Advancing Green Accounting in Emerging Asian Economies: A Systematic Literature Review of Drivers, Frameworks, and Technological Enablers (2015–2025)

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Abstract

Green accounting has evolved from a niche concept into a strategic mechanism for integrating environmental considerations into business decision-making, particularly in emerging Asian economies facing rapid industrialisation and rising ecological pressures. This study conducts a systematic literature review (SLR) of 1,370 peer-reviewed articles published between 2015 and 2025 to synthesise current knowledge on green accounting adoption, measurement frameworks, and technological enablers across diverse organisational and institutional contexts. The review identifies four thematic domains: (1) the influence of green accounting on firm performance and financial outcomes, (2) organisational drivers and barriers shaping adoption, (3) the development and fragmentation of measurement and policy frameworks, and (4) the role of green innovation and digital technologies in strengthening environmental reporting. Findings reveal that green accounting enhances operational efficiency, risk management, and market valuation when embedded within broader sustainability strategies, yet adoption remains uneven due to capability gaps, inconsistent indicators, and resource constraints. Measurement systems are expanding toward multidimensional carbon and resource accounting models, but lack alignment, limiting comparability and policy integration. Technological readiness emerges as a critical enabler, with digital tools and clean technologies improving data accuracy and transparency, though benefits depend on organisational capacity and governance structures. The review concludes with recommendations for sector-wide measurement templates, staged capability-building routines, and workflow-integrated data collection to improve reliability and practical relevance. Future research should address SME adoption pathways, comparative analysis of frameworks, and the integration of low-cost digital solutions into routine operations. This synthesis provides a comprehensive foundation for advancing green accounting as a driver of sustainable business performance in Asia.

Keywords: Green Accounting, Environmental Management Accounting, Sustainability Reporting, Digital Innovation

Introduction

Background

Environmental impacts are now producing costs that no firm can quietly absorb or overlook (Kumalawati et al., 2023). Rising energy prices, waste management fees, carbon charges, and supply-chain disruptions are compelling companies to integrate environmental considerations into their everyday financial decision-making, rather than treating them as a separate sustainability exercise (Chen et al., 2025). As these pressures intensify, green accounting has shifted from a specialist topic to a practical concern for managers and researchers alike.

These pressures are particularly evident in emerging and Asian economies, where rapid industrial expansion has increased resource use and intensified environmental strain. Firms in countries such as China, Indonesia, Malaysia, and Vietnam are facing growing expectations to demonstrate how they measure and report their environmental impacts (Kumalawati et al., 2023). The literature reflects this diversity. Studies highlight that organisations operating within stronger regulatory environments or with higher levels of transparency tend to progress more quickly in green innovation. Other research such as Lisnawati et al. (2024), Kumalawati et al. (2023) and Lutfi et al. (2023) indicates that environmental information is increasingly influencing operational planning, resource management, and investment decisions. Examples include improved energy efficiency in Indonesian firms through environmental management accounting, and the use of carbon-related metrics to guide regional development planning or support cleaner production technologies.

Despite these developments, progress remains uneven. Many firms still rely on systems designed for financial reporting rather than environmental measurement, which results in inconsistent, incomplete, or incomparable data. Others remain uncertain about which indicators to report or how to define reporting boundaries. Sectoral differences varied organisational capacity, and uneven access to resources contribute to a fragmented reporting landscape. A wide range of measurement approaches also exists. These include carbon accounting tools, resource flow assessments, and environmental cost models (Zhang et al., 2024). Each approach offers insights, but they rely on different assumptions and indicators. This diversity makes it difficult to compare findings or draw broader conclusions.

Technology has the potential to support more accurate environmental measurement, yet its adoption varies significantly (Liang & Qiao, 2024). Larger firms may invest in structured monitoring systems, while smaller organisations often depend on basic tools, gradual improvements, or external technical support (Liang & Qiao, 2024). These differences highlight the uneven readiness across the region and the challenges of producing reliable and timely environmental information.

Taken together, the literature is rich but scattered across sectors, methodological approaches, and analytical perspectives. Some studies focus on performance outcomes, others examine organisational and institutional drivers, while another group evaluates measurement frameworks or technological tools. What is missing is a clear synthesis that brings these strands together to demonstrate how green accounting is evolving in emerging and Asian economies, the challenges that persist, and the factors that consistently influence its adoption.

This review addresses that gap by conducting a Systematic Literature Review of studies published between 2015 and 2025. By focusing on Asia, where environmental pressures are significant and institutional responses vary widely, the review aims to identify shared patterns, clarify areas of divergence, and explain how green accounting interacts with firm performance, organisational capability, measurement systems, and technological development. This provides a more integrated understanding of how green accounting is evolving across the region.

Problem Statement

Although green accounting is gaining attention, its adoption in emerging and Asian economies remains inconsistent. Many firms still use systems that are not designed to accurately capture environmental information. As a result, data is often incomplete, reconstructed long after activities occur, or based on different assumptions across firms and sectors (Liang & Qiao, 2024). These weaknesses make it challenging to evaluate the impact of green accounting on performance, as findings from different contexts cannot be easily compared or combined.

Organisational capability also remains uneven. Some firms lack the environmental literacy and staffing needed to maintain stable measurement routines, while others face financial or operational constraints that limit their ability to produce reliable information (Iskandar et al., 2021). In many cases, environmental responsibilities are unclear and not well integrated into everyday work. When capability and leadership support are weak, environmental reporting becomes a reactive exercise driven by external pressure rather than a deliberate management practice.

At the same time, measurement frameworks are expanding rapidly, but they differ widely in scope, indicators, and methodological foundations. While these tools can enhance environmental reporting, their lack of alignment makes interpretation difficult and limits their usefulness for policy and practice. Digital tools can help improve accuracy and reduce inconsistency; however, technological readiness varies across countries and sectors. Many organisations struggle to integrate digital systems into daily operations, and technological support remains uneven.

These issues weaken the usefulness of green accounting for decision-making. Firms cannot reliably benchmark their performance, regulators cannot depend on reported information, and researchers cannot draw clear conclusions about the impact of environmental accounting practices. A structured review is therefore necessary to clarify current practices, identify persistent barriers, and explain how measurement systems, organisational capability, and technological readiness shape the development of green accounting in Asia. These concerns lead directly to the four research objectives guiding this review.

Research objectives
1. To examine how green accounting influences firm performance and financial outcomes.
2. To explore the drivers, barriers, and organisational determinants that influence the implementation and adoption of green accounting.
3. To analyse measurement frameworks, carbon/environmental accounting systems, and policy mechanisms related to green accounting.

4. To evaluate the role of green innovation, technology, and operational systems in advancing green accounting practices.

Literature Review

Green accounting has become an increasingly prominent area of research as firms face rising environmental costs, institutional pressures, and stakeholder expectations. The growing body of work, particularly across emerging and Asian economies, reflects diverse theoretical, methodological, and sectoral approaches to understanding how firms measure, report, and manage their environmental performance. Broadly, the literature converges around four domains relevant to this review: (1) the influence of green accounting on firm performance, (2) organisational drivers and barriers to adoption, (3) the evolution of measurement and policy frameworks, and (4) the role of technology and innovation in shaping green accounting practices.

Green Accounting and Firm Performance

A substantial segment of the literature links green accounting to improved financial and operational outcomes. Studies show that incorporating environmental cost information into decision-making enhances corporate performance by improving resource efficiency, lowering long-term risks, and strengthening market credibility. Evidence from Indonesian firms, for example, demonstrates that environmental management accounting supports operational efficiency and contributes directly to green-economy outcomes (Kumalawati et al., 2023). Similar effects are found in mining and manufacturing sectors, where green accounting systems reduce resource waste and enhance profitability (Iskandar et al., 2025). Research in broader ASEAN contexts indicates that firms integrating environmental accounting often experience higher firm value, reflecting investor appreciation of improved transparency and long-term sustainability (Bawono et al., 2025).

The literature also points to several mediating and moderating relationships. Environmental sustainability (Zainal et al., 2025), sustainable competitive advantage (Aljawarneh et al., 2025), and ESG structures strengthen the pathways from green accounting to performance, suggesting that firms must embed environmental goals into strategic planning to realise full benefits. These studies collectively emphasise that green accounting functions not merely as an informational tool but as a strategic mechanism that enhances competitive positioning, risk management, and organisational legitimacy across diverse sectors.

Drivers, Barriers, and Organisational Determinants

Research examining adoption dynamics highlights the interplay between internal motivations and external pressures. Managerial awareness, environmental orientation, and perceived benefits are consistently identified as internal drivers that shape the adoption of green accounting and related environmental practices, especially among SMEs (Huy & Phuc, 2025; Sabihaini et al., 2024). However, capability gaps, such as limited environmental literacy and insufficient technical expertise, often constrain adoption. Notably, studies report low levels of green accounting knowledge even among accounting students, raising concerns about long-term professional readiness (Iskandar et al., 2021).

Externally, institutional and regulatory pressures play a decisive role. Coercive forces from governments, shareholders, and capital markets strongly predict adoption among public-

listed companies (Razak et al., 2020). Sectoral studies reveal additional variations: construction companies adopt green accounting when it yields tangible cost benefits, while public-sector organisations depend on technological infrastructure and policy mandates (Rumambi et al., 2023; Maswadeh & Alhusban, 2024). Resource constraints, weak oversight, and conflicting organisational priorities continue to hinder widespread adoption, resulting in a highly uneven process across industries and regions (Nguyen et al., 2023; Sholehah et al., 2024).

Measurement Frameworks and Policy Mechanisms
Green accounting research increasingly focuses on developing more sophisticated measurement frameworks to capture carbon emissions, resource use, and environmental costs with greater accuracy. Emerging approaches include carbon balance accounting models that integrate factor analysis and spatial heterogeneity (Chen et al., 2025), land-use-based carbon accounting (Zhang et al., 2024), and network models for embodied energy assessments (Liang et al., 2024). To mitigate the significant environmental impacts and implement environmentally friendly practices, a green accounting reporting model is proposed for medium-sized businesses in developing countries (Rasyid et al., 2025). These frameworks reflect a shift toward multidimensional measurement systems that align environmental data with economic and spatial processes.

Policy-oriented studies emphasise that regulatory design, carbon pricing, and disclosure mandates shape how firms adopt and implement environmental accounting. Carbon tax mechanisms, the EU's CBAM, and national carbon-trading systems are increasingly requiring high-quality emissions inventories and consistent reporting standards (Yan et al., 2023; Li, 2024). Empirical modelling further shows that well-designed carbon accounting systems can influence economic transformation, support emissions reduction, and guide investment flows (Liu et al., 2022; Wang et al., 2023). Despite these advancements, the literature highlights persistent fragmentation, with measurement tools varying widely in scope, assumptions, and indicators. The study by Rasyid et al (2025) indicated that clear technical guidance, regulatory certainty, and incentives, along with guidance on managing and reporting environmental impacts, are crucial for effectively adopting green accounting to achieve sustainable business performance.

Technology, Digitalisation, and Green Innovation
Technology and green innovation are recurrent themes in the literature, signalling their central role in strengthening green accounting practices. Digital trade and industrial upgrading promote regional green innovation by enhancing information flows and enabling more robust environmental monitoring (Liang & Qiao, 2024). Collaborative digital manufacturing ecosystems support the development of real-time carbon accounting and green R&D (He & Liu, 2023). Clean technologies, such as solar-driven CO_2 capture systems, demonstrate how engineering innovations feed directly into measurable environmental performance (Shen & Yang, 2023). Empirical evidence on mediation effects confirms that green concepts have a positive and indirect impact on firm performance through sustainability-driven strategies. The findings reinforce the importance of sustainability-based approaches in aligning environmental objectives with economic performance, particularly within emerging economy contexts. Overall, the results highlight the strategic value of

sustainability-oriented innovations and accounting practices in fostering long-term corporate success.

At the organisational level, digital innovation enhances the usefulness of green accounting and strengthens sustainability performance, especially when supported by strong governance structures (Lisnawati et al., 2024; Lutfi et al., 2023). Environmental management accounting similarly provides structured cost data that informs eco-efficient operations (Kumalawati et al., 2023), while green design frameworks integrate 3R principles and lifecycle assessments into product development (Tu & Huang, 2015).

Across the literature, green accounting emerges as a multifaceted domain shaped by institutional forces, organisational capabilities, technological infrastructures, and evolving measurement systems. While the evidence consistently links green accounting to improved performance and enhanced environmental responsibility, adoption remains fragmented due to capability gaps, inconsistent frameworks, resource constraints, and uneven technological readiness. The diversity of findings highlights the need for an integrated review, such as the present study, to clarify patterns, identify persistent barriers, and synthesise how green accounting is evolving across emerging and Asian economies.

Methodology
This study employed a systematic literature review (SLR) approach to examine the adoption and advancement of green accounting practices in selected Asian economies between 2015 and 2025. The SLR focused on scholarly publications to synthesise current knowledge, identify trends, and highlight key insights into green accounting adoption. A total of 6,826 documents were initially retrieved, which, after applying inclusion criteria based on publication year, subject area, document type, country affiliation, language, and publication stage, were refined to 1,370 English-language, peer-reviewed journal articles.

The search was conducted using a comprehensive query on Scopus, covering the title, abstract, and keywords with the terms "Green Accounting," "Green Economy," and "Accounting." The query was restricted to relevant subject areas, including environmental science, energy, agriculture, social sciences, business, and economics, and focused on countries in Asia, such as China, India, Indonesia, Malaysia, South Korea, Japan, Viet Nam, Thailand, Taiwan, Pakistan, Hong Kong, Jordan, Singapore, United Arab Emirates, Bangladesh, Philippines, Oman, Qatar, Sri Lanka, Kuwait, Nepal, Mongolia, and Brunei Darussalam. Document types were limited to research articles, including open access and final publication stage articles.

The study further analysed keywords, resulting in 77 unique terms that informed thematic categorization. The screening and selection process followed standard SLR protocols to ensure the reliability and relevance of included studies. Data extraction captured information on research objectives, methodologies, frameworks, key findings, and policy implications.

Finally, the extracted studies were synthesised narratively and thematically to evaluate the role of green innovation, digital technologies, and operational systems in advancing green accounting practices. This approach enabled a structured assessment of the interconnections

between organisational transparency, environmental management accounting, green design, and operational decision-making across diverse sectors in Asia.

Table 1
Search String

Search String	TITLE-ABS-KEY (Green Accounting) AND PUBYEAR > 2014 AND PUBYEAR < 2027 AND (LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "ENER") OR LIMIT-TO (SUBJAREA , "AGRI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "ECON")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (AFFILCOUNTRY , "China") OR LIMIT-TO (AFFILCOUNTRY , "India") OR LIMIT-TO (AFFILCOUNTRY , "Indonesia") OR LIMIT-TO (AFFILCOUNTRY , "Malaysia") OR LIMIT-TO (AFFILCOUNTRY , "South Korea") OR LIMIT-TO (AFFILCOUNTRY , "Japan") OR LIMIT-TO (AFFILCOUNTRY , "Viet Nam") OR LIMIT-TO (AFFILCOUNTRY , "Thailand") OR LIMIT-TO (AFFILCOUNTRY , "Taiwan") OR LIMIT-TO (AFFILCOUNTRY , "Pakistan") OR LIMIT-TO (AFFILCOUNTRY , "Hong Kong") OR LIMIT-TO (AFFILCOUNTRY , "Jordan") OR LIMIT-TO (AFFILCOUNTRY , "Singapore") OR LIMIT-TO (AFFILCOUNTRY , "United Arab Emirates") OR LIMIT-TO (AFFILCOUNTRY , "Bangladesh") OR LIMIT-TO (AFFILCOUNTRY , "Philippines") OR LIMIT-TO (AFFILCOUNTRY , "Oman") OR LIMIT-TO (AFFILCOUNTRY , "Qatar") OR LIMIT-TO (AFFILCOUNTRY , "Sri Lanka") OR LIMIT-TO (AFFILCOUNTRY , "Kuwait") OR LIMIT-TO (AFFILCOUNTRY , "Nepal") OR LIMIT-TO (AFFILCOUNTRY , "Mongolia") OR LIMIT-TO (AFFILCOUNTRY , "Brunei Darussalam")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (EXACTKEYWORD , "Green Accounting") OR LIMIT-TO (EXACTKEYWORD , "Green Economy") OR LIMIT-TO (EXACTKEYWORD , "Accounting"))
Date	25th October 2025

Findings
The visual highlights the geographical spread of empirical studies, showing how evidence on green accounting and firm performance emerges across Asia, Europe, the Middle East, and Africa. Industry markers indicate strong representation from manufacturing, energy, construction, finance, and agriculture, reflecting the diversity of sectors applying environmental cost management, carbon accounting, and ESG-related practices. The lower panels summarise the main analytical focus, linking green accounting practices to financial outcomes, market valuation, risk reduction, and productivity. Together, the illustration conveys how regional context, industrial characteristics, and specific green accounting approaches collectively shape firm-level performance findings.

Figure 1: Global Evidence on Green Accounting and Firm Performance

Figure 2: Green Accounting Adoption

The visual highlights the dynamic interplay between the key drivers, barriers, and overall relevance influencing the adoption of green accounting. It shows how regulatory pressure, stakeholder expectations, and long-term cost efficiency act as strong catalysts, pushing firms toward environmental disclosure and sustainability-focused practices. At the same time, the illustration depicts significant barriers such as high implementation costs, limited technical expertise, and inconsistent reporting standards that slow adoption. Together, these elements converge to show that green accounting is increasingly recognised as essential for improving transparency, enhancing strategic decision-making, and strengthening environmental responsibility across different organisational contexts.
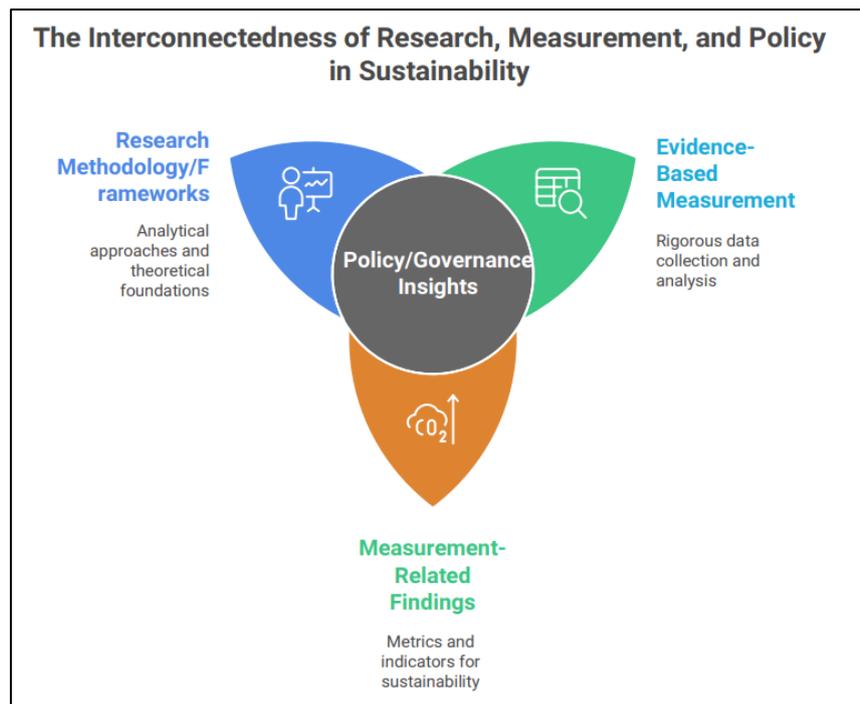
Figure 3: The Interconnectedness of Research, Measurement, and Policy in Sustainability

The visual presents how methodological choices, measurement practices, and policy linkages interact in studies of green accounting. The first section highlights the diverse research approaches used, from econometric modelling and structural equation techniques to content analysis and theory-driven frameworks such as legitimacy, stakeholder, and institutional theory. The second section shows how these methods uncover key measurement insights, including environmental cost tracking, carbon accounting indicators, and ESG performance metrics. The final section illustrates how these findings connect to policy and governance, emphasising regulatory compliance, disclosure mandates, and the role of corporate governance in strengthening green accounting implementation.

The below table summarises how diverse methodological approaches, ranging from content analysis and Delphi techniques to econometric modelling and mixed-methods frameworks, shape the evidence base in green accounting research. These methods support studies focusing on carbon measurement, disclosure quality, decarbonisation strategies, governance structures, and sector-specific environmental practices. Together, they generate key insights that advance green accounting adoption, including the need for standardised measurement systems, stronger policy alignment, accurate emissions reporting, organisational capability building, and integration of digital technologies. The three pillars illustrate a clear progression: rigorous methodology drives focused inquiry, which in turn produces actionable insights for environmental accounting transformation.

Table 2

Key Insights Relevant to Green Accounting Adoption

Authors (Year)	Context / Country	Methodology / Framework	Focus of Study	Key Insights Relevant to Green Accounting Adoption
Chen et al. (2024)	Green supply chain; Competitive manufacturing	Three decision models: rational, risk-aversion, cost-sharing; Numerical simulations	Role of supply-chain coordination and risk aversion in green production	Higher risk aversion reduces product greenness and profitability; cost-sharing contracts improve collaboration and green outcomes.
Liang & Qiao (2024)	China (2011–2022)	Provincial panel data; Threshold models	Digital trade and regional green innovation	Digital technologies upgrade industrial structures and accelerate green innovation; stronger under stricter environmental regulation.
Xia et al. (2023)	4,017 Chinese listed firms	Multisource transparency metrics (accounting, analyst, audit)	Information transparency and green innovation legitimacy	Higher corporate transparency strengthens the legitimacy of green innovation, reinforcing stakeholder trust and environmental accountability.
Kumalawati et al. (2023)	Indonesia – Textile sector	Survey; Multiple linear regression	Environmental management accounting & energy efficiency	Environmental management accounting and energy efficiency significantly support green-economy outcomes.
He & Liu (2023)	China – Auto manufacturing	Evolutionary game model	Digital–manufacturing crossover cooperation in green innovation	Digital partnerships and carbon-credit mechanisms enhance green innovation and system-wide ecological benefits.
Yuan et al. (2023)	China – Highway transportation	System analysis; Policy framework	Clean-energy integration in transportation	Operational systems (energy efficiency, system integration) support low-carbon transitions and guide policy decisions.
Shen & Yang (2023)	Industrial buildings	Multi-objective optimisation using NSGA-II	Solar-driven CO_2 capture systems	Clean technologies enhance emission reduction and energy efficiency; provides decision guidance for decarbonisation.
Hamdan et al. (2022)	Global aviation	Optimisation modelling	Sustainable aviation fuel (SAF) vs. conventional fuel	Clean-fuel adoption improves environmental outcomes; requires carbon price incentives for economic feasibility.

Tian et al. (2022)	China provinces	Static OLS; Threshold models	Digital economy and green financial investment	Digitalisation improves the efficiency of green financial systems, reducing regional disparities and supporting sustainability accounting.
Hsieh et al. (2020)	Paper industry	Mathematical programming; ABC + Theory of Constraints	Green production modelling	Green cost-accounting models (ABC, carbon constraints) optimise energy use and reduce emissions.
Ulupui et al. (2020)	Indonesia – Cement industry	SmartPLS; Quantitative survey	Green accounting & MFCA	Green accounting improves environmental performance; MFCA does not significantly influence outcomes.
Tu & Huang (2015)	Cross-regional	KJ method; Meta-research	Green design and environmental accounting requirements	Green design must align with environmental accounting requirements (3R policy, lifecycle assessment, internalising externalities).

Discussions

Research Objective 1: To examine how green accounting influences firm performance and financial outcomes.

Across emerging and developed economies, the collective evidence indicates that green accounting plays a pivotal role in enhancing firm performance, although the magnitude and channels vary across different contexts. In Indonesia, Hasan et al. (2025) demonstrate that green accounting directly improves corporate performance among consumer non-cyclical firms, indicating that environmentally responsible accounting is increasingly recognised as an indicator of operational quality rather than an additional compliance cost. Similar positive effects are observed in mining companies, where the implementation of green accounting practices contributes to higher profitability, suggesting that environmentally aligned resource management leads to more efficient cost structures (Iskandar et al., 2025). Studies conducted in ASEAN firms further confirm that firms integrating green accounting tend to exhibit stronger value creation, implying that investors increasingly perceive environmental accountability as a driver of long-term resilience (Bawono et al., 2025). In Jordan, Hamshari (2025) report that green accounting strengthens corporate performance by embedding ecological considerations into strategic decisions, highlighting the growing relevance of environmental cost disclosure in Middle Eastern contexts. Taken together, these studies illustrate that green accounting is no longer peripheral; it acts as a strategic lever that improves operational efficiency, reputation, and competitive positioning across diverse industries, from manufacturing to consumer goods and natural-resource sectors. Despite variations in regulatory environments and industry maturity, the overall trend points toward green accounting becoming a global determinant of firm competitiveness, with empirical evidence consistently showing improved financial and non-financial outcomes when firms adopt environmentally responsible accounting systems.

A prominent pattern emerging from the literature is that green accounting rarely operates in isolation; instead, its impact on firm performance is strongly shaped by mediating and moderating mechanisms. Zainal et al. (2025) highlight that environmental sustainability acts

as a powerful mediator, transforming green accounting from a technical reporting tool into a driver of broader sustainability-oriented performance outcomes. This suggests that firms must embed environmental goals into business strategies for green accounting to yield its full benefits. Similarly, Wichitsathian and Ekkaphol (2025) find that sustainable competitive advantage mediates the relationship between green accounting and hotel performance, indicating that environmental cost measurement enhances intangible value creation such as brand differentiation and customer loyalty. ESG structures also play a mediating role; Zhen and Rahman (2024) show that green accounting strengthens a firm's ESG performance, which in turn improves environmental outcomes, implying that green accounting enhances not only internal cost efficiency but also external accountability. CSR disclosure is another important mechanism. Riyadh et al. (2020) demonstrate that green accounting contributes indirectly to sustainability and financial performance through strengthened CSR initiatives, reinforcing the argument that firms gain more when environmental accounting aligns with stakeholder expectations. Moderating effects further enrich the relationship. Astuti and Ahmar (2025) demonstrates that return on assets can strengthen the link between green accounting and firm value, indicating that financially healthy firms gain more from environmental cost reporting. Together, these studies reveal that green accounting acts as a foundational mechanism that influences performance through broader organisational, ethical, and sustainability systems rather than through direct cost accounting alone.

The literature also reveals the strategic role of green accounting in shaping firm value, risk perception, and investment attractiveness. In ASEAN firms, green accounting is shown to significantly enhance firm value, implying that financial markets reward environmentally responsible reporting through higher valuation premiums (Bawono et al., 2025). This finding aligns with Sholehah et al. (2025) evidence that firm value increases when green accounting interacts with strong financial fundamentals, suggesting that investors view environmental accounting as a positive signal of managerial competence and risk preparedness. Several studies demonstrate that green accounting contributes to risk mitigation by improving transparency about environmental liabilities and long-term sustainability exposures. Hasan et al. (2025) argue that firms adopting green accounting communicate lower environmental and operational risks, which enhances stakeholder confidence and strengthens performance outcomes. In the mining and natural resource sectors, Iskandar et al. (2025) show that environmental cost reporting helps firms manage resource depletion risks more systematically, leading to better investment decisions and capital allocation. The role of green accounting in investment decision-making is further illustrated in the hotel sector, where Wichitsathian and Ekkaphol (2025) indicate that performance improvements derived from green accounting make firms more attractive to environmentally conscious investors seeking long-term sustainability returns. Meanwhile, CSR-related mechanisms identified by enhance investor confidence by signalling compliance with global standards. Across various contexts, green accounting serves as both an information-enhancing mechanism and a risk-reducing instrument, resulting in higher market valuation and improved investor perceptions.

Despite the overall positive findings, the literature reveals several boundary conditions and contextual variations that limit the universal applicability of the benefits of green accounting. In some regions, regulatory environments remain inconsistent, resulting in uneven adoption rates and weaker performance impacts. For example, while studies in Indonesia and ASEAN consistently show strong effects, Hamshari (2025) emphasise that in Jordan, the strength of

the relationship between green accounting and performance depends heavily on organisational commitment, suggesting that cultural and managerial factors play a decisive role. Contradictions also arise in relation to firm size: larger firms with established sustainability frameworks tend to benefit more from green accounting, while SMEs may face resource constraints that reduce its effectiveness. Furthermore, the mediating effects identified by Zainal et al. (2025) and Wichitsathian and Ekkaphol (2025) suggest that green accounting delivers limited direct benefits unless paired with complementary practices such as CSR, ESG integration, and sustainability-oriented strategies. This implies that green accounting alone is insufficient; it must operate within a broader ecosystem of environmental governance. There are also indications that firms with weaker financial health, those with low return on assets, as shown by Astuti and Ahmar (2025), may not experience the same positive value impacts, highlighting financial stability as a boundary condition. Industry context also matters resource-intensive sectors, such as mining, realise more cost-efficiency gains, whereas service industries rely more on reputational and strategic advantages. Overall, while green accounting is generally beneficial, its effectiveness depends on regulatory alignment, organisational culture, financial capacity, and the presence of holistic sustainability mechanisms.

Research Objective 2: To explore the drivers, barriers, and organisational determinants that influence the implementation and adoption of green accounting.

Across the studies, a clear narrative emerges as organisations adopt green accounting when internal motivations intersect with external pressures that make environmental responsibility both unavoidable and strategically advantageous. Huy and Phuc (2025) demonstrate that SMEs' behavioural intentions toward the green transition stem from an internal recognition of efficiency gains, capability building, and a desire to future-proof operations. They argue that when SME leaders perceive environmental practices as a pathway to improving effectiveness, adoption becomes a deliberate strategic choice rather than mere compliance. Similar patterns emerge in SMEs following the pandemic, where environmental orientation and top management's environmental awareness shape green business strategies (Sabihaini et al., 2024). In this storyline, internal cognition, such as what managers believe and understand about sustainability, plays a catalytic role. However, these internal drivers are highly dependent on knowledge and capacity. Iskandar et al. (2021) reveal striking gaps in green accounting literacy among accounting students, signalling a fragile foundation for the next generation of practitioners. This intellectual weakness represents a structural barrier, suggesting that without strong educational scaffolding, organisational interest may be insufficient to sustain adoption. When viewed together, these studies illustrate that intention, awareness, and knowledge form the bedrock of adoption, but their strength varies significantly across organisational settings. The evidence collectively suggests that green accounting adoption begins with a mindset shift emphasising that firms must not only recognise environmental responsibility but also understand how it aligns with their operational capabilities, strategic goals, and long-term survival.

While internal motivations matter, the push toward green accounting is often externally orchestrated. Razak et al. (2020) demonstrate that coercive pressures, particularly from regulators and shareholders, are the strongest predictors of environmental management accounting adoption among Malaysian public-listed companies. Their argument implies that in formal and highly regulated environments, adoption is rarely optional, and it is shaped by

institutional forces that command compliance. This dynamic contrasts sharply with SMEs and construction firms in developing economies, where regulatory enforcement is weaker and adoption relies more on managerial awareness and resource availability (Nguyen et al., 2023; Sabihaini et al., 2024). In the construction sector, Rumambi et al. (2023) illustrate an even more grounded picture, in which firms adopt green accounting when it relates directly to cost structures, such as waste management, recycling activities, and potential economic returns. This pragmatic orientation reveals that sectoral realities influence motivations, with construction companies being driven not by abstract sustainability ideals, but by tangible operational benefits. Meanwhile, the government sector in Jordan exhibits another notable pattern. Maswadeh and Alhusban (2024) demonstrate that environmental technology serves as an external lever that amplifies the impact of green accounting, highlighting how public organisations rely on technological infrastructure to translate policy into practice. These differing sectoral stories reveal that adoption is neither uniform nor linear, and it is contingent on institutional pressures, resource structures, and the type of organisation. Public-listed firms respond to rules, SMEs respond to awareness, and construction firms respond to cost-benefit calculations, demonstrating that adoption pathways diverge across industries.

The studies also highlight a rapidly evolving reality. Digital innovation and technological capabilities increasingly shape the adoption of green accounting. Lisnawati et al. (2024) argue that digital innovation does not merely enhance sustainability performance, but rather it activates the usefulness of green accounting itself, strengthening its effects particularly in organisations with strong digital cultures. They position digital ecosystems (digital supply chains, digital accounting, and digital products) as the infrastructure that enables green accounting to become actionable. This finding resonates with the findings from the Pentahelix framework study, where Sholehah et al. (2024) found that advanced technologies, such as big data, IoT, and blockchain, enhance transparency and accountability. Yet, this study cautions that technology alone cannot resolve adoption barriers; rather, it is weak oversight, limited funding, and profit-driven behaviour that undermine adoption despite technological potential. In parallel, governance structures matter. Studies grounded in the technology–organisation–environment (TOE) framework emphasise top management support and perceived benefits as significant predictors of green management accounting practices (Lutfi et al., 2023). This suggests that technology acts as an enabler, but governance acts as the gatekeeper. Without capable leadership and coherent strategies, digital tools cannot catalyse green transformation. Knowledge, too, becomes a decisive factor. The observed low literacy in higher education institutions (Iskandar et al., 2021) foreshadows a systemic challenge. Future practitioners may lack the conceptual grounding required to implement green accounting effectively. Across these studies, digital readiness, governance, and knowledge co-evolve, forming a triad that determines whether green accounting becomes embedded or remains superficial.

Despite growing interest, adoption remains uneven and is hindered by barriers that vary across different contexts. Several studies foreground resource constraints, such as SMEs struggling with limited internal resources and technical capacity, making green transition intentions fragile (Huy & Phuc, 2025; Nguyen et al., 2023). Construction firms, although motivated by cost-saving opportunities, face operational challenges such as fragmented waste management systems and limited investment in eco-efficient machinery (Rumambi et

al., 2023). In remote or disadvantaged regions, Sholehah et al. (2024) reveal structural barriers, including poor oversight, lack of funding, weak digital infrastructure, and entrenched profit-driven cultures that prioritise economic gains over environmental accountability. Even in formal institutional environments, contradictions emerge. Lisnawati et al. (2024) find that green accounting strengthens only some pathways (digital innovation leads to sustainability performance) but weakens others, suggesting that its organisational impact is not universally positive and may depend on strategic alignment. Razak et al. (2020) highlight that coercive pressure drives adoption; however, such compliance-based adoption risks superficiality rather than genuine internalisation of green principles. Higher education, which should act as a foundational ecosystem for professional competence, also shows structural weaknesses. Low literacy in green accounting principles among students reveals a long-term barrier to talent readiness (Iskandar et al., 2021). Taken together, these studies show that adoption is constrained not by a single barrier but by a constellation of organisational, institutional, and cultural factors. Adoption remains contingent, uneven, and deeply contextual shaped by what firms value, what resources they possess, and what pressures they face.

Research Objective 3: To analyse measurement frameworks, carbon/environmental accounting systems, and policy mechanisms related to green accounting.

The literature reveals a clear shift toward increasingly sophisticated measurement frameworks designed to operationalise green accounting and carbon accounting, yet the diversity of approaches indicates ongoing methodological fragmentation. For instance, Chen et al. (2025) construct a carbon balance accounting framework built on "basic accounting–factor analysis–prediction simulation," demonstrating how spatial heterogeneity and sectoral variations complicate the quantification of carbon deficits in the Yangtze River Delta. Their results emphasise that carbon measurement is inseparable from regional economic trajectories and infrastructural characteristics. Similarly, Zhang et al. (2024) propose a land-use-based accounting framework incorporating environmental parameters to capture spatially explicit carbon emissions. By showing a strong spatial association between emissions and land-use variables, they argue that conventional inventories fail to reflect real spatial processes. Even in contexts beyond carbon, such as embodied energy accounting in Australia, Liang et al. (2024) argue that existing methods neglect hidden energy transfers. Their two-layer network model responds to this gap by capturing sectoral interdependencies and embodied flows. Together, these studies suggest that measurement systems are evolving toward multi-layered, spatially integrated models, yet challenges persist in aligning them with broader environmental accounting objectives.

Environmental policies and regulatory design have a profound influence on how carbon accounting systems evolve, although their effectiveness varies across different institutional contexts. Yan et al. (2023) highlight the tightening link between carbon tax mechanisms, such as the EU CBAM, and the need for higher-quality emissions inventories. They argue that China's framework, although improving, must advance faster at the enterprise and product levels to avoid regulatory mismatches. Likewise, Li (2024) positions carbon financial accounting as a national strategic necessity, arguing that China must integrate carbon accounting into corporate operations to enable carbon trading, pricing, and financial oversight. Policies also shape investment flows, as shown by Yang and Zhong (2023), who find that green supervision and standardised regulations exert strong stimulus on renewable energy investments, while green accounting regulations exhibit weaker and statistically

insignificant effects. This suggests that measurement-related policies alone are insufficient without complementary governance mechanisms. The narrative becomes even more compelling when viewed through the lens of the Belt and Road Initiative: Chin et al. (2024) demonstrate that green finance, when supported by policy incentives, significantly reduces environmental degradation. These studies indicate that policy frameworks do not just regulate carbon accounting; they co-create the system's structure, credibility, and behavioural outcomes.

Empirical studies further illustrate how carbon accounting systems support emission reduction, resource efficiency, and broader policy outcomes, though the level of impact varies depending on the maturity of the accounting framework. Shen and Yang (2023) focus on industrial decarbonisation, demonstrating how a solar-driven CO_2 capture system, optimised via multi-objective modelling, can inform policymakers on industrial carbon management. Their findings highlight that quantifying capture capacity, system efficiency, and cost metrics enables more targeted policy incentives. In the macroeconomic context, Liu et al. (2022) use a CGE model to demonstrate that recycling carbon tax revenues through clean electricity innovation achieves a "triple dividend": economic growth, emission reduction, and improved welfare. Their evidence showcases how carbon accounting, when integrated into fiscal mechanisms, directly shapes economic transitions. Meanwhile, Wang et al. (2023) reveal how detailed production- and consumption-based carbon inventories for Kazakhstan expose sectoral and trade-driven emission patterns, providing the basis for targeted mitigation strategies. Importantly, they argue that the Belt and Road Initiative presents a timely opportunity to embed greener accounting systems into economic expansion. Across these works, the common thread is that accounting systems are not passive measurement tools, but they actively guide resource allocation, technological adoption, and policy effectiveness.

Underlying all these developments is a recognition that green accounting systems must incorporate ecological, social, and spatial dimensions to meaningfully support sustainability outcomes. For example, Sun et al. (2024) demonstrate how ecological footprint accounting, specifically energy-based measures, directly influences assessments of industrial green GDP, revealing significant spillover effects across provinces. This reinforces the argument that accounting frameworks shape not only carbon metrics but also regional development models. Wang et al. (2023) further show that ecosystem service-based assessment frameworks help identify ecological security patterns and natural asset hotspots, implying they can be integrated into national accounting and land-use planning. Shang (2021) extends this logic to green construction, where an AHP-fuzzy evaluation model quantifies pollution risks in construction processes, highlighting the importance of accounting for resource utilisation and environmental management. Complementing these applied frameworks, Sardana and Simpson (2023) reflect on the conceptual and empirical challenges of valuing biodiversity within national accounts, arguing that valuation gaps continue to hinder full integration of ecological assets. Across these perspectives, the literature indicates that empirical accounting systems are progressively aligning with sustainability principles, but must further integrate ecological value, spatial heterogeneity, and policy alignment to drive meaningful environmental outcomes.

Research Objective 4: To evaluate the role of green innovation, technology, and operational systems in advancing green accounting practices.

Across the studies reviewed, green innovation and digital technologies emerge as catalytic forces that push firms toward more structured and data-driven green accounting practices. Liang and Qiao (2024) provide compelling regional evidence from China showing that digital trade stimulates green innovation by enabling industrial upgrading, technology transfer, and agglomeration. Their findings implicitly argue that digital infrastructures, intertwined with information systems, provide the technological backbone necessary for firms to quantify carbon intensity, monitor energy use, and report environmental impacts more transparently. This aligns with He and Liu's (2023) perspective, who emphasise that digital transformation is often too costly and technically demanding for manufacturing firms to undertake alone. Thus, they model how cooperation with Internet enterprises, under carbon-credit policy conditions, enables traditional manufacturers to access digital innovation capabilities at lower cost. From their viewpoint, digital cooperation evolves into an operational mechanism that supports real-time environmental data tracking, carbon credit accounting, and green R&D decision-making, core pillars of advanced green accounting systems. Meanwhile, Shen and Yang (2023) take a technological engineering perspective by proposing a solar-driven CO_2 capture system designed for industrial buildings. Their multi-objective optimisation model demonstrates how clean technologies can quantify CO_2 capture mass, energy efficiency, and cost parameters, reinforcing the idea that green accounting is inseparable from technological systems capable of continuous measurement. Collectively, these findings illustrate that digital ecosystems, clean technologies, and cross-industry technological partnerships expand firms' capacity to generate precise environmental information, thereby strengthening the credibility, comparability, and operational relevance of green accounting practices.

Organisational transparency plays a central role in legitimising and operationalising green innovation, creating a natural bridge to green accounting. Xia et al. (2023), drawing on over 4000 listed firms, demonstrate that information transparency, measured through earnings quality, analyst monitoring, and Big Four audits, significantly enhances the legitimacy of green innovation. Their argument implies that transparent firms are more inclined to adopt systematic environmental accounting processes because stakeholders can directly observe and evaluate the environmental implications of innovation activities. When firms disclose more accurate and externally verified information, green accounting becomes a mechanism not only for compliance but also for signalling credibility to investors, regulators, and analysts. This resonates with the findings of Kumalawati et al. (2023), who assert that environmental management accounting (EMA) and energy efficiency have a significant and direct influence on achieving a green economy. Their evidence from Indonesia shows how EMA provides managers with structured environmental cost data that support operational decision-making. In their words, EMA "becomes the mechanism" through which firms translate resource use and environmental performance into strategic planning. Tu and Huang (2015) further extend this argument from a design perspective. Through Kawakita Jiro method and meta-analysis, they reveal that green design must be supported by environmental accounting guidelines that internalise externalities, enforce lifecycle assessment, and embed 3R principles into product development. Their perspective positions green accounting as a governance tool that reorients design, production, and reporting toward integrated sustainability outcomes. Together, these studies illustrate that transparency, EMA, and green design operate jointly

as information-rich systems that guide operational decisions and reinforce organisational accountability.

The intersection between green operational systems, supply-chain strategies, and green cost-accounting models reveals how environmental performance is operationalised across industries. Chen, Khalilpour, and Yao (2024) explore this dynamic within green supply chains by modelling how risk aversion and competition shape pricing, product greenness, and profitability. Their simulations show that higher risk aversion diminishes greenness and profitability, implying that effective green accounting must be embedded within cost-sharing and coordination contracts to sustain environmentally aligned operational decisions. When market competition is weak, they demonstrate that cost-sharing contracts enhance both profitability and sustainable practices, showing that green accounting in supply chains must integrate behavioural and economic considerations. A more technical operational model is offered by Hsieh, Tsai, and Chang (2020), who incorporate Activity-Based Costing (ABC) and Theory of Constraints into a green production model for the paper industry. By accounting for unit-level, batch-level, and product-level activity costs alongside carbon emission limits, their model illustrates how green accounting becomes the analytical engine supporting energy-saving and carbon-reduction strategies. Similarly, in the aviation sector, Hamdan et al. (2022) compare sustainable aviation fuel (SAF) with conventional fuel using an optimisation model that includes emissions costs. Their findings show that without appropriate carbon pricing, SAF adoption increases operational costs, reinforcing the argument that green accounting must integrate carbon cost metrics into operational decision-making frameworks. Collectively, these studies show that operational systems, from supply-chain coordination to energy modelling, rely on green accounting to quantify trade-offs, evaluate emission costs, and guide eco-efficient decisions across industries.

Across infrastructure-intensive sectors such as transportation and energy, the reviewed studies demonstrate how clean technologies and strategic planning support both environmental and economic outcomes, strengthening the foundational relevance of green accounting. Yuan et al. (2023) examine China's highway transportation system and propose a comprehensive green energy application model grounded in safety, efficiency, intelligence, and environmental friendliness. Their framework outlines multi-layered security systems and developmental objectives that rely heavily on environmental data tracking and carbon accounting to guide low-carbon transformation. Green accounting, in this context, acts as the evaluative platform linking policy aspirations to operational performance. Similarly, Tian, Zhang, and Qu (2022) reveal that digital economy development significantly enhances the efficiency of green financial investment across Chinese provinces. Their threshold analysis demonstrates that digital systems reduce regional financial imbalance and strengthen green auditing mechanisms, implying that digital finance infrastructure improves the traceability and auditability of environmental investments. This expands the role of green accounting into investment evaluation and regional financial governance. Meanwhile, Ulupui et al. (2020) show that green accounting, measured through GRI-based disclosure, has a significant impact on environmental performance in Indonesia's cement industry, whereas Material Flow Cost Accounting (MFCA) does not. Their findings challenge the assumption that all green accounting tools equally influence performance, arguing instead that disclosure-driven accounting exerts stronger behavioural pressure than internal cost-flow systems. Together, these sectoral insights demonstrate that clean technologies, digital ecosystems, and

accounting frameworks collectively enhance both environmental accountability and economic rationality. Green accounting becomes the integrative mechanism through which firms align technology adoption, investment decisions, and sustainability outcomes.

Conclusion and Recommendations

Conclusion

This review examined how green accounting has developed in emerging and Asian economies and highlighted the main factors that determine its effectiveness across different organisational and institutional settings. The evidence shows that interest in environmental reporting is growing, but the foundation needed for consistent practice remains uneven. Many firms still work with systems designed for financial information, which leads to inconsistent indicators, unclear reporting boundaries, and data that cannot be used to compare performance across firms or sectors. These weaknesses complicate efforts to evaluate how green accounting influences firm-level outcomes and contribute to the scattered findings identified under the first research objective.

Organisational capability is another central factor. Firms with limited environmental literacy, insufficient staffing, or unstable routines often adopt green accounting only when they face external pressure from regulators, investors, or industry bodies. This reactive pattern reflects the challenges highlighted under the second research objective. Internal readiness, leadership commitment, and resource allocation determine whether firms can generate information that is reliable enough to guide decision-making. When these internal elements are weak, environmental reporting becomes a form of compliance rather than an activity that supports operational or strategic decisions.

Measurement systems also remain fragmented. The rapid growth of carbon accounting tools, environmental cost models, and resource flow assessments has created a wide range of frameworks, each built on different assumptions and indicators. While these tools offer technical insights, they do not align neatly with one another, which affects comparability and limits the usefulness of findings across studies. This issue lies at the centre of the third research objective and demonstrates the need for clearer, more coordinated measurement guidance.

The fourth research objective highlights the growing influence of technology and innovation. Digital tools can reduce errors, expand data coverage, and support real-time monitoring, but their benefits depend on organisational readiness. Larger firms may integrate digital systems into routine work, while smaller organisations often lack the skills or financial capacity to do so. These differences show that technology alone does not guarantee better reporting. Instead, capability, planning, and routine integration determine whether digital tools enhance or simply complicate environmental measurement.

Across the literature, the strongest improvements in green accounting occur when three conditions are present. First, measurement guidance is clear and widely understood. Second, organisations have the capability to collect and interpret environmental data. Third, environmental information is integrated into day-to-day work rather than treated as a separate reporting activity. When these conditions are met, firms show better resource planning, clearer performance evaluation, and stronger accountability. When they are

absent, environmental reporting risks becoming symbolic and disconnected from actual operations.

Based on the patterns identified in the literature, three recommendations are proposed to support more reliable, consistent, and practical green accounting practices in emerging and Asian economies.

Recommendation 1: Develop Sector-Wide Measurement Templates to Improve Consistency
A major barrier to reliable environmental reporting is the lack of shared measurement practices across firms. Regulators and industry associations can reduce this variability by preparing sector-wide templates that set out core indicators, recommended measurement frequency, and clear reporting boundaries. A dedicated working group with representatives from regulators, industry, and the accounting profession can oversee this work to ensure that templates remain practical and do not impose unnecessary administrative burdens. A well-structured guide that explains how to record energy use, water consumption, and waste generation allows firms of different sizes to follow a consistent approach. Digital validation tools can highlight missing or unusual entries, but the main improvement comes from having a shared measurement structure. This recommendation addresses the inconsistent indicators and fragmented measurement systems highlighted under the first and third research objectives.

Recommendation 2: Strengthen Capability through Staged Routines and Top-Level Accountability linked to Directors' Performance Indicators
Green accounting often weakens inside firms because responsibilities are unclear, and capability is uneven. Organisations can address this by introducing simple routines that prompt staff to record environmental information at scheduled intervals. These routines should gradually be linked to planning, procurement, and performance discussions so that environmental data becomes part of normal work. Capability development, however, must be supported from the top. Boards can strengthen this by setting environmental performance indicators for directors and linking these targets to annual evaluations. Indicators may include resource efficiency, waste management results, or progress toward agreed environmental commitments. When directors are accountable for environmental performance, responsibility shifts to those with the authority to allocate resources, support training, and enforce routines. This recommendation responds directly to the capability challenges raised under the second research objective and reinforces the performance linkages highlighted under the first and fourth research objectives.

Recommendation 3: Integrate Environmental Data Collection into Everyday Workflows to Improve Accuracy and Reduce Reconstruction
Environmental information often loses accuracy when staff try to reconstruct it long after activities have taken place. The quality of reporting improves when data is captured at the moment the activity occurs. Firms can do this by building small recording steps into routine work, such as noting resource use when a production batch finishes or documenting waste handled during daily closing procedures. For firms that need more structure, simple tools can make these recordings easier. These include basic checklists, short digital forms, or taking photos as evidence. Photos can be time-stamped or linked to a QR code system that automatically records the time, location, and activity, and the files can be uploaded to a

shared cloud folder for authorised staff to review or compile into reports. These practical steps help maintain consistency while keeping daily operations straightforward. More advanced technologies, such as sensors or automated monitoring devices, can be introduced once firms are ready, but they should not be treated as compulsory starting points. Digital tools are meant to support staff in capturing information, not replace the basic routines that ensure environmental data is collected reliably. This approach directly strengthens data accuracy and reinforces the connection between day-to-day operations and environmental reporting, which responds to concerns raised in the first and fourth research objectives.

Limitations and Directions for Future Research
This review draws from studies conducted across many emerging and Asian economies, and the diversity of these contexts introduces several limitations. Countries differ in their regulatory strength, technological readiness, and environmental governance, which means that findings cannot be generalised evenly across the region. Some industries, especially manufacturing, energy, and resource-intensive sectors, are far more represented in the literature than services or small and medium-sized enterprises. As a result, the evidence base reflects where research activity is concentrated rather than the full landscape of green accounting practice.

Methodological variation across studies is another limitation. The review includes econometric analyses, surveys, case studies, simulation models, and various environmental and carbon accounting approaches. These methods provide useful insights but rely on different assumptions and indicators, which limit comparability. The fragmented nature of measurement frameworks further complicates synthesis, as studies often adopt incompatible tools or boundaries.

These limitations highlight several priorities for future work. First, more research is needed on capability development, particularly how firms progress from basic environmental measurement to more advanced systems, and what forms of leadership or training support this transition. Second, systematic comparisons of existing measurement frameworks would help clarify which indicators or models are most practical and reliable for firms with different levels of capacity. Third, the role of digital tools requires deeper study, especially how organisations integrate low-cost technologies into routine work. Fourth, future studies should examine how green accounting influences long-term governance, strategy, and investment decisions rather than only short-term performance outcomes. Finally, small and medium-sized enterprises remain significantly under-exploited. Research focusing on their constraints and adoption pathways would offer a more complete understanding of green accounting practice in the region.

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