 2013). Common findings of these studies indicate that both the valuation methods produce a nil result.

Haupt and Ismer (2013) identified three reasons for dissatisfaction with recognizing free allocations at nil. First, it does not meet the International Financial Reporting Standards (IFRS) true-and-fair-view requirement; second, it hides the benefits of free allocations in the financial statements; third, it would obstruct the EU single market's proper functioning. Carbon will remain invisible if allowances are freely distributed and offset by corresponding emissions. Three types of effects can be anticipated when carbon is made invisible in accounting terms: undermining the intended impact of the carbon market, allowing those with extra allowances to sell them later, and bolstering the position of managers who are interested in maintaining market share by refusing to pass on the opportunity cost of free allowances to customers (MacKenzie, 2009). Allini et al. (2018) criticized corporations for ignoring the societal cost of pollution operations by adopting a net approach and depriving users of a set of financial information essential to their decisions. Therefore, netting assets and liabilities to avoid disclosing bought emission rights and corresponding liabilities on the balance sheet are controversial. This situation could be avoided by classifying emission allowances as intangible assets measured at fair value regardless of the purpose of holding it to yield comparable accounting results (Ertimur et al., 2020), and emission allowances should be remeasured at fair value to reflect the economic conditions when the changes occur. The government also welcomes this fair value method, which calls for a transparent reflection of carbon costs (Haupt & Ismer, 2013).

3.5. High Level of Non-Disclosure

The investigation of current accounting approaches indicates a high level of non-disclosure (Allini et al., 2018; Black, 2013; Garcia-Torea et al., 2021; Kashyap et al., 2020; Lovell et al., 2013; Warwick & Ng, 2012). The non-disclosure includes the initial recognition of granted allowances, the recognition of purchased allowances, the initial valuation of granted allowances, and the subsequent valuation. Regarding this condition, Lovell et al. (2013) examined the phenomenon by understanding the "materiality" of emission allowances for accountants. Companies have the right to omit such disclosures from their financial statements if the allowances and liabilities resulting from carbon trading are not significant. However, the materiality of emission allowances is revealed to be high in Lovell et al.'s (2013) investigation: ranging from 14% of profit or loss before taxes of up to a staggering 85%. Further study revealed that the high level of non-disclosure is due to the protracted absence of a financial standard for emission allowance. It is difficult to provide a complete and comprehensive representation of the impact of emission allowances in a company's financial statements due to the variety of accounting approaches used to account for carbon emission allowances, which lowers the quality of climate change data that is available. This highlights the need for guidance to resolve this uncertainty and messiness and requires standardization in reporting to improve low disclosure levels. Kashyap et al. (2020) also identified that institutional pressure is one of the critical determinants

for increasing corporate carbon financial accounting pressures and further improving disclosure behaviors.

3.6. Carbon Accounting for Sustainability Governance

The limited studies on sustainability governance currently available focus primarily on enhancing carbon accounting disclosure for improved governance and enhancing carbon financial accounting accordingly. Bui and Fowler (2019) suggested that carbon accounting has both a positive and negative role in facilitating accountability. Carbon accounting may increase transparency and accountability by informing the public about companies' sustainable practices and helping managers evaluate performance, perform green investments, implement carbon strategies, and conduct emissions trading. However, it aids companies in avoiding responsibility when making unsustainable investments.

Bowen and Wittneben (2011) discussed that one major challenge is to ensure actual GHG emissions reduction by carbon accounting. Their investigation indicates that the disclosure of climate change is symbolic rather than substantive mitigation; thus, rather than simply reporting GHG emission reductions, corporate carbon accounting should be set up to monitor corporate behavior and decision-making. Schaltegger and Csutora (2012) also criticized the failure of carbon reports to create accurate results. They suggest that carbon accounting for sustainability contributions should prioritize identifying, selecting, introducing, and implementing carbon reduction action plans and measures. These accounts and accounting procedures assist management to reduce carbon emissions most effectively and to achieve the most cost-effective carbon reductions.

Negash (2012) proposed a revolution in carbon accounting disclosure standards to improve disclosure practice, determining that the environmental information must be included in the current set of financial statements and companies should provide a separate statement on the environment. Lodhia (2011) emphasized that mandatory disclosure would ensure that carbon accounting plays its accountability role in managing climate change risks. Organizations can proactively change their processes and systems to account for climate change. They can also be reactive in response to increased stakeholder pressure or new legislative demands for carbon accounting and reporting. According to Bui and Fowler (2019), carbon-focused regulation led to carbon reduction when it created visible institutional and economic pressure.

Haupt and Ismer (2013) proposed a coherent accounting framework to improve EU ETS accounting practices and assist companies in adapting to climate change. Adopting the fair value method in valuation and reflecting the relationship between mitigating emissions and granted allowances in the accounts is essential. Subsequent emission allowance measurements should differentiate between those held for compliance and those held for trading, which meets the requirements of the EU ETS as a climate policy instrument and better matches the general accounting principles under IFRS.

3.7. Responses of Accountancy Professionals

The responses of accountancy professionals refer to the actions of accountants and accounting organizations in response to climate change, and the importance of accountancy professionals' participation in climate change (Lovell et al., 2013). Accountancy professionals are critical to developing dominant carbon accounting standards and practices (Lovell & Mackenzie, 2011), as carbon accounting is a new field of inquiry; they are influencing how the issue of climate change can be understood and managed through markets in an important but largely unnoticed manner. Lovell and Mackenzie (2011) discovered a significant interest in climate change among international accounting and professional auditing groups by studying accountants' responses to the topic since 2005. Since there is a gap in professional governance of climate change that accountants are most qualified to fill, especially with multiple framing of calculation still in use, the findings suggest that accountants may take the lead on dealing with climate change issues (Lovell et al., 2013) pushing the accounting profession to be responsible in establishing external ties with other professions. This necessitates closer collaboration among other communities, and accountants must first recognize the worth and skills of other communities, such as the collaboration between physical carbon accounting experts and carbon market practitioners. Ascui and Lovell (2012) further discussed the Climate Disclosure Standards Board as a community where accountants engage in strategic carbon accounting, even though the level of engagement has yet to reach the mainstream of rank-and-file accountants.

4. Discussions and Avenues for Future Studies

This study provides a thorough overview of the historical trends, research focuses, and major themes in carbon financial accounting. As seen from the analysis in this study, in the lack of global standards for carbon accounting, the investigation of corporate carbon accounting practices has gained increasing interest in this field. Meanwhile, carbon accounting's role in framing sustainability governance and the responses of accounting professionals are yet to be investigated. This study then explores a few gaps in the present literature between societal expectations and the current status of carbon accounting research that develops an accepted proposal to cover carbon emissions allowance trading and the topics that are not covered in detail in the literature.

4.1. Interactions among Carbon Accounting Frames

Carbon financial accounting practices show a wide range of accounting treatments. The variance in

accounting methods for carbon emission permits emphasizes the need for guidance. Thus, further discussion on granted and purchased allowances in accounting is needed. As there are five significant frameworks for carbon accounting (Ascui & Lovell, 2011), each has set boundaries, defined terms, and claimed ownership of carbon accounting. The overlapping of different frameworks for emissions allowances helps map out financial accounting concepts (de Aguiar, 2018), and understanding carbon financial accounting is inextricably linked to other frameworks. Future research could investigate the monetary aspects of carbon accounting; this results in a blind spot regarding the relationship between changes in the physical carbon impacts and the company's financial performance, which could assist companies in developing their core businesses, core products, and business models to achieve carbon neutrality and sustainability rather than treating carbon reduction efforts as a matter of legal compliance (Schaltegger & Csutora, 2012).

4.2. Application of Theories and Empirical Analysis

Model and qualitative interviews and case studies are lacking in carbon accounting studies. Only 19% of the studies conduct qualitative interviews and cases, and 7% adopt models. Carbon accounting academics should adopt new theoretical views and empirical methods to provide nuanced insight into and widen and deepen their knowledge of carbon accounting challenges. Carbon accounting procedures can be critiqued; therefore, newer, sounder practices can be developed. For example, future research could look into how the standard-setting process can help improve accountability and explore carbon accounting silence to understand the implications of non-disclosure and provide explanation of such accounting choices (Garcia-Torea et al., 2021); conduct and facilitate critical research on the functions that accounting and calculative mechanisms can and cannot perform in the environmental area (Hopwood, 2009); look into the process of making decisions based on consensus, the potential for holding a series of workshops, and develop additional opportunities for discussion as the main impediment to action is the absence of carbon financial accounting (Lovell et al., 2013); examine how organizational actors interact when practicing sustainability governance or understanding them; assess management and stakeholder engagement, alternative carbon emission reduction strategies, and the creation of strategies to support the effective and efficient implementation of zero-carbon solutions (Schaltegger & Csutora, 2012); critique current reporting practices and explores organizational motivations for undertaking carbon accounting and reporting (Lodhia, 2011); survey companies that do not provide these disclosures in their annual reports to learn more about their accounting procedures and the manager's thinking behind them (Warwick & Ng, 2012); and examine the role that accountants play in understanding and regulating markets in relation to the issue of climate change (Lovell et al., 2013).

4.3. Research on Less-Developed Countries

Most of the carbon accounting literature focuses on developed countries, especially the practice of EU ETS. Research in developing countries (for example, China and India) may reveal insights into their distinct political regimes, less-developed financial markets, and management attitudes that differ from those of developed countries (Bui & Fowler, 2019; He et al., 2020). For example, China has launched carbon trading in several pilot areas, and investigating Chinese carbon accounting practices may provide insights into this field (Qian et al., 2016), especially considering that Chinese carbon trading is a composite of neoliberalism and government intervention. Although many studies have examined carbon accounting practices and theories of EU ETS, America, Australia, and some developing countries (Allini et al., 2018; Black, 2013; Garcia-Torea et al., 2021; Haupt & Ismer, 2013; Kumar & Firoz, 2019; Lovell et al., 2013; Mete et al., 2010; Warwick & Ng, 2012), only Qian et al. (2016) and Zhang (2011) reviewed Chinese carbon accounting practices, methods, and implementation processes. This has created a solid contrast to the research in the EU or other places. Nevertheless, research on Chinese carbon accounting behaviors requires a comprehensive examination. It is vital to understand how carbon accounting emerged and developed in China and how institutional environments influence these practices (Rinaldi, 2019) with distinctive and immutable cultural facets (Li & Soobaroyen, 2021).

5. Conclusion

This systematic literature review offers comprehensive research on carbon financial accounting literature. Current carbon financial accounting research has produced numerous insights on the accounting approach for emission rights that companies, legislators, standard setters, and scholars must deal with. It powerfully conveys that carbon mitigation and trade necessitate a globally agreed accounting framework for emission rights. As a result, carbon financial accounting has developed as a distinct academic discipline from general corporate social responsibility or sustainability.

This study offers the following contributions: from a theoretical perspective, this study is the first comprehensive and up-to-date systematic literature review on carbon financial accounting. It synthesizes the current state of knowledge in terms of publication trends, relevant sources, and research methods and derives seven themes related to this stream of research. From a practical perspective, the findings of this study are valuable to regulators and policymakers in developing climate policies and regulations, assisting them in better understanding and evaluating corporate carbon accounting behaviors. Organizations could implement carbon trading based on accounting professionals' engagement to improve organizations'

understanding of different carbon accounting frameworks. Accordingly, managers can make appropriate decisions to ensure that carbon financial accounting accurately reflects the economic nature of the carbon trading business and disclose relevant information as much as possible, laying a solid foundation for the convergence of carbon financial accounting standards.

6. Limitations and Further Study

Although the authors used a rigorous methodology to include the majority of the previously published articles, there is still a possibility that some studies may not have been included in the databases employed in this study. In addition, it is possible that the search string may not capture certain relevant studies, given that other studies may have used keywords other than those used in this study. However, the authors firmly believe that all significant advancements in the field's research have been covered in this review. Further studies may build on this review and re-examine the current state of carbon financial accounting research. Researchers can expand the range of inclusion and exclusion criteria for studies by considering books and reports on carbon financial accounting.

Acknowledgments

The authors would like to thank Chenyou Li (Ph.D.), a researcher from Guangxi University of Finance and Economics, who undertook the external review of this systematic literature review. We are very grateful for his valuable comments to improve this study.

Authors' Contributions

The first author undertook the preliminary conception, data collection, literature review, and partial writing of this study. The second and third authors are the supervisors of the first author in her doctoral study; they contributed to the design of this study, provided comments, and proposed many revisions to this study.

References

[1] ALDIERI, L., CARLUCCI, F., VINCI, C.P., & YIGITCANLAR, T. (2019). Environmental innovation, knowledge spillovers and policy implications: A systematic review of the economic effects literature. *Journal of Cleaner Production*, 239, 118051. http://dx.doi.org/10.1016/j.clepro.2019.118051

[2] ALLINI, A., GINER, B., & CALDARELLI, A. (2018). Opening the black box of accounting for greenhouse gas emissions: The different views of institutional bodies and firms. *Journal of Cleaner Production*, 172, 2195–2205. https://doi.org/10.1016/J.JCLEPRO.2017.11.194

[3] 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(1), 6–28. http://dx.doi.org/10.1080/0969160X.2013.870487

[4] ASCUI, F., & LOVELL, H. (2011). As frames collide: Making sense of carbon accounting. *Accounting, Auditing and Accountability Journal*, 24(8), 978–999. https://doi.org/10.1108/09513571111184724

[5] ASCUI, F., & LOVELL, H. (2012). Carbon accounting and the construction of competence. *Journal of Cleaner Production*, 36, 48–59. http://dx.doi.org/10.1016/j.jclepro.2011.12.015

[6] BEBBINGTON, J., & LARRINAGA-GONZALÉZ, C. (2008). Carbon trading: Accounting and reporting issues. *European Accounting Review*, 17(4), 697–717. http://dx.doi.org/10.1080/09638180802489162

[7] BLACK, C.M. (2013). Accounting for Carbon Emission Allowances in the European Union: In Search of Consistency. *Accounting in Europe*, 10(2), 223–239. http://dx.doi.org/10.1080/17449480.2013.834730

[8] BORGHEI, Z. (2021). Carbon disclosure: a systematic literature review. *Accounting and Finance*, 61(4), 5255–5280. https://doi.org/10.1111/acfi.12757

[9] BOWEN, F., & WITTNEBEN, B. (2011). Carbon accounting: Negotiating accuracy, consistency and certainty across organisational fields. *Accounting, Auditing & Accountability Journal*, 24(8), 1022–1036. https://doi.org/10.1108/09513571111184742

[10] BUBEN, O. (2019). Emission Rights Reporting by Czech Companies. In: PROCHÁZKA, D. (ed.) *Global Versus Local Perspectives on Finance and Accounting. ACFA2018 2018. Springer Proceedings in Business and Economics.* Cham: Springer, pp. 239–248. https://doi.org/10.1007/978-3-030-11851-8_23

[11] BUI, B., & FOWLER, C.J. (2019). Strategic Responses to Changing Climate Change Policies: The Role Played by Carbon Accounting. *Australian Accounting Review*, 29(2), 360–375. https://doi.org/10.1111/auar.12213

[12] COOK, A. (2009). Emission rights: From costless activity to market operations. *Accounting, Organizations and Society*, 34(3–4), 456–468. http://dx.doi.org/10.1016/j.aos.2007.12.001

[13] DE AGUIAR, T.R.S. (2018). Turning accounting for emissions rights inside out as well as upside down. *Environment and Planning C: Politics and Space*, 36(1), 139–159. https://doi.org/10.1177/2399654417703662

[14] ERTIMUR, Y., FRANCIS, J., GONZALES, A., & SCHIPPER, K. (2020). Financial reporting for pollution reduction programs. *Management Science*, 66(12), 6015–6041. http://dx.doi.org/10.1287/mnsc.2019.3416

[15] FERGUSON, J., SALES DE AGUIAR, T.R., & FEARFULL, A. (2016). Corporate response to climate change: language, power and symbolic construction. *Accounting, Auditing and Accountability Journal*, 29(2), 278–304.

http://dx.doi.org/10.1108/AAAJ-09-2013-1465

[16] GALLEGO-ALVAREZ, I., MARTÍNEZ-FERRERO, J., & CUADRADO-BALLESTEROS, B. (2016). Accounting treatment for carbon emission rights. *Systems*, 4(1), 12. https://doi.org/10.3390/systems4010012

[17] GARZA-REYES, J.A. (2019). Lean and green – a systematic review of the state of the art literature. *Journal of Cleaner Production*, 102, 18–29. https://doi.org/10.1016/J.JCLEPRO.2015.04.064

[18] GARCIA-TOREA, N., GIORDANO-SPRING, S., LARRINAGA, C., & RIVIÈRE-GIORDANO, G. (2021). Accounting for Carbon Emission Allowances: An Empirical Analysis in the EU ETS Phase 3. *Social and Environmental Accountability Journal*, 42(1–2), 93–115. http://dx.doi.org/10.1080/0969160X.2021.2012496

[19] GINER, B. (2014). Accounting for emission trading schemes: A still open debate. *Social and Environmental Accountability Journal*, 34(1), 45–51. http://dx.doi.org/10.1080/0969160X.2014.885670

[20] GRIFFI, P.A. (2013). Cap-and-trade emission allowances and US companies' balance sheets. *Sustainability Accounting, Management and Policy Journal*, 4(1), 7–31. https://doi.org/10.1108/SAMPJ-01-2012-0001

[21] GRINNELL, J.D., & HERBERT, G.H. (2002). Gifted pollution allowances: Recognizing a liability to society. *Critical Perspectives on Accounting*, 13(2), 211–228. http://dx.doi.org/10.1006/cpac.2001.0489

[22] HAUPT, M., & ISMER, R. (2013). The EU Emissions Trading System under IFRS – Towards a 'True and Fair View'. *Accounting in Europe*, 10(1), 71–97. https://doi.org/10.1080/17449480.2013.772726

[23] HE, R., LUO, L., SHAMSUDDIN, A., & TANG, Q. (2020). Corporate carbon accounting: a literature review of carbon accounting research from the Kyoto Protocol to the Paris Agreement. *Accounting & Finance*, 62, 261–298. http://dx.doi.org/10.1111/acfi.12789

[24] HOPWOOD, A.G. (2009). Accounting and the environment. *Accounting, Organizations and Society*, 34(3–4), 433–439. https://doi.org/10.1016/j.aos.2009.03.002

[25] KARAI, É., & BÁRÁNY, M. (2013). Towards convergence of accounting for emission rights. *Acta Polytechnica Hungarica*, 10(1), 177–196. https://doi.org/10.12700/APH.10.01.2013.1.10

[26] KASHYAP, V., HOOKS, J., RAHMAN, A., BORHAN, M., & BHUIYAN, U. (2020). *Institutional determinants of carbon financial accounting practices.* Retrieved from https://www.unitec.ac.nz/epress/wp-content/uploads/2020/08/Kashyap-et-al.-Final-version.pdf

[27] KUMAR, P., & FIROZ, M. (2019). Accounting for certified emission reductions (CERs) in India: An analysis of the disclosure and reporting practices within the financial statements. *Meditari Accountancy Research*, 28(2), 365–389. https://doi.org/10.1108/MEDAR-01-2019-0428

[28] LI, X., & SOOBAROYEN, T. (2021). Accounting, Ideological and Political Work and Chinese Multinational Operations: A Neo-Gramscian Perspective. *Critical Perspectives on Accounting*, 74, 102160. http://dx.doi.org/10.1016/j.cpa.2020.102160

[29] LINNENLUECKE, M.K., MARRONE, M., & SINGH, A.K. (2020). Conducting systematic literature reviews and bibliometric analyses. *Australian Journal of Management*, 45(2), 175–194. http://dx.doi.org/10.1177/0312896219877678

[30] LODHIA, S. (2011). The Australian National Greenhouse and Energy Reporting Act and Its Implications for Accounting Practice and Research: A Mini-Review. *Journal of Accounting and Organizational Change*, 7(2), 190–198. https://doi.org/10.1108/18325911111139699

[31] LOVELL, H., & MACKENZIE, D. (2011). Accounting for Carbon: The Role of Accounting Professional Organisations in Governing Climate Change. *Antipode*, 43(3), 704–730. http://dx.doi.org/10.1111/j.1467-8330.2011.00883.x

[32] LOVELL, H., BEBBINGTON, J., LARRINAGA, C., & SALES DE AGUIAR, T.R. (2013). Putting carbon markets into practice: A case study of financial accounting in Europe. *Environment and Planning C: Government and Policy*, 31(4), 741–757. http://dx.doi.org/10.1068/c1275

[33] MACKENZIE, D. (2009). Making things the same: Gases, emission rights and the politics of carbon markets. *Accounting, Organizations and Society*, 34(3–4), 440–455. http://dx.doi.org/10.1016/j.aos.2008.02.004

[34] MARTINEAU, R., & LAFONTAINE, J.P. (2020). When carbon accounting systems make us forget nature: from commodification to reification. *Sustainability Accounting, Management and Policy Journal*, 11(3), 487–504. https://doi.org/10.1108/SAMPJ-07-2018-0178

[35] MENGIST, W., SOROMESSA, T., & LEGESE, G. (2020). Method for conducting systematic literature review and meta-analysis for environmental science research. *MethodsX*, 7, 100777. https://doi.org/10.1016/j.mex.2019.100777

[36] METE, P., DICK, C., & MOERMAN, L. (2010). Creating institutional meaning: Accounting and taxation law perspectives of carbon permits. *Critical Perspectives on Accounting*, 21(7), 619–630. http://dx.doi.org/10.1016/j.cpa.2010.03.006

[37] MONTERO, P.M., CALDERÓN, E.P., & DIAS, A.I.L. (2020). Transparency of financial reporting on greenhouse gas emission allowances: The influence of regulation. *International Journal of Environmental Research and Public Health*, 17(3), 893. https://doi.org/10.3390/ijerph17030893

[38] NARANJO TUESTA, Y., CRESPO SOLER, C., &

RIPOLL FELIU, V. (2021). Carbon management accounting and financial performance: Evidence from the European Union emission trading system. *Business Strategy and the Environment*, 30(2), 1270-1282. http://dx.doi.org/10.1002/bse.2683

[39] NEGASH, M. (2012). IFRS and environmental accounting. *Management Research Review*, 35(7), 577–601. https://doi.org/10.1108/01409171211238811

[40] QIAN, Y., WANG, J., & YAN, X. (2016). Study on carbon accounting of power enterprises in China. Proceedings of the 3rd International Seminar on Education Innovation and Economic Management, Penang, 29-31 December 2018, pp. 30–32. https://doi.org/10.2991/seiem-18.2019.8

[41] RATNATUNGA, J., JONES, S., & BALACHANDRAN, K.R. (2011). The valuation and reporting of organizational capability in carbon emissions management. *Accounting Horizons*, 25(1), 127–147. http://dx.doi.org/10.2308/acch.2011.25.1.127

[42] RINALDI, L. (2019). Accounting for Sustainability Governance: The Enabling Role of Social and Environmental Accountability Research. *Social and Environmental Accountability Journal*, 39(1), 1–22. http://dx.doi.org/10.1080/0969160X.2019.1578675

[43] ROBERTS, L., HASSAN, A., ELAMER, A., & NANDY, M. (2021). Biodiversity and extinction accounting for sustainable development: A systematic literature review and future research directions. *Business Strategy and the Environment*, 30(1), 705–720. http://dx.doi.org/10.1002/bse.2649

[44] SCHALTEGGER, S., & CSUTORA, M. (2012). Carbon accounting for sustainability and management. Status quo and challenges. *Journal of Cleaner Production*, 36, 1–16. https://doi.org/10.1016/j.jclepro.2012.06.024

[45] STECHEMESSER, K., & GUENTHER, E. (2012). Carbon accounting: A systematic literature review. *Journal of Cleaner Production*, 36, 17–38. http://dx.doi.org/10.1016/j.jclepro.2012.02.021

[46] TUŠAN, R. (2014). Comparison of Slovak accounting regulation and international financial reporting standards in the area of accounting and recognition of emission rights. Proceedings of the 14th International Multidisciplinary Scientific GeoConference SGEM, pp. 87–94. Retrieved from https://www.researchgate.net/publication/290873823_Comparison_of_Slovak_accounting_regulation_and_international_financial_reporting_standards_in_the_area_of_accounting_and_recognition_of_emission_rights

[47] WAMBSGANSS, J.R., & SANFORD, B. (1996). The problem with reporting pollution allowances. *Critical Perspectives on Accounting*, 7(6), 643–652. https://doi.org/10.1006/CPAC.1996.0070

[48] WARWICK, P., & NG, C. (2012). The 'Cost' of Climate Change: How Carbon Emissions Allowances are Accounted for Amongst European Union Companies. *Australian Accounting Review*, 22(1), 54–67. https://doi.org/10.1111/j.1835-2561.2011.00158.x

[49] ZHANG, J. (2011). Accounting recognition and measurement on carbon emissions under low-carbon economy. Proceedings of the International Conference on Business Management and Electronic Information, Guangzhou, 13-15 May 2011, pp. 910–912.

[50] ZHANG-DEBRECENY, E., KAIDONIS, M.A., & MOERMAN, L. (2009). Accounting for emission rights: An environmental ethics approach. *Journal of the Asia-Pacific Centre for Environmental Accountability*, 15(3), 19–27.

参考文:

[1] ALDIERI, L., CARLUCCI, F., VINCI, C.P., & YIGITCANLAR, T. (2019)。环境创新、知识溢出和政策影响：对经济影响文献的系统回顾。清洁生产杂志，239，118051。http://dx.doi.org/10.1016/j.clepro.2019.118051

[2] ALLINI, A., GINER, B., & CALDARELLI, A. (2018)。打开温室气体排放核算的黑匣子：机构和企业的不同观点。清洁生产杂志，172，2195–2205。https://doi.org/10.1016/J.JCLEPRO.2017.11.194

[3] ASCUI, F. (2014)。社会和环境核算文献中的碳核算回顾：它对辩论有何贡献？社会和环境责任期刊，34(1), 6-28。http://dx.doi.org/10.1080/0969160X.2013.870487

[4] ASCUI, F., & LOVELL, H. (2011)。随着框架的碰撞：理解碳核算。会计、审计和问责杂志，24(8)，978-999。https://doi.org/10.1108/09513571111184724

[5] ASCUI, F., & LOVELL, H. (2012)。碳核算与能力建设。清洁生产杂志，36、48–59。http://dx.doi.org/10.1016/j.jclepro.2011.12.015

[6] BEBBINGTON, J., & LARRINAGA-GONZALÉZ, C. (2008)。碳交易：会计和报告问题。欧洲会计评论，17(4), 697–717。http://dx.doi.org/10.1080/09638180802489162

[7] 布莱克，C.M. (2013)。欧盟碳排放配额核算：寻求一致性。欧洲会计，10(2)，223–239。http://dx.doi.org/10.1080/17449480.2013.834730

[8] BORGHEI, Z. (2021)。碳披露：系统的文献综述。会计与金融，61(4)，5255–5280。https://doi.org/10.1111/acfi.12757

[9] BOWEN, F., & WITTNEBEN, B. (2011)。碳核算：跨组织领域的谈判准确性、一致性和确定性。会计、审计与责任期刊，24(8)，1022–1036。https://doi.org/10.1108/09513571111184742

[10] BUBEN, O. (2019)。捷克公司的排放权报告。载于：PROCHÁZKA, D.（编辑）关于财务和会计的全球与地方观点。亚洲金融协会 2018 2018.

施普林格商业和经济学会刊。湛：施普林格，第239–248 页 。 https://doi.org/10.1007/978-3-030-11851-8_23

[11] BUI, B., & FOWLER, C.J. (2019)。对不断变化的气候变化政策的战略反应：碳核算所扮演的角色。澳大利亚会计评论，29(2), 360–375。https://doi.org/10.1111/auar.12213

[12]库克，A.（2009）。排放权：从无成本活动到市场运作。会计、组织与社会，34(3–4), 456–468。http://dx.doi.org/10.1016/j.aos.2007.12.001

[13] DE AGUIAR, T.R.S. (2018)。将排放权的核算彻底颠倒过来。环境与规划 C：政治与空间，36(1), 139–159 。https://doi.org/10.1177/2399654417703662

[14] ERTIMUR, Y., FRANCIS, J., GONZALES, A., & SCHIPPER, K. (2020)。减少污染计划的财务报告。管理科学，66（12），6015-6041。http://dx.doi.org/10.1287/mnsc.2019.3416

[15] FERGUSON, J., SALES DE AGUIAR, T.R., & FEARFULL, A. (2016)。企业应对气候变化：语言、权力和符号建构。会计、审计和问责杂志，29(2)，278-304。http://dx.doi.org/10.1108/AAAJ-09-2013-1465

[16] GALLEGO-ALVAREZ, I., MARTÍNEZ-FERRERO, J., & CUADRADO-BALLESTEROS, B. (2016)。碳排放权的会计处理。系统，4(1), 12. https://doi.org/10.3390/systems4010012

[17] GARZA-REYES, J.A.（2019）。精益和绿色——对最先进文献的系统回顾。清洁生产杂志，102 、 18–29 。https://doi.org/10.1016/J.JCLEPRO.2015.04.064

[18] GARCIA-TOREA, N., GIORDANO-SPRING, S., LARRINAGA, C., & RIVIÈRE-GIORDANO, G. (2021)。碳排放配额核算：欧盟排放交易体系第 3 阶段的实证分析。社会和环境责任期刊，42(1–2), 93–115 。http://dx.doi.org/10.1080/0969160X.2021.2012496

[19] GINER, B. (2014)。排放交易计划的核算：一个仍然开放的辩论。社会和环境责任期刊，34(1), 45-51 。http://dx.doi.org/10.1080/0969160X.2014.885670

[20] 格里菲，P.A. (2013)。限额与交易排放配额和美国公司的资产负债表。可持续性会计、管理和政策杂志，4(1)，7-31。https://doi.org/10.1108/SAMPJ-01-2012-0001

[21] GRINNELL, J.D., & HERBERT, G.H. (2002)。赠送污染津贴：承认对社会的责任。会计学的批判性观点，13(2), 211–228 。http://dx.doi.org/10.1006/cpac.2001.0489

[22] HAUPT, M., & ISMER, R. (2013)。国际财务报告准则下的欧盟排放交易体系——走向“真实和公平的观点”。欧洲会计，10(1), 71–97。https://doi.org/10.1080/17449480.2013.772726

[23] HE, R., LUO, L., SHAMSUDDIN, A., & TANG, Q. (2020)。企业碳核算：从京都议定书到巴黎协定的碳核算研究文献综述。会计与金融，62, 261–298。http://dx.doi.org/10.1111/acfi.12789

[24] 霍普伍德 (2009)。会计和环境。会计、组织与社会，34(3–4)，433–439 。https://doi.org/10.1016/j.aos.2009.03.002

[25] KARAI, É., & BÁRÁNY, M. (2013)。实现排放权核算的趋同。匈牙利理工学院学报，10(1), 177–196 。https://doi.org/10.12700/APH.10.01.2013.1.10

[26] KASHYAP, V., HOOKS, J., RAHMAN, A., BORHAN, M., & BHUIYAN, U. (2020)。碳财务会计实践的制度决定因素。取自 https://www.unitec.ac.nz/epress/wp-content/uploads/2020/08/Kashyap-et-al.-Final-version.pdf

[27] KUMAR, P., & FIROZ, M. (2019)。印度核证减排量(认证证书)的核算：对财务报表中披露和报告做法的分析。打坐会计研究，28(2)，365–389。https://doi.org/10.1108/MEDAR-01-2019-0428

[28] LI, X., & SOOBAROYEN, T. (2021)。 会计、思想政治工作与中国跨国经营：新葛兰西主义视角。会计学批判视角，74，102160。http://dx.doi.org/10.1016/j.cpa.2020.102160

[29] LINNENLUECKE, M.K., MARRONE, M., & SINGH, A.K.（2020）。进行系统的文献综述和文献计量分析。澳大利亚管理杂志，45(2)，175-194。http://dx.doi.org/10.1177/0312896219877678

[30] LODHIA, S. (2011)。澳大利亚国家温室气体和能源报告法及其对会计实务和研究的影响：小型评论。会计与组织变革杂志，7(2)，190-198。https://doi.org/10.1108/18325911111139699

[31] LOVELL, H., & MACKENZIE, D. (2011)。碳会计：会计专业组织在治理气候变化中的作用。对极，43(3), 704–730 。http://dx.doi.org/10.1111/j.1467-8330.2011.00883.x

[32] LOVELL, H., BEBBINGTON, J., LARRINAGA, C., & SALES DE AGUIAR, T.R. (2013)。将碳市场付诸实践：欧洲财务会计案例研究。环境与规划 C：政府与政策，31(4)，741-757。http://dx.doi.org/10.1068/c1275

[33] 麦肯齐 (2009)。让事情变得一样：气体、排放权和碳市场的政治。会计、组织与社会，34(3–4), 440–455 。http://dx.doi.org/10.1016/j.aos.2008.02.004

[34] 马蒂诺, R., & 拉方丹, J.P. (2020)。当碳核算系统让我们忘记自然：从商品化到具体化。可持续性会计、管理和政策杂志，11(3)，487-504。https://doi.org/10.1108/SAMPJ-07-2018-0178

[35] MENGIST, W., SOROMESSA, T., & LEGESE, G. (2020)。为环境科学研究进行系统文献综述和荟萃分析的方法。方法 X, 7, 100777. https://doi.org/10.1016/j.mex.2019.100777

[36] METE, P., DICK, C., & MOERMAN, L. (2010)。

创造制度意义：碳许可证的会计和税法视角。会计学的批判性观点，21(7), 619–630。http://dx.doi.org/10.1016/j.cpa.2010.03.006

[37] MONTERO, P.M., CALDERÓN, E.P., & DIAS, A.I.L.（2020）。温室气体排放配额财务报告的透明度：监管的影响。国际环境研究与公共卫生杂志，17(3), 893。https://doi.org/10.3390/ijerph17030893

[38] NARANJO TUESTA, Y., CRESPO SOLER, C., & RIPOLL FELIU, V. (2021)。碳管理核算和财务绩效：来自欧盟排放交易体系的证据。商业战略与环境，30(2), 1270-1282。http://dx.doi.org/10.1002/bse.2683

[39] NEGASH, M. (2012)。国际财务报告准则和环境会计。管理研究评论，35(7), 577–601。https://doi.org/10.1108/01409171211238811

[40] 钱玉、王建、颜晓 (2016). 中国电力企业碳核算研究 第三届教育创新与经济管理国际研讨会论文集，槟城，2018 年 12 月 29 日至 31 日，第 30-32 页。https://doi.org/10.2991/seiem-18.2019.8

[41] RATNATUNGA, J., JONES, S., & BALACHANDRAN, K.R. (2011)。碳排放管理组织能力的评估和报告。会计视野，25（1），127-147。http://dx.doi.org/10.2308/acch.2011.25.1.127

[42] 里纳尔迪 (2019)。可持续性治理会计：社会和环境责任研究的促成作用。社会和环境责任期刊，39(1), 1-22。http://dx.doi.org/10.1080/0969160X.2019.1578675

[43] ROBERTS, L., HASSAN, A., ELAMER, A., & NANDY, M. (2021)。可持续发展的生物多样性和灭绝：系统的文献回顾和未来的研究方向。商业战略与环境，30(1), 705–720。http://dx.doi.org/10.1002/bse.2649

[44] 夏尔泰格，S.，& CSUTORA，M. (2012)。可持续性和管理的碳核算。现状与挑战。清洁生产杂志，36，1-16。https://doi.org/10.1016/j.jclepro.2012.06.024

[45] STECHEMESSER, K., & GUENTHER, E. (2012)。碳核算：系统的文献综述。清洁生产杂志，36、17–38。http://dx.doi.org/10.1016/j.jclepro.2012.02.021

[46] TUŠAN, R. (2014)。斯洛伐克会计法规与国际财务报告标准在排放权会计和确认方面的比较。第 14 届国际多学科科学地理会议论文集上海创业板，第 87-94 页。取自 https://www.researchgate.net/publication/290873823_Comparison_of_Slovak_accounting_regulation_and_international_financial_reporting_standards_in_the_area_of_accounting_and_recognition_of_emission_rights

[47] WAMBSGANSS, J.R., & SANFORD, B. (1996)。报告污染配额的问题。会计学的批判性观点，7(6), 643–652。https://doi.org/10.1006/CPAC.1996.0070

[48] WARWICK, P., & NG, C. (2012)。气候变化的“成本”：欧盟公司如何计算碳排放配额。澳大利亚会计评论，22(1), 54–67。https://doi.org/10.1111/j.1835-2561.2011.00158.x

[49] 张静 (2011). 低碳经济下碳排放的会计确认与计量 商业管理与电子信息国际会议论文集，广州，2011 年 5 月 13-15 日，第 910-912 页。

[50] ZHANG-DEBRECENY, E., KAIDONIS, M.A., & MOERMAN, L. (2009)。排放权核算：一种环境伦理方法。亚太环境责任中心杂志，15(3), 19-27.