International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 07 July 2025, pp: 717-727 www.ijaem.net ISSN: 2395-5252

The Drivers and Barriers of Corporate Carbon Accounting Adoption: A Systematic Review of Managerial, Organizational, and Policy Factors

Okon, Daniel U., Oguzierem Marauche
School of Public Health, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria
University of Port Harcourt Teaching Hospital, School of Health Information Management

Date of Submission: 15-07-2025 Date of Acceptance: 25-07-2025

ABSTRACT

Background: As climate change accelerates, corporations are under pressure to manage and report their greenhouse gas (GHG) emissions. While various carbon accounting tools and environmental management practices exist, adoption is inconsistent and effectiveness in reducing emissions is debated. Small and medium-sized enterprises (SMEs) which make up a significant portion of global economic activity and pollution are often overlooked in policy and research.

Objective: To systematically review the empirical evidence on the drivers, barriers and outcomes of corporate GHG accounting and management practice adoption with a focus on the role of managerial, organisational and policy factors in large corporations and SMEs.

Methods: A systematic search was conducted across Scopus, Web of Science and Google Scholar from inception till date using comprehensive search terms for corporate environmental management, GHG accounting and performance outcomes. The search process was supplemented by screening reference lists of included articles. From an initial pool of 1249 identified records, 52 full text articles were assessed for eligibility resulting in 24 studies that met the predefined criteria. The diverse methodologies of the included studies (e.g. econometric analyses, case studies, surveys and literature reviews) precluded a quantitative meta-analysis; therefore, a narrative synthesis was performed. Study quality was critically appraised using design appropriate criteria.

Results: The evidence shows a complex interplay of factors influencing GHG management adoption. Key external drivers are regulatory pressure, investor and stakeholder demands and the pursuit of legitimacy. Internal motivations are dominated by financial benefits (cost savings and competitive advantage) and managerial values and environmental awareness. For SMEs the barriers are severe: (1) resource constraints (financial, personnel and time); (2) lack of specialist knowledge and technical expertise; (3) difficulty in getting reliable data for comprehensive accounting. Managerial characteristics (executive ability, personal values and environmental attitudes) emerged as key determinants of both adoption and environmental performance. Several studies found a troubling disconnect where formal environmental practices were adopted but didnot lead to significant emissions reductions – greenwashing. Others found "green blushing" where SMEs took substantive environmental action without formal reporting.

Conclusion: Corporate carbon management is a balance of external pressure and internal capability with managerial will and ability being the often-overlooked key. The big implementation gap especially in SMEs shows that current policies and tools are not aligned with their reality. Future policy must move beyond one size fits all mandates to offer targeted, resource appropriate support and simple accounting frameworks to bridge the gap between corporate intention and climate action.

Keywords: Greenhouse Gas Accounting, Corporate Environmental Responsibility, Small and Medium-Sized Enterprises (SMEs), Environmental Management, Systematic Review, Drivers and Barriers, Managerial Ability.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 07 July 2025, pp: 717-727 www.ijaem.net ISSN: 2395-5252

I. INTRODUCTION

The climate crisis resulting from anthropogenic greenhouse gas (GHG) emissions represents a threat to the vitality of ecosystems and the stability of socioeconomics (Okafor et al., 2021). The science indicates there is no time to delay, and urgent and dramatic reductions in emissions will be needed to avoid the most damaging effects of climate change (Panjaitan et al., 2023). In this environment the corporate sector has emerged as a main contributor of global emissions, and has become an increasing priority for policymakers, investors and civil society (Hassan et al., 2023; Olarewaju et al., 2023). Thus, a global architecture of climate governance has framed the corporate sector, with both international agreements such as the Paris Agreement, as well as increasing number of national and regional policies that will lead the corporate sector to a low carbon future (Gaganis et al., 2023).

This new institutional pressure has spurred the emergence and dissemination of corporate carbon and the environmental accounting practice of measuring, monitoring, managing and reporting GHG emissions with definitions and standardization practices (Asdrubali et al., 2013; He et al., 2022).Tools like the GHG Protocols, and standards like ISO 14064, have become the accepted language of corporate climate action, as they take the mystery out of developing GHG inventories and structuring a baseline to reduce (Alromaizan et al., 2023; Abrahamsson, 2022). The theoretical promise of weaning opportunities is apparent: organizations can make their emissions transparent and manageable, thereby identifying inefficiencies, pursuing low carbon innovations, and allowing organisations to hold themselves accountable to stakeholders (Thadeshwar and Radadiya 2025).

Yet a chasm exists between the availability of these tools and their acceptable application and impact. A significant number of large corporations, in particular, are engaging in some sort of carbon management process since this is occurring primarily in developed economies. However, the effective, tangible, impact on global emissions, has been distressingly small (Doda et al., 2016; Panjaitan et al., 2023). This has exacerbated accusations of "greenwashing" where legitimate environmental management processes are seemingly adopted ceremoniously to obtain legitimacy and reputational benefits. However, these sustainability solutions processes are "decoupled" from actual operations, and, therefore, do not actually facilitate any improvements on environmental performance (Hassan et al., 2023).

The issue is further compounded when we take into account the role of small and medium-sized enterprises (SMEs). SMEs are the backbone of the global economy and represent a significant proportion of businesses, employment, and industrial pollutants (Afolabi et al., 2023; OECD, 2023). However, there is often little or no emphasis within climate policy and research focused on SMEs (Kutzschbach et al, 2021). Compared to larger businesses, SMEs operate under a range of severe resource constraints, which include limited financial capital, no suitable employees with relevant expertise, and limited time to a navigate a complex GHG accounting system (Kumar et al., 2022; Abrahamsson, 2022). This begs the question, are current models of corporate carbon management, which or designed by and for large corporations, adequate for the SME sector?

The choice to implement—or not implement—environmental management practices is not purely a technical or financial decision. Lead theories of organizations, such as institutional theory and upper echelon theory, indicate that corporate strategic decisions are influenced by both external factors and the internal factors of the firm's leadership. Institutional theory demonstrates that firms want to implement practices to demonstrate compliance with regulative, normative, and cognitive-cultural expectations in their environment to develop legitimacy (Ning et al., 2023; Hassan et al., 2023). In parallel, upper echelon theory argues that top managers' personal values, experiences, and cognitive bases are the strongest predictors of organizational outcomes (Gaganis et al., 2023; Vo and Hien, 2024; Papagiannakis and Lioukas, 2012). Thus, from this theoretical perspective, we need to look beyond corporations' public statements about their environmental action and explore the complex mental calculations their leaders have made.

Although there has been an increase in literature providing various examinations of this issue, a comprehensive synthesis examining the drivers, barriers to, and ultimate success in adopting GHG accounting in firms of different sizes and contexts does not exist.Historical reviews have commonly emphasized specific aspects, such as green innovation in SMEs or the financial impact of carbon performance in large firms (Baratta et al., 2023; Olekanma et al., 2024). The objective of this systematic review is to fill the gap and add value by synthesizing the empirical evidence on the prevalence and influence of

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 07 July 2025, pp: 717-727 www.ijaem.net ISSN: 2395-5252

corporate carbon management. Specifically, this review aims to:

1. Identify the primary external and internal drivers motivating firms, particularly SMEs, to adopt GHG accounting and environmental management practices.
2. Characterize the most significant barriers that inhibit the effective implementation of these practices.
3. Evaluate the evidence for the impact of these practices on both environmental (i.e., GHG emissions) and financial performance.
4. Explore the critical role of top management, including their attitudes, values, and abilities, in shaping corporate environmental responsiveness.

This review critically explored these questions and provide a deeper understanding of current corporate carbon management, revealing the fundamental disconnects that exist between policy, practice and performance. The results provide important information for policymakers wanting to develop more effective interventions, for managers wanting to navigate their organizations towards a low-carbon economy, and for researchers wanting to find new avenues for future research.

II. METHODS

2.1. Protocol and Guidance

This systematic review was performed according to a pre-defined protocol, and follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021). The protocol for this review was developed a priori to provide guidance on the search strategy, study selection, data extraction and synthesis.

2.2. Eligibility Criteria

Studies were included if they met the following criteria, structured around the Population, Exposure, Comparators, and Outcomes (PECO) framework:

a. **Population:** The review included studies focusing on business enterprises, encompassing both large corporations and SMEs, across any industrial or service sector and geographical location.
b. **Exposure:**The primary exposure of interest was the adoption, implementation, or use of GHG accounting tools (e.g., GHG Protocol, ISO 14064, customized calculators), carbon management strategies, or management practices (EMPs) related to climate or carbon performance.
c. **Comparators:** Comparators included firms not adopting such practices, pre-adoption versus post-adoption states, or comparisons between different types of drivers, barriers, or managerial characteristics.
d. **Outcomes:** Primary outcomes of interest included: (1) drivers of and barriers to adoption; (2) rates or levels of adoption; (3) impacts on environmental performance, measured primarily as GHG emissions or carbon intensity; and (4) impacts on financial or operational performance.

Qualifying study designs were empirical research (such as surveys, econometric analyses, case studies), narrative and systematic literature reviews, as well as papers presenting the development of frameworks or tools. Only peer-reviewed articles in English were included. Commentaries, editorial articles, and book chapters were excluded.

2.3. Information Sources and Search Strategy

An extensive literature search was conducted to identify relevant studies. The search included a mix of electronic databases that offer a wide range of literature (business, management, environmental science, and economics) including Scopus, Web of Science, and Google Scholar. The search was conducted from the inception of the database and included literature till date. The search strategy included a combination of keywords representative of the population, exposure and outcomes. A representative search string for a database like Scopus would be structured as follows:

(TITLE-ABS-KEY("greenhouse gas*" OR "GHG" OR "carbon accounting" OR "carbon management" OR "carbon footprint" OR "environmental management" OR "net zero" OR "decarboni*") AND TITLE-ABS-KEY("corporate" OR "firm" OR "business" OR "SME" OR "small and medium enterprise*") AND TITLE-ABS-KEY("adoption" OR "driver*" OR "barrier*" OR "factor*" OR "performance" OR "emission*"))

In addition to the database search, the reference lists of all included studies and relevant review articles were manually screened to identify any further eligible publications (i.e., snowballing).

2.4. Study Selection

The study selection process involved a two-stage process. First, two independent reviewers

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 07 July 2025, pp: 717-727 www.ijaem.net ISSN: 2395-5252

screened the titles and abstracts of all identified records against the eligibility criteria. Second, the full texts of all potentially relevant articles were retrieved and assessed for final inclusion by the same two reviewers. Disagreements were resolved through discussion and consensus. **Figure 1** presents the PRISMA flow diagram, illustrating the flow of studies through the review process.

2.5. Data Extraction and Quality Assessment

A data extraction form was developed and pilot-tested to collect relevant information from each included study. Key data points would include: first author and year, country/region, study population (firm size, sector), study objectives, methodology, theoretical framework, key findings (drivers, barriers, performance linkages), and reported limitations. Given the methodological heterogeneity of the included studies—spanning quantitative surveys, econometric modelling, qualitative case studies, and conceptual papers—a single standardized risk-of-bias tool was deemed inappropriate. Instead, each study was critically appraised using design-appropriate criteria to assess its methodological rigor and the reliability of its findings.

2.6. Data Synthesis

Due to the significant heterogeneity in study designs, populations, interventions (i.e., specific tools and practices), and outcome measures across the included studies, a quantitative meta-analysis was not feasible or appropriate. Therefore, a narrative synthesis approach was employed. The findings were thematically analyzed and grouped according to the primary research objectives: (1) drivers of adoption, (2) barriers to adoption, (3) the role of management and governance, and (4) performance outcomes and effectiveness. This approach allowed for the exploration of patterns, consistencies, and contradictions across the evidence base, facilitating a nuanced interpretation of the complex factors influencing corporate carbon management.

III. RESULTS

3.1. Study Selection

The literature search identified an initial 1,249 records. After removing 545 duplicates, 704 titles and abstracts were screened. This led to the exclusion of 652 records that were clearly not relevant to the review's scope. The full texts of the remaining 52 articles were assessed for eligibility. Of these, 28 were excluded for various reasons, including focusing exclusively on large corporations without an SME dimension, not addressing GHG or carbon-specific management, or being non-empirical commentaries. This process resulted in a final selection of 24 studies for inclusion in the narrative synthesis. The PRISMA flow diagram summarizing this process is shown in **Figure 1**.

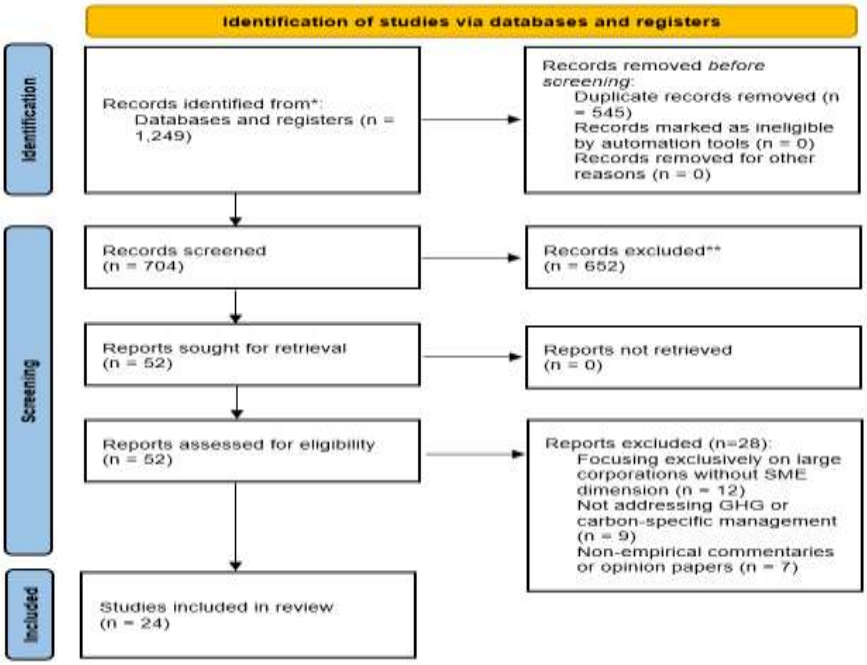

Figure 1: PRISMA 2020 Flow Diagram

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 07 July 2025, pp: 717-727 www.ijaem.net ISSN: 2395-5252

3.2. Characteristics of Included Studies

The 24 included studies represent a diverse body of evidence in terms of geography, methodology, and focus. Geographically, the studies spanned a wide range of contexts, including Europe (e.g., UK, Italy, Sweden), North America (US), Asia (e.g., China, South Korea, Vietnam, India, Malaysia, Indonesia), Africa (e.g., Nigeria, South Africa), and global/cross-country analyses. This diversity provides valuable insights into how institutional and economic contexts shape corporate environmental behaviour.

The corpus was highly heterogeneous methodologically. Generally, quantitative methods and approaches were common; large surveys of firms were common (Ning et al., 2023; Abrahamsson, 2022), as were complex econometric studies of panel data (Gaganis et al., 2023; Hassan et al., 2023). Qualitative research also has a strong presence in the corpus, including single-firm and project case studies (Di Giacomo et al., 2017; Panjaitan et al., 2023), and interview -based studies of managerial perspectives (Afolabi et al., 2023). Several papers looked at the development and testing of new accounting tools or conceptual tools (Asdrubali et al., 2013; Olarewaju et al., 2023). It is notable how varied the study subjects were. There was a very strong contingent of research focused on the issues and practices of SMEs (e.g., Alromaizan et al., 2023; Kumar et al., 2022; Kutzschbach et al., 2021), and several others studying large publicly traded firms (Gaganis et al., 2023; Afzali et al., 2025).

3.3. Methodological Quality of Included Studies

The critical appraisal found considerable differences in the methodological quality of studies included in the review. The econometric studies (e.g., Gaganis et al, 2023; Hassan et al., 2023) tended to be of high quality, with several studies using large panel datasets, strong control variables, and the use of endogeneity techniques leading to more credible causal inferences. The survey studies varied in their rigor. Some (e.g., Ning et al, 2023) implemented valid scales and large and representative samples whereas others relied on small, convenience samples, which likely reduces generalizability (e.g., Abrahamsson, 2022). A strength of the qualitative studies was that they provided rich, contextualized understandings of how firms made decisions (Afolabi et al, 2023; Panjaitan et al, 2023). A limitation in many studies (particularly survey/self-reported data studies) was the potential breach of self-reported data by social desirability bias and the inability to triangulate self-reported/practices of actual performance.

3.4. Narrative Synthesis of Findings

The findings from the 24 studies were synthesized into four overarching themes: (1) Drivers of GHG accounting and management adoption; (2) Barriers to implementation, with a focus on SMEs; (3) The pivotal role of management and governance; and (4) The effectiveness and performance outcomes of adoption.

The decision to adopt GHG accounting and management practices is influenced by a confluence of external pressures and internal motivations.

a. **External Pressures:**In several contexts, institutional driving forces were recognized as influential drivers. Regulatory pressure from government was a common mention acting as a driver, and businesses were forced to comply with environmental laws and environmental reporting requirements to avoid negative punishment (Vo & Hien, 2024; Ning et al., 2023). This was especially apparent in studies from developing countries when new environmental regulations are being rolled out (Panjaitan et al., 2023). Stakeholder pressure from investors, customers, and the community were very strong drivers too, and businesses pursue environmental practices for credibility and branding to satisfy the intentions of the stakeholders to reinforce their reputation and secure the social legitimacy of the firm (Papagiannakis&Lioukas, 2012; Afolabi et al., 2023). Ning et al. (2023) identified "herd behavior," or mimetic pressure, which is a driving force beyond stakeholder pressure; firms adopt skills, and tools e.g. like the GHG Protocol, just because they see their subordinates and competitors doing the same.

b. **Internal Motivations:**The ability to make money was the most commonly noted internal driver including: cost-savings and profit. Firms are drawn to install measures that will improve energy efficiency and reduce waste as it is in most cases, a good economic deal (Panjaitan et al.; 2023; Thadeshwar&Radadiya, 2025). This compares with the 'best value for money' in the case of the Indonesian cement company where low-cost, quick return measures were dominant (Panjaitan et al., 2023). Beyond economic benefit, considerable attention is given to managerial values and awareness, as top managers with both high personal

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 07 July 2025, pp: 717-727 www.ijaem.net ISSN: 2395-5252

environmental value and belief in the corporate social responsibility will advance sustainability initiatives and decisions (Kutzschbach et al., 2021; Sampene et al., 2024). Internal awareness and the intention to 'do the right thing' will precede or accompanied by external pressures (Vo & Hien, 2024).

While drivers create the impetus for action, a formidable set of barriers often impedes effective implementation, with SMEs being disproportionately affected.

a. **Resource Constraints:**This was the most common barrier reported across all studies of SMEs. This includes a lack of financial capital for technology investment or consulting help, a lack of dedicated people, and a lack of managerial time and attention (who juggle multiple roles) (Alromaizan et al., 2023; Kumar et al., 2022; Abrahamsson, 2022). The cost of deploying low-carbon technologies in addition to the perception that sustainability is a cost burden (a burden not an opportunity), are significant barriers (Kumar et al., 2022; Onyekawa, 2025).
b. **Knowledge and Competence Gaps:** Many SMEs lack the specialized knowledge and technical expertise required to navigate the complexities of GHG accounting, select appropriate tools, and interpret the results for strategic decision-making (Abrahamsson, 2022; Alromaizan et al., 2023). This includes a limited understanding of existing standards, methodologies, and the potential benefits of adoption (Afolabi et al., 2023).
c. **Data and Methodological Challenges:** Acquiring accurate and comprehensive data, especially for Scope 3 (value chain) emissions, was highlighted as a major obstacle for both large firms and SMEs (Alromaizan et al., 2023). The complexity of existing accounting tools, which are often designed for large corporations, makes them inaccessible and impractical for many SMEs (Alromaizan et al., 2023; Olarewaju et al., 2023).
d. **Policy and Governance Barriers:**In specific contexts, especially emerging economies, ambiguous, supportive and stable government regulation can create uncertainty and act as a hindrance. Panjaitan et al. (2023) found conflicting regulations and a lack of government support limited efforts for mitigation in Indonesia. A perceived lack of government support and doubt about the net-zero agenda can also facilitate inaction from SMEs (Afolabi et al., 2023).

The synthesis strongly indicates that top management is not just a passive respondent to pressures but an active agent whose characteristics and decisions are critical to a firm's environmental trajectory.

a. **Managerial Ability and Attitudes:**The research conducted by Gaganis et al. (2023) offered strong econometric evidence that companies with more capable managers had fewer GHG emissions (Scope 1 and 2). This indicates that better qualified managers are more effective at transforming financial and non-financial corporate resources (e.g. energy) into revenue. Similarly, a manager's environmental attitude was a significant predictor of participating in adopting green production strategies and environmental management accounting (Vo & Hien, 2024; Sampene et al., 2024).
b. **Personal Values:**Numerous studies, examined in the context of Upper Echelon Theory, concluded that the values of top managers (and parental socialization) represent a strong influence on corporate sustainability. Kutzschbach et al. (2021) identified benevolence, achievement, and conformity values of the Schwartz Value System to be motivations for SMEs in undertaking social and environmental accountability practices. Papagiannakis and Lioukas (2012) showed the indirect affect of managers' personal values on environmental responsiveness through environmental attitudes.
c. **Corporate Governance and Culture:**In regard to the institutional context surrounding managers the authors noted that there was a moderating relationship between local climate change denial and corporate environmental responsibility. In other words, Afzali et al. (2025) found that strong corporate governance and a deep corporate culture moderated the negative relationship between local climate change denial and corporate environmental responsibility. Their study indicates that strong corporate governance and corporate culture can serve as gatekeepers by insulating the firm from external influences, and by helping to moderate the corporate environmental responsible behaviour of managers. On the other hand, they found a lack of a corporate environmental policy framework, which is often made worse by management transitions,

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 07 July 2025, pp: 717-727 www.ijaem.net ISSN: 2395-5252

as a significant internal barrier (Panjaitan et al., 2023).

A critical theme emerging from the review is the disconnect between the adoption of environmental practices and their actual impact on performance.

a. **The Efficacy Gap:**A striking finding from two high-quality econometric studies published at the same time was that there was no empirical support for a causal chain from EMP adoption to improved environmental performance. Specifically, in the largest global study to date by Hassan et al. (2023), they found while poor environmental performance Granger-caused the adoption of EMPs, the reverse was not true signalling EMP adoption was done in a 'symbolic' manner to legitimise poor performance. This supports a similar finding by Doda et al. (2016), as cited in Hassan et al. (2023), for example, no association between 23 carbon management practices and GHG emissions. Di Giacomo et al. (2017), in a case study illustrated this failure. Here a global consulting firm adopted an EMP for air travel emissions, giving employees incentives to reduce these emissions. The consulting firm not only failed to reduce emissions, it increased them.
b. **"Green Blushing" in SMEs:**Contrary to the greenwashing narrative, Kutzschbach et al. (2021) observed research around "green blushing" in SMEs, where organizations took meaningful environmental action while neglecting to formally communicate or promote them or promote them. This circumstance was attributed to an assumption that reporting was a time-consuming and burdensome PR overture for an organization of a larger size, or even a general assumption that their sustainability work was a tacit part of their business ethic.
c. **Financial Performance:**The connections to financial performance were mixed. However, some studies indicated that green practices and green innovation may help create competitive advantage and profitability (Vo & Hien, 2024; Thadeshwar&Radadiya, 2025) whereas others refuted any desirable immediacy of financial payoff which inhibits adoption (Kumar et al., 2022). Smith's (2016) study reinforced that investor interpretations of organizational data on GHG emissions might be affected depending on the accounting method, giving room for possible implications for financial markets. Appah et al. (2024) found no significant relationship between carbon accounting scopes and return on assets in Nigerian participants.

IV. DISCUSSION

This systematic review provided empirical evidence from 24 different studies following a comprehensive literature search, and indicates a large and complicated implementation gap in corporate carbon management. The major findings show that external institutional believe and pressure (like from regulators, stakeholders and market competitors) along with internal financial drive are strong motivators for adopting GHG accounting processes; but much of those motivations do not translate into meaningful environmental performance. For SMEs, significant implementation gaps occur for environmental management practices— with barriers for resource constraints, technical knowledge, and availability of data. Importantly, our review brings attention to the importance of the facility's leadership, and emphasizes the managerial capabilities, personal values and environmental attitudes of managers are significant determinants of the intention to adopt environmental management practices, as well as their actual effectiveness. This positions another central dilemma - when many firms adopt formal environmental practices that do not reduce emissions, many SMEs do much more than they report.

The results characterize not a straightforward and linear adoption process, but a contested landscape in which environmental pressures for legitimacy bump against operational realities and managerial priorities. The strong evidence of a "performance-to-practice" causality (Hassan et al., 2023), in which poor environmental performers tend to adopt formal environmental management programs (EMPs), provided strong support for the hypothesis of "decoupling" from institutional theory. Firms appear to adopt the structures of environmental management as a merely symbolic action in response to institutional pressures, and not as part of substantive operation in their organizations. While the case by Di Giacomo et al. (2017) involving the failed incentive-based travel reduction program illustrates the decoupling we describe: formal systems never had a chance against the deeply entrenched actions and perceived needs of the senior people in the organization.

The differences in extent of effectiveness in SMEs in relation to GHG emissions can be understood in terms of the hefty barriers noted in

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 07 July 2025, pp: 717-727 www.ijaem.net ISSN: 2395-5252

the literature, which are cognitive and cultural but much more than just logistical. The structural findings, pointing to SMEs not having the resources, knowledge and data available to complete complex carbon accounting (Alromaizan et al., 2023; Kumar et al., 2022; Abrahamsson, 2022), highlight that dominant GHG management/viewing tools (like the GHG Protocol) are elastically structurally misaligned to the capabilities of a large portion of businesses all around the world. The accountability tool, originally developed for larger corporations, represents a high cognitive and financial load than SMEs cannot carry, which has likely led to non-adoption or course partial adoption.

It is in this turbulent landscape that the role of management will take on critical importance. The work of Gaganis et al. (2023) provides strong insights, demonstrating that managerial capability is a type of "green" human capital associated with lower levels of emissions. Skilled managers would be expected to be more effective at effectively using resources, recognizing instances of emissions abatement that are also low cost, and successfully instigate shifts in complex operations. This would supplement research on managerial values and attitudes (Kutzschbach et al., 2021; Vo & Hien, 2024; Papagiannakis&Lioukas, 2012), which suggest that a manager's intrinsic motivation and pro-environmental world view can provide the sustainment needed to jump the hurdles of implementation and initiate substantive as opposed to symbolic, action. The notion of "green blushing" prevalent in SMEs (Kutzschbach et al., 2021) could be interpreted in consideration of a values-led view that prioritizes action over the espousing of performance measures. The second qualifier concerns the moderating role of corporate governance and culture (Afzali et al., 2025; Onyekawa, 2025), indicating that managerial agency is limited or enabled by the internal institutional environment of the firm. Where corporate governance and culture is stronger, managers have the opportunity to pursue long term accountable sustainability aspirations, regardless of local normative scepticism or financial pressures for short term success.

This review demonstrates a serious disparity between the intent of policy and the reality of action, and specifically illustrates the failure of existing regulatory frameworks in relation to the significant implementation gap facing small and medium enterprises (SMEs). This evidence suggests that we need to move away from standardized approaches or rigid policies and adopt an approach that reflects the obstacle of resource and knowledge availability facing SMEs on a daily basis. As policymakers, we must embrace the notion of developing a tiered structure of standards or at least let SMEs develop tiered approaches to compliance, or develop a simplified standard; this has been proposed recently by Alromaizan et al. (2023) and Olarewaju et al. (2023) in the form of low-cost GHG accounting tools that provide the same functionalities as a full standard but remove obstacle barriers to entry for SMEs, as seen in Asdrubali et al.'s (2013) flexible GIS-based tool that worked with varying levels of data accuracy. However, more than simplifying the process, governments must radically rethink their role, perhaps not as simply a mandate issuer, but as a proactive and total supporting mechanism for SMEs. This involves not only giving the option of credit risk but providing the needed technical advice, training workshops (capacity development), and subsidy supports such as tax credits for technology adoption to help SMEs overcome their initial hurdles to participation, as mentioned by Kumar et al. (2022) and Adu et al. (2023). Strategic policy intervention should also leverage existing business relationships, with policies incentivizing or requiring large corporations to extend technical support and data-sharing platforms to their SME suppliers, recognizing how smaller firms often operate within the influence sphere of larger partners as noted by Afolabi et al. (2023), while simultaneously strengthening verification mechanisms to combat greenwashing by moving beyond self-reported practices toward performance-based metrics that accurately assess genuine environmental improvements.

This review gives managers and business leaders further insight into the key difference between implementing environmental management systems and improving environmental performance, indicating that while a formal implementation may occur, it does not necessarily constitute some form of environmental performance improvement and it demands an increasingly detailed understanding of what influences real change. Leadership commitment is of course the most foundational aspect; but, as emphasized by Panjaitan, et al (2023) such commitment needs to go beyond self-serving public relations opportunities and needs to recognize sustainability as a vital strategic priority that is engrained into the organizational culture and operational decision-making, transforming environmental management into a fundamental aspect of creating value for that organization.

Almost equally as important is a serious investment in human capital capabilities and comprising a considerable investment in hiring managers that have demonstrated skills in efficiency and some systematic training in environmental management and data analysis, as noted by Gaganis et al (2023) and Sampene et al (2024), because many of today's environmental challenges require the ability to holistically analyze both technical and strategic sustainability development and design a pathway to appropriately addressing that challenge from planning and implementation perspectives based on collective environmental management skill development. The tendency toward symbolic adoption must give way to substantive action, with managers concentrating efforts on measures with demonstrable emissions impact such as improving energy efficiency, optimizing supply chains to reduce carbon footprints, and innovating products that inherently generate lower emissions throughout their lifecycle, recognizing that meaningful environmental performance requires the same rigorous measurement and improvement approach organizations apply to their financial performance.

V. CONCLUSION

From the evidence mediated through an elaborate systematic review process, we conclude that the political landscape of corporate carbon management is complex and contradictory. There is increasing institutional pressure for firms to do something about climate change; however, the presence of formal processes and associated practices does not equate to environmental improvement. Between the world of sustainability rhetoric and the world of operational inertia and resource constraints lies a significant gap; for SMEs the gap is especially wide. The evidence offers strong indication that managerial agency, defined as the ability, values, and commitment to the environment possessed by the firm's leadership is what connects the external environments, as organizational resource, with a reduction in GHG emission. Without resolute leadership, corporate environmentalism is at serious risk of being a symbolic rather than substantive act. To that end, climate policy must be two-pronged: it must focus on external regulations and incentives and organizational capabilities in managerial capabilities for a committed low-carbon transition to occur.

REFERENCES

[1]. Abrahamsson, M. (2022). Challenges and opportunities for SMEs to adopt GHG calculation tools [Master's thesis, Linnaeus University].

[2]. Adu, D. A., Chen, X. H., Hasan, M., Zhu, X., &Jellason, N. (2023). The relationship between entrepreneurial energy efficiency orientation and carbon footprint reduction: The mediating role of green networking and identification of barriers to green practices. Journal of Environmental Management, 347, 119256.

[3]. Afeku-Amenyo, H. (2021). The outlook for debt from emerging markets – as a great opportunity for investors or as an "accident waiting to happen?" DOI: 10.13140/RG.2.2.25528.15369.

[4]. Afolabi, H., Ram, R., Hussainey, K., Nandy, M., &Lodh, S. (2023). Exploration of Small and Medium Entities' actions on sustainability practices and their implications for a greener economy. Journal of Applied Accounting Research, 24(4), 655-681.

[5]. Afzali, M., Colak, G., &Vähämaa, S. (2025). Climate change denial and corporate environmental responsibility. Journal of Business Ethics, 196, 31–59.

[6]. Alromaizan, M., Afy-Shararah, M., Jagtap, S., Litos, L., &Salonitis, K. (2023). Developing a carbon accounting tool for SMEs in the agri-food sector. Procedia CIRP, 116, 492-497.

[7]. Appah, E., Nkak, P., &Eburunobi, E. O. (2024). Corporate carbon emissions accounting and financial performance of listed manufacturing firms in Nigeria: Moderating influence of firm size. British International Journal of Applied Economics, Finance and Accounting, 8(3), 93-118.

[8]. Asdrubali, F., Presciutti, A., &Scrucca, F. (2013). Development of a greenhouse gas accounting GIS-based tool to support local policy making—Application to an Italian municipality. Energy Policy, 61, 587-594.

[9]. Bakare, O. A., Achumie, G. O., & Okeke, N. I. (2024). The impact of administrative efficiency on SME growth and sustainability. Open Access Research Journal of Multidisciplinary Studies, 8(1), 126-138.

[10]. Baratta, A., Cimino, A., Longo, F., Solina, V., & Verteramo, S. (2023). The impact of

ESG practices in industry with a focus on carbon emissions: Insights and future perspectives. Sustainability, 15(8), 6685.

[11]. Di Giacomo, N., Guthrie, J., & Farneti, F. (2017). Environmental management control systems for carbon emissions. PSU Research Review, 1(1), 39-50.

[12]. Doda, B., Gennaioli, C., Gouldson, A., Grover, D., & Sullivan, R. (2016). Are corporate carbon management practices reducing corporate carbon emissions? Corporate Social Responsibility and Environmental Management, 23, 257–270.

[13]. Gaganis, C., Galariotis, E., Pasiouras, F., &Tasiou, M. (2023). Managerial ability and corporate greenhouse gas emissions. Journal of Economic Behavior& Organization, 212, 438-453.

[14]. Hassan, O. A. G., Romilly, P., & Khadaroo, I. (2023). The impact of corporate environmental management practices on environmental performance. Business Ethics, the Environment & Responsibility, 33(3), 449-467.

[15]. He, R., Luo, L., Shamsuddin, A., & Tang, Q. (2022). Corporate carbon accounting: A literature review of carbon accounting research from the Kyoto Protocol to the Paris Agreement. Accounting & Finance, 62(1), 261-298.

[16]. Khairy, H. A., Elzek, Y., Aliane, N., &Agina, M. F. (2023). Perceived environmental corporate social responsibility effect on green perceived value and green attitude in hospitality and tourism industry: The mediating role of environmental well-being. Sustainability, 15(6), 4746.

[17]. Kumar, A., Luthra, S., Mangla, S. K., Garza-Reyes, J. A., &Kazancoglu, Y. (2022). Analysing the adoption barriers of low-carbon operations: A step forward for achieving net-zero emissions. Resources Policy, 80, 103256.

[18]. Kutzschbach, J., Tanikulova, P., & Lueg, R. (2021). The role of top managers in implementing corporate sustainability—A systematic literature review on small and medium-sized enterprises. Administrative Sciences, 11(2), 44.

[19]. MacSween, K., & Feliciano, D. (2018). Comparison of online greenhouse gas accounting tools for agriculture. CCAFS Info Note. CGIAR Research Program for Climate Change, Agriculture and Food Security (CCAFS).

[20]. Marchese, M., & Medus, J. (2023). Assessing greenhouse gas emissions and energy consumption in SMEs: Towards a pilot dashboard of SME greening and green entrepreneurship indicators. OECD SME and Entrepreneurship Papers, No. 42. OECD Publishing.

[21]. Ning, X., Lu, Y., Yim, D., &Khuntia, J. (2023). Factors affecting the usage intention of environmental sustainability management tools: Empirical analysis of adoption of greenhouse gas protocol tools by firms in two countries. Sustainability, 15(3), 2703.

[22]. Okafor, C., Madu, C., Ajaero, C., Ibekwe, J., Bebenimibo, H., &Nzekwe, C. (2021). Moving beyond fossil fuel in an oil-exporting and emerging economy: Paradigm shift. AIMS Energy, 9(2), 379-413.

[23]. Olarewaju, T., Dani, S., & Jabbar, A. (2023). A comprehensive model for developing SME net zero capability incorporating grey literature. Sustainability, 15(5), 4459.

[24]. Olekanma, O., Rodrigo, L. S., Adu, D. A., &Gahir, B. (2024). Small-and medium-sized enterprises' carbon footprint reduction initiatives as a catalyst for green jobs: A systematic review and comprehensive business strategy agenda. Business Strategy and the Environment, 33(7), 6911-6939.

[25]. Onyekawa, G. C. (2025). Assessing the adoption and implementation of environmental accounting practices in Nigerian industries: A comparative analysis. ResearchGate.

[26]. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ, 372.

[27]. Panjaitan, T. W. S., Dargusch, P., Wadley, D., & Aziz, A. A. (2023). A study of management decisions to adopt emission reduction measures in heavy industry in an emerging economy. Scientific Reports, 13(1), 1413.

[28]. Papagiannakis, G., &Lioukas, S. (2012). Values, attitudes and perceptions of managers as predictors of corporate

environmental responsiveness. Journal of Environmental Management, 100, 41-51.

[29]. Sampene, A. K., Li, C., Agyeman, F. O., & Brenya, R. (2024). Employees' behavioural action towards corporate environmental performance: The moderating effect of moral reflectiveness. Heliyon, 10(6), e28075.

[30]. Smith, A. (2016). Methodology options in greenhouse gas accounting practices at an organizational level and their implications for investors. Carbon Management, 7(3-4), 1-12.

[31]. Smith, L. K. (2024). Quantifying green house gas (GHG) emissions for small businesses in the US: Effective policies to reduce GHG [Master's thesis, Harvard University].

[32]. Thadeshwar, R. J., &Radadiya, P. P. (2025). Green accounting tools for SMEs: Integrating sustainability into financial practices. International Research Journal on Advanced Engineering and Management, 3(5), 1935-1941.

[33]. Vo, T. T., & Hien, N. N. (2024). The impact of managers' attitudes towards environmental management accounting and green competitive advantage in Vietnam manufacturers. Heliyon, 10(13), e33565.