Exploring Green Growth in SMEs: Global Trends, Challenges, and Future Directions

Aghnia Nadhira Aliya Putri
PhD Student, aghnia_nadhira@sbm-itb.ac.id

Pri Hermawan
Associate Professor, pri_hermawan@sbm-itb.ac.id

Isti Raafaldini Mirzanti
Assistant Professor, isti@sbm-itb.ac.id

School of Business and Management, Institut Teknologi Bandung, Jl. Ganesa No.10, Lb. Siliwangi, Kecamatan Coblong, Kota Bandung, Jawa Barat 40132, Indonesia

Maureen Meadows
Professor, ac3495@coventry.ac.uk

Rosie Sadraei
Lecturer, ad9531@coventry.ac.uk

Centre for Business in Society – CBiS, Coventry University, Priory St, Coventry CV1 5FB, UK.

Abstract

This systematic literature review examines the adoption of green growth practices at small and medium-sized enterprises (SMEs), synthesizing findings from 56 peer-reviewed articles published between 2010 and 2024. The study explores key dimensions of green growth, including environmental innovation, circular economy practices, and green financial management across various sectors and geographical regions. The analysis reveals a progressive shift in SMEs' sustainability practices, from initial awareness to ecosystem development, influenced by factors at the macro, meso, and micro levels. Key drivers identified include government policies, market pressures, and technological innovations, while primary barriers encompass financial constraints and knowledge gaps. The research highlights emerging trends such as the integration of digitalization, circular economy models, and green finance in SMEs' sustainability efforts. Additionally, it uncovers significant research gaps, particularly in understanding the long-term impacts of green growth initiatives and the role of resilience in post-pandemic recovery. This study concludes by proposing a future research agenda focusing on themes like AI-driven business model innovation, blockchain in green finance, and cross-sector policy harmonization. These findings offer valuable insights for policymakers, business leaders, and researchers in fostering sustainable practices across the SME sector.

Keywords: green growth; small and medium-sized enterprises (SMEs); environmental innovation; circular economy; sustainability

Citation: Putri A.N.A., Hermawan P., Mirzanti I.R., Meadows M., Sadraei R. (2025) Exploring Green Growth in SMEs: Global Trends, Challenges, and Future Directions. *Foresight and STI Governance*, 19(1), pp. 16–31. DOI: 10.17323/fstig.2025.23708

Introduction

Both the rise of a more complex world economy and the continuing rise of the concept of green growth have created an urgent need of a new framework for development to ensure sustainable development. Organisation for Economic Co-operation and Development (OECD, 2019) defines green growth, which focuses on economic increase that ensures and sustainably applies natural resources to preserve the society wellbeing. Thus, small and medium sized enterprises, known as SMEs, are drivers of innovation and economic vitality and are seen as harbinger of global move towards more sustainable economic pattern (Tereshchenko et al., 2023; Musa et al., 2016). The need to understand the role of SMEs in supporting green growth has recently become urgent, given its omnipresence in different sectors and its contribution in both economic output and environmental impact. This research confirms that SMEs account for 70 percent or more of industrial pollution in some areas, a fact which underscores the imperative for sustainable business in this sector.

There has been minimal research focusing on green growth in SMEs, with most research focusing on specific items such as technological innovation, regulatory compliance and financial barriers (Ebrahimi et al., 2017; Gandhi et al., 2018). It clearly shows the external driver like policy support and market demand, means of accomplishment and difficulties in emerging markets like high starting costs and restricted accessibility to green financing (Musa et al., 2016; Koirala et al., 2019). Nevertheless, there is a lot of gaps in the literature. Individual factors in green growth are studied by many but there is little convergence in integrating them into a strategic approach especially regarding how SMEs build green dynamic capabilities to achieve environmental innovation. In addition, there is very little attention on the concept of value co creation. In addition, despite extensive documentation of financial constraints, less is known as to how SMEs can overcome these constraints through internal strategic capabilities. As existing research also focuses on developed economies, there are gaps in understanding how SMEs in emerging markets with different regulatory and institutional contexts transit towards green growth (Tereshchenko et al., 2023). Second, there has been little work on the temporal evolution of green strategies and geographical variations in adoption, especially in the developing region (Gandhi et al., 2018; Murray et al., 2017). This research then seeks to address these gaps and look into how green dynamic capabilities, value co-creation and contextual factors contribute to an SME's green growth trajectory.

This research seeks to fill in the significant void existing in the current knowledge base on comprehensively integrating green growth concepts to SMEs postdominant logic and the interrelations between green dynamic capabilities and value co-creation. Previous research has extensively studied some of the isolated pieces of the green practises puzzle, such as technological upgradation and regulatory compliance, but there has been little prior study of how SMEs can use dynamic capabilities to promote simultaneously both environmental performance and business objectives. Finally, geographical variations in greens practise adoption, as well as the timing of these green strategies remain underexplored.

To fill this gap, the present study employs a Systematic Literature Review (SLR) methodology to critically examine the existing body of knowledge on green growth in SMEs. By synthesizing findings from diverse studies, this research seeks to uncover gaps and trends, with a particular focus on how green dynamic capabilities and value co-creation contribute to the broader green growth agenda. In doing so, the study proposes five core research questions: (1) What is the contribution of environmental innovation to green growth in SMEs between 2010 and 2024? (2) What are the primary barriers and enablers for SMEs transitioning to a circular economy? (3) How do green dynamic capabilities and value co-creation influence green innovation and performance in SMEs? (4) How does geographical distribution affect green growth initiatives? (5) What are the key stages of green growth in SMEs, and how do various stakeholders contribute to these stages?

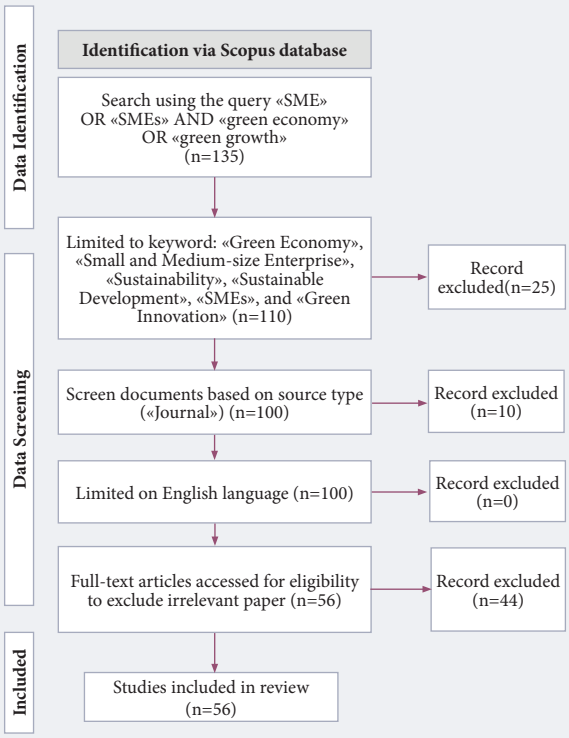
Methodology

This study examines the challenges and opportunities in SMEs' transition toward green growth by analyzing 56 peer-reviewed articles published between 2010-2024. The systematic literature search was conducted using Scopus database with the search string "SME" OR "SMEs" AND "green economy" OR "green growth", yielding 135 initial documents. Following the PRISMA guidelines (Page et al., 2021), articles were screened based on specific inclusion criteria: peer-reviewed journals, clear focus on SMEs and environmental sustainability, empirical studies with primary data, and English language publications (Figure 1). Studies that were conference papers, lacked clear methodology, or had no explicit environmental focus were excluded, resulting in 56 final articles for analysis. This approach aligns with established systematic review methodologies in sustainability research (Tranfield et al., 2003; Denyer, Tranfield, 2009).

The analysis is structured around three critical dimensions of SME green transformation: implementation barriers (including resource constraints, knowledge gaps, and market challenges), strategic approaches (such as green innovation adoption and circular economy practices), and enabling mechanisms (particularly policy support, financial instruments, and capacity building programs). By examining these dimensions through multiple theoretical lenses - including institutional theory (DiMaggio, Powell, 1983), resource-based view (Barney, 1991), and stakeholder theory (Freeman, 1984) — the study provides insights into effective pathways for SME sustainability transition. The selected articles were systematically coded and analyzed using thematic analysis following Braun and Clarke's (2006) methodology to identify recurring patterns and emerging themes in SME green transformation.

Specifically, the research focuses on how SMEs overcome resource and capability constraints when adopting green practises in light of seminal works in environmental management (Hart, 1995; Porter, van der Linde, 1995). This focus is consonant with the distinctive difficulties that small enterprises are confronted in balancing environmental responsibilities and business viability, in the face of market pressure, limited availability of green technologies, and financial resource constraint (Hillary, 2024; Revell et al., 2010). The analysis is more focused on the strategies of implementation which are suc-

Figure 1. **PRISMA Flow Diagram**



Source: authors.

cessful and the policy framework which support the achievement of environmental and economic objectives by SMEs (Parker et al., 2009).

In order to better understand, government led and private sector programmes had been implemented in Indonesia in order to encourage SMEs to adopt environmentally friendly practises. In particular, it looks into the contribution of Bank Indonesia (BI) in the development of the green business model and green financing options to help SME green transformation. Integrated education and training initiatives with regards to building the capacity of SME owners to use sustainable practises have also been implemented by BI. The main focus continues to remain on describing the general trends and enabling mechanisms of SME green growth in Indonesia.

Overview of Included Studies

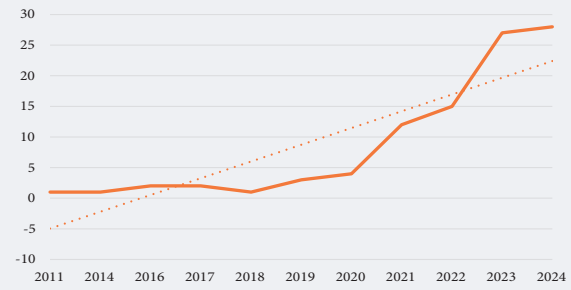
Publication trends

According to Figure 2, since 2018, there has been a steady increase in the number of publications on the topic under consideration. The time span of the study we have chosen can be divided into three periods.

1. Foundation Period of Environmental Innovation (2010–2014). It was during early 2010s when a divergence in environmental innovation approach to SMEs was taking place in different regions. In contrast, many developed economies, especially in East Asia and Europe, pursued sophisticated environmental management systems, which were developed in order to improve both ecological and competitive results. Environmental innovation could significantly improve labour productivity in South Korea's manufacturing sector when company structures and business group affiliations provide appropriate support (Woo et al., 2014). On the other hand emerging economies mainly prioritised basic environmental compliance and achieved environmental benefits via resource efficiency measures of cost reduction due to different developmental priorities and resource constraints (Silva et al., 2021; Ashton et al., 2017). Increased recognition of government support and policy frameworks to enable green innovation adoption was also taking place during this period (Chatzistamoulou, Tyllianakis, 2022). Several critical challenges that would shape future development of the research community were identified. Although constrained with limited financial resources as well as technological expertise, SMEs across all regions varied on their economic context (Rizos et al., 2016; Muzamwese, 2016). For example, standardising environmental performance measurement was one challenge developed economies had to adapt to, while developing nations had to overcome more fundamental matters such as finding ways to obtain green technologies and building rudimentary environmental management understanding where possible (Fadly, 2020; Namagembe et al., 2019). However, as studies realised that successful ecological innovation did not rely on just technological measures, but required an integrated approach which takes into account organisational capacity, market conditions and, policy support mechanisms (Woo et al., 2014; Bassi, Guidolin, 2021), there was increasing recognition of the need for such an integrated approach.

2. Transition to Circular Economy Focus (2015–2019). A dramatic shift towards circular economy principles occurred in the mid-2010s, formalised in distinct regionalised implementations. For SMEs, European nations were the first to developed complete circular economy frameworks, based upon closed-loop production systems and extended producer responsibility (Rizos et al., 2016; Cecere, Mazzanti, 2017). Through resource efficiency improvements, SMEs could enjoy significant cost savings and increased competitiveness (Arcuri, Pisani, 2021; Passaro et al., 2023). Meanwhile, Asian markets of China and Japan increased their focus on technological innovation in cleaner production systems to set new standards for processes in the manufacturing of resources (Bu et al., 2020; Gao, Yang, 2023). However, the implementation of

Figure 2. **Publication Trends (Number of Publications)**



Source: authors.

this period presented a number of challenges, much more so in developing economies. It was found that that SMEs, whilst supporting the need for structural adaptation towards circular models, faced many barriers to transition, particularly in areas of infrastructure limitations, complex supply chains, and a lack of financial viability (Muzamwese, 2016; Ilyas et al., 2020). Across different regions, studies showed that outdated equipment and limited technical capabilities prevented SMEs from executing even the most rudimentary energy efficiency measures (Tereshchenko et al., 2023; Phonthanukitithaworn et al., 2024). As a result of these challenges, SMEs have been more called to the role of support networks and knowledge sharing platforms in enabling environmental innovation (Gorondutse et al., 2020; Rajapakse et al., 2022).

3. Technology Integration and Strategic Evolution (2020-2024). In recent years, markets around the globe have proven uniquely convergent between both environmental innovation and advanced technologies. However, research exposes a clear trend regarding integration of digital solutions with environmental management systems, although implementation patterns significantly differ among regions (Ha et al., 2024; Chau et al., 2024). Studies have proven the benefits of green dynamic capabilities and digital transformation in Asian markets on environmental performance (Yousaf, 2021; Mubeen et al., 2024) as well as the lead for Asian markets in smart manufacturing integration. In the domain of ESG measures and holistic accounting of ESG impacts, European markets have leaned on policy harmonisation and standardisation of green practises (Domaracka et al., 2023; Zorpas, 2024), while North American markets have relied on market driven innovation through technological solutions (Anwar et al., 2024; Shaik et al., 2024). The current period shows challenging and opportunistic developments for future development. In particular, there is a long list of other serious barriers: high costs of implementing advanced technology, persistent skills gaps on new and complex green technologies, including for SMEs in emerging economy (Kim et al., 2021; Wang et al., 2023). Nevertheless, future development of these technologies is indicated by research in artificial intelligence in environmental management systems (Du et al., 2024), blockchain for sustainability tracking (Ling, Wang, 2024), and Internet of Things applications for resource optimization (Cheng et al., 2024). Evolved policy frameworks, market pressures, and these technological advances indicate a future where environmental innovation becomes a core part of business strategies globally and across many economic contexts (Maesaroh et al., 2024; Oliveira, Secchi, 2023).

Geographical distribution

The geographical distribution analysis of green initiatives in SMEs reveals distinct regional patterns and development trajectories across developed and emerging economies (Table 1). This analysis demonstrates how different economic, institutional, and cultural contexts shape both the focus and implementation of green practices.

Asia (38 studies). Analysis reveals three distinct evolutionary patterns in Asian SME green initiatives. First, a clear technology-driven transformation is emerging, particularly in China (14 studies) where a shift from basic compliance to proactive innovation is documented (Kannan, Gambetta, 2025; Aras, Crowther, 2008). The research shows Chinese SMEs increasingly leveraging AI and big data for environmental management - a trend that's reshaping traditional business models. Second, Southeast Asian nations (11 studies combined) demonstrate an emerging "leapfrog effect" where SMEs bypass traditional industrial development stages to adopt advanced green technologies directly. This is particularly evident in Thailand and Vietnam, where Ha et al. (2024) identifies how firms overcome resource constraints through digital solutions. However, a critical challenge emerges: the "capability gap" between technology adoption and implementation effectiveness. Looking forward, research suggests the region is moving towards a "hybrid model" combining technological innovation with traditional manufacturing strengths, though significant variations exist between developed and developing economies.

Table 1. **Geographical Distribution**

Country (number of documents)	Main Research Topic
China (14)	Green innovation, green supply chain management, environmental performance
Thailand (5)	Green economy, green supply chain management, eco-innovation
Pakistan (5)	Green dynamic capabilities, green HRM, sustainable performance
EU (5)	Circular economy, resource efficiency, green jobs
Indonesia (3)	Digital transformation, green economy implementation, green financial management
Vietnam (3)	Green product innovation, environmental management standards, resource efficiency
Turkey (2)	Green entrepreneurship, humane entrepreneurship
Malaysia (2)	Green entrepreneurship, eco-innovation capabilities
USA (2)	Green business practices, AI-driven business model innovation
ASEAN (2)	Green economic growth, green power generation
Bangladesh (1)	Environmental sustainability practices in textile SMEs
Jordan (1)	Green innovation adoption in manufacturing firms
Poland (1)	Green initiatives in SME sector
Romania (1)	Pro-environmental behavior in SMEs
Saudi Arabia (1)	Integration of lean and green manufacturing
South Korea (1)	Green supply chain management evolution
Spain (1)	Material flows cost accounting for circular economy
Sri Lanka (1)	Environmental incentives and green responsiveness
Taiwan (1)	Carbon reduction strategies in metal industry SMEs
Uganda (1)	Green practices and firm performance
UAE (1)	Green innovation adoption barriers
Ukraine (1)	Eco-innovation and circular economy strategies
Zimbabwe (1)	Energy efficiency adoption in SMEs

Source: authors.

Europe (16 studies). European research reveals a sophisticated policy-practice nexus that distinguishes it from other regions. Chatzistamoulou & Tyllianakis's (2022) analysis shows how EU circular economy directives are creating a unique "regulatory ecosystem" that shapes SME behavior. A key trend emerging from the data is the development of "integrated sustainability frameworks" where environmental initiatives are inseparable from core business strategies. However, studies from Eastern Europe (3 studies) highlight a persistent East-West divide in implementation capabilities. The research points to an emerging challenge: balancing standardization with local adaptability. Future directions suggest a move towards what Aranda-Usón et al. (2024) terms "smart sustainability" - where digital technologies and circular economy principles converge to create new business models.

North America (12 studies). North American research demonstrates a distinct market-driven approach that sets it apart from the regulatory-focused European model. Shaik et al.'s (2024) analysis reveals an emerging "technology-market convergence" where environmental initiatives are increasingly driven by consumer demand rather than regulation. A key trend is the rise of what researchers term "environmental entrepreneurship" – where green initiatives become sources of competitive advantage rather than compliance costs. The research identifies a critical challenge: the "scale-up gap" where successful pilot programs struggle to achieve broader implementation. Future trajectories suggest an increasing focus on what Abualfaraa et al. (2023) calls "precision sustainability" - using advanced analytics to optimize environmental impacts across operations.

Africa (9 studies). Unique frontier of 'developmental sustainability' is found in Africa. In Uganda, Namagembe et al. (2019) demonstrate that SMEs are integrating environmental initiatives with social development goals in a pattern that is unique to other regions. Through this research we identify an emerging trend identified as 'resource-conscious innovation' in which creative solutions are developed in response to environmental constraints. A problem however is what the researchers call the 'infrastructure-innovation gap' in which ambitious environmental goals that go beyond current infrastructure availability. Future directions point to further favouring 'adaptive green technologies' - technologies developed for resource constrained environments as identified by Muzamwese (2016).

Latin America (6 studies). The study of Latin American research shows an 'emerging 'hybrid sustainability' model that integrates organic (traditional) and environmental sustainability. In Peru, work done by Polas et al. (2022) shows that SMEs are integrating blockchain and other more advanced technology while continuing to employ traditional resource management practises. A second trend is of "collaborative environmental networks", where SMEs use their resources and knowledge to overcome limitations of an individual organisation and emerging forms of new collaboration are identified as important innovation factors. The research identifies a critical challenge: between rapid industrialization with environmental protection. Future directions point at further movement towards regional cooperation and knowledge sharing networks.

This analysis shows how the context of region matters a great deal in determining the path of green initiatives, with resultant differences in technology adoption, policy implementation and business model innovation. Although implementation paths vary widely among regions considering economic development and local resources, the research indicates a global trend towards more integrated, technological rich environmental management.

Distribution of Theoretical Frameworks in Green Growth Research

Patterns regarding the application of green growth theoretical frameworks and contributions to authorship are revealed when the green growth theoretical frameworks landscape is mined. One popular framework is the Resource-Based View (RBV) theory, with 12 applications, a 10% growth over the previous paper's results and is represented by both the established and the emerging scholars. Such collaborative authorship patterns, common in this field, are demonstrated by Silva et al. (2021) with multiple, many-institution, institutions, and more recent works (Tian et al., 2023; Hu, Chen, 2023) reveal increasing participation by Asian researchers, notably from Chinese institutions. 8 stakeholder theory applications appear diverse in their geographic coordinates of authors, from the Southeast Asian perspective of Van et al. (2019) to Aboalhool et al. (2024) expressing Turkic scholarly views.

A notable trend emerges in authorship patterns across theoretical applications, particularly in emerging frameworks like the Technology-Organization-Environment (TOE). Authors like Anwar et al. (2024) and Du et al. (2024) frequently collaborate across institutions, combining expertise from multiple disciplines. The Natural Resource-Based View (NRBV) studies show strong representation from developing economies, with Rajapakse et al. (2022) bringing valuable insights from South Asian contexts. Interestingly, studies applying Ecological Modernization Theory, though fewer in number (4 applications), demonstrate the highest level of international collaboration, as seen in Tereshchenko et al.'s (2023) work involving authors from multiple European institutions. This analysis reveals not only the theoretical evolution in green growth research but also the increasing globalization and diversification of scholarly contributions in this field (Table 2).

Research methods used

The analysis of research methodologies in SME green innovation (Table 3) studies reveals a strong predominance of quantitative approaches, with 77.4% (41 studies) employing statistical methods. Structural Equation Modeling (SEM/PLS-SEM) leads with 19 studies, demonstrating its effectiveness in uncovering complex relationships between green dynamic capabilities, innovation adoption, and performance outcomes. Survey-based research (15 studies) and regression analysis (7 studies) have been instrumental in identifying key determinants of environmental performance and mapping broad adoption patterns across different contexts. Notable works like Yousaf (2021) and Kim et al. (2021) demonstrate how these quantitative approaches have helped establish causal relationships between green practices and business outcomes.

Table 2. **Theoretical Approaches to Green Growth – Total Counts of Works and Key Literature Examples**

Study	Description
Resource-Based View (RBV) Theory – 12 studies	
Silva et al., 2021	Examines entrepreneurial orientation in green supply chain management
Tian et al., 2023	Studies green technology and market orientation
Hu, Chen, 2023	Analyzes sustainability and innovation
Stakeholder Theory – 8 studies	
Le Van et al., 2019	Analyzes stakeholder influence on green product strategy
Wang et al., 2023	Studies corporate governance and sustainability
Aboalhool et al., 2024	Examines humane entrepreneurship
Institutional Theory – 7 studies	
Gao, Yang, 2023	Studies institutional pressures on CER practices
Sun et al., 2022	Analyzes SME responses to green credit policy
Huang et al., 2022	Examines environmental protection policies
Technology-Organization-Environment (TOE) – 6 studies	
Lutfi et al., 2023	Studies factors influencing green innovation adoption
Du et al., 2024	Analyzes digital financial inclusion
Anwar et al., 2024	Studies big data analytics adoption
Natural Resource-Based View (NRBV) – 5 studies	
Rajapakse et al., 2022	Studies environmental incentives
Khan et al., 2023	Examines green effectuation orientations
Namagembe et al., 2019	Studies green supply chain practices
Ecological Modernization Theory – 4 studies	
Anwar et al., 2024	Studies big data analytics impact
Tereshchenko et al., 2023	Examines eco-innovation success
Huo et al., 2022	Studies green HRM practices

Source: authors.

Less well known, but an essential addition to quantitative findings, are the qualitative and mixed method approaches. Five studies utilise literature reviews and bibliometric analyses for mapping research trends and knowledge gaps, three of which use mixed methods combining SWOT analysis, case studies by assessing implementation challenges. In two studies that use system based approaches using evolutionary game models and two studies with detailed case studies with interviews provide insights into stakeholder dynamics and adoption processes but their lack of use indicates an underutilised methodological avenue.

Methodological patterns in current focus reveal tremendous limitations of understanding the complexities of green innovation adoption in interdependent systems. As Bouchmel et al. (2024) and Chatzistamoulou & Tyllianakis (2022) have shown, much of the current research relies heavily on cross sectional quantitative data, limiting the ability of these approaches to capture the temporal evolution of green practises in dynamically changing business environments. As noted by Ling & Wang (2024), there are a dearth of system approaches to understand the interactions of multi stakeholders, feedback loops, and emergent behaviours in green innovation ecosystems. Consequently, according to Bassi & Guidolin (2021) and Arcuri & Pisani (2021), using limited qualitative methods hinders more insightful understanding of the cultural, institutional, and behavioural factors affecting adoption decisions across various regional settings.

To mitigate these systemic limitations future research should utilise a more sophisticated methodological approach, recognising the complex adaptive nature of green innovation systems. Therefore, Shaik et al. (2024) and Wang et al. (2023) recommend integrating mixed methods to bring out both the macro level patterns and the micro level dynamics. As Qin and Hong (2023) show with advanced system approaches like agent based modelling and network analysis, a more refined mapping of the complex web of interactions among the SMEs and the stakeholders and environmental factors is needed. The emergent patterns and nonlinear relationships embedded in green innovation networks are proposed to be understood by Du et al. (2024) through big data analytics and real time monitoring systems.

In developing methodology, the field would benefit from more complex science inspired methodological innovation that would maintain analytical rigour. These calls for studies which could monitor the evolutionary coevolution of SMEs and their environmental context over time have been made by Oliveira and Secchi (2023) and Zorpas et al. (2024). Longitudinal studies focused on adaptation processes, comparative case studies on variation in system dynamics between regions or from different perspectives (stakeholders, power, place, management strategies), and participatory approaches connecting multiple stakeholders with regions' feedback loops and/or emergence patterns. Methodological sophistication, which Chatzistamoulou & Tyllianakis (2022) and Ha et al. (2024) advocate, would assist in constructing a finer understanding of how SMEs engage with and influence vibrant green innovation ecosystems, so as to subsequently enable more informed and adaptive support mechanisms and policy interventions.

Research Unit and Analysis

A systematic analysis of green SME innovation research is conducted to show how multi-level interactions shape the outcome of adoption. Research in this space exposes a fundamental tension at the macro level (15 studies) between policy design and implementation effectiveness. Contrary to regulations, policies generate better results according to Eckersley (2016), Ha et al. (2024), Zorpas et al. (2024), but such works reveal implementation gaps in policies arising from a mismatch between national policies and local capabilities. Additional studies by Chatzistamoulou & Tyllianakis (2022) and Woo et al. (2014) also illustrate that successful green innovation necessitates a match between an instrument of policy and regional economic contexts and institutional institutions.

Sectoral analysis, at the meso level (18 studies), shows sectoral influence on innovation diffusion patterns in the industry ecosystems. Yousaf (2021); Naruetharadhol et al. (2021);

Table 3. **Summary of Analytical Tools in Green Growth Studies for SMEs, by Research Method Categories**

Analytical Tool (number of papers)	Outcome
Quantitative	
Structural Equation Modeling – SEM/ PLS-SEM (19)	Identifies relationships between variables in the adoption of green practices and innovation in SMEs
Survey/ Questionnaire Analysis (15)	Provides insights into SME perceptions and behaviors related to sustainability
Regression Analysis (7)	Demonstrates factors influencing the environmental and economic performance of SMEs
Literature Review	
Systematic/ Bibliometric Analysis (5)	Maps research trends and identifies gaps in the literature
Mixed Method	
SWOT Analysis, Case Studies (3)	Offers in-depth understanding of the challenges and opportunities in adopting green practices
System Approach	
Evolutionary Game Model, MATLAB (2)	Models complex interactions between stakeholders in the green economy
Qualitative	
Case Studies, Interviews (2)	Provides in-depth insights into the process of adopting green innovation in SMEs

Source: authors.

and Kim et al. (2021) show that the green innovation leadership by manufacturing sectors goes beyond technological capability—most of these sectors have lead the way due to complex network effects. Du et al. (2024), Huang et al. (2022), Tereshchenko et al. (2023) and Bassi & Guidolin (2021) all study how supply chain pressures and knowledge spillovers contribute to self-reinforcing adoption cycles, while Bassi & Guidolin (2021) and Tereshchenko et al. (2023) point out that differences in sector specific characteristics matter and policy frameworks have to account for them.

The micro level analysis (47 studies) shows that SME responses are shaped by a complex interplay between internal capabilities and external pressures. Following Wang et al. (2023), Chatzistamoulou & Tyllianakis (2022), and Arcuri & Pisani (2021) show that access to multiple technological capabilities combined with resource limitations dictate a specific adoption trajectory. The implementation challenges investigated by Fadly (2020) and Bu et al. (2020) and the importance of organisational learning as presented by Cecere & Mazzanti (2017) and Silva et al. (2021) are also discussed. Nevertheless, the dominant focus on successful cases ((Rizos et al. 2016; Muzamwese 2016)) conceals learning opportunities from failed implementations.

Research by by Arulrajah et al. (2016); Perez et al. (2024) and Gull et al. (2024) at the individual level (5 studies), as reported in the literature, finds how leadership and employee engagement contribute in generating organisational momentum for green innovation. Zulkiffli et al. (2022); Maniu et al. (2021); Ahsan (2024); Cheng et al. (2024) however, study behavioural factors; Ahsan (2024); Cheng et al. (2024) also show the influence of management commitment. On one hand, they find that successful implementation hinges on complex social dynamics within firms, but such important aspects remain underexplored, necessitating a significant knowledge gap about how human factors influence adoption success.

This multi-level analysis (see summary at Table 4) exposes three critical systemic challenges: In fact, Passaro et al. (2023) and Oliveira and Secchi (2023) document the friction derived from the mismatch between policy design and implementation capabilities in shaping innovation diffusion. Secondly, as earlier demonstrated by Qin and Hong (2023) and Ling and Wang (2024), sector specific adoption patterns information indicates the need for more industry specific, tailored approaches. Third, little is known about the interaction between organisational capabilities and human factors, which inhibits the efficacy of intervention strategies as noted by Bouchmel et al. (2024) and Shaik et al. (2024). It is left to future research to overcome these systemic challenges through integrated approaches that recognise the dynamic interactions between different analytical levels.

Sectors of SMEs – Drivers – Barries

The sectoral analysis reveals distinct evolutionary patterns in green innovation adoption, with manufacturing leading at 57.7% of studies. A clear shift from compliance-driven to strategic adoption is evident, particularly in manufacturing where firms are integrating environmental innovations into their core business strategies (Ha et al., 2024). The textile industry shows crisis-driven rapid transformation due to environmental urgency, while technology services demonstrate market-led innovation through digital green solutions (Hossain et al., 2024; Tian et al., 2023). This multi-speed transformation across sectors indicates an overall trend toward strategic sustainability integration, though the pace and drivers vary significantly by sector.

Each sector faces unique but interconnected challenges in green innovation adoption. Manufacturing SMEs struggle with financial constraints and technical expertise gaps (Lutfi et al., 2023), while textile industries grapple with resource intensity and severe environmental impacts (Hossain et al., 2024). Technology services face immature green markets despite their digital capabilities (Huang et al., 2022), and diversified service industries encounter sector-specific barriers ranging from cultural resistance in hospitality to infrastructure limitations in retail (Elshaer et al., 2023; Bolaji et al., 2024). The persistence of these challenges across sectors suggests systemic barriers in resource availability, technical capability, and market readiness that require coordinated intervention.

The analysis suggests several promising directions for future development (Table 5). Manufacturing sectors are likely to see increased integration of digital technologies with green innovations, particularly in product development and process optimization (Kim et al., 2021). The textile industry shows potential for breakthrough innovations in water conservation and pollution control technologies, driven by urgent environmental pressures. Technology services are positioned to

lead in developing and scaling digital sustainability solutions, while diversified service industries may evolve toward sector-specific green innovation models. Cross-sector collaboration and knowledge sharing emerge as critical enablers for future development, particularly in addressing common challenges around technical expertise and resource constraints. Policy support mechanisms will need to evolve toward more targeted, sector-specific interventions while fostering cross-sector learning and innovation diffusion.

Cross-sectoral analysis reveals distinct patterns and challenges in green innovation adoption across different industries (Table 6). Manufacturing leads in systematic implementation, driven by regulatory pressures and operational benefits (Ha et al., 2024; Kim et al., 2021), while service sectors demonstrate customer-centric innovation approaches (Elshaer et al., 2023). Digital capabilities are leveraged within the technology sector for the development of sustainability solutions (Tian et al., 2023) and niche approaches are adapted within specialised industries based upon their operational context. While resource constraints as universal dilemmas, they manifest in different ways – financial and technical shortcomings undermine manufacturing SMEs (Lutfi et al. 2023), environmental impacts stress the textile industries (Hossain et al. 2024), and access to green practise is scarce for service sectors to implement in customer facing operations.

This research identifies critical success factors and future research needs in the sectors. Particularly in the case of textile's response to stakeholder pressures (Hossain et al., 2024), stakeholder engagement is clearly crucial, as well as in the case of the manufacturing industry adapting to regulatory requirements (Wang et al., 2023). Key overseers of these enablers are technology integration and employee commitment, which have been found to be enablers of VEB across all sectors, but their realisation differs across industry context. Future research should involve more comparative studies of cross sector approaches to environmental challenges, studies of failed implementation to identify sector specific barriers, as well as long term impact assessments of green initiatives. These insights indicate that supportive sector specific mechanisms are important, while leaving room to allow for cross sector learning and knowledge sharing.

Analysis by various sectors identified different patterns and challenges of green innovation adoption across different industries. Systematic implementation, underpinned by regulatory pressure and operation benefit (Ha et al. 2024; Kim et al. 2021), found manufacturing leads, while customer centric innovation is found in service sectors (Elshaer et al. 2023). The technology sector has digital capabilities to enhance sustainability solutions (Tian et al., 2023); the technology sector itself has its own niche approaches based on the operational context of the industry. Despite being a universal challenge with varying resource constraint, manufacturing SMEs face economic and technical constraints (Lutfi et al., 2023), textile industries have to face very high pressure to mitigate environmental impacts (Hossain et al., 2024), and service sector struggle to integrate green practise into customer facing operations.

The research identifies the critical success factors and future research needs across the sectors. The response by manufacturers to the regulatory requirements (Wang et al., 2023) is likely to be similar, also in the textile sector. Here, stakeholder engagement, however, is equally strong and has notably influenced the response to pressure to (Hossain et al., 2024). However, across all sectors technology integration and employee commitment are seen as enablers that emerge at varying degrees of implementation according to industry context. Future research requires additional comparative studies that evaluate cross sectoral approaches to environmental challenges; further investigation of failed implementations to learn about sector specific barriers; and to assess the long-term impacts of

Table 4. **Analysis Framework of Green Innovation in SMEs, by levels**

Research Focus	Key Findings	Research Gaps
Macro (National/Regional Economy) – 15 studies		
• National policy impacts on SME green practices • Green economic growth contribution • Regional development patterns	• Policy incentives more effective than regulations (Eckersley, 2016) • SMEs significantly contribute to green GDP growth in developing economies (Ha et al., 2024) • Regional variations in implementation success	• Limited cross-country comparative studies • Insufficient analysis of policy effectiveness • Lack of long-term impact studies
Meso (Industry/Sector Networks) – 18 studies		
• Sector-specific green innovation trends • Cross-industry sustainability practices • Supply chain transformations	• Manufacturing leads in green innovation adoption (Kim et al., 2021) • Industry networks crucial for knowledge transfer • Sector-specific barriers vary significantly	• Limited inter-industry effects studies • Few studies on emerging sectors • Insufficient focus on SME networks
Micro (Individual SMEs) – 47 studies		
• Green practice adoption factors • Innovation performance impact • Implementation strategies	• Resource constraints as key barriers (Yousaf, 2021) • Positive link between green innovation and performance • Technology crucial for implementation	• Over-reliance on single-firm studies • Limited understanding of processes • Focus mainly on success cases
Individual (Managers/Employees) – 5 studies		
• Leadership in sustainability • Environmental behaviour • Change management	• Leadership commitment crucial (Huo et al., 2023) • Employee behavior significantly impacts success • Knowledge gaps affect implementation	• Few studies on employee roles • Limited analysis of leadership styles • Lack of behavioral studies

Source: authors.

green initiatives. These insights imply the need of the need to develop sector specific assistive mechanisms while retaining the flexibility of cross sector learning and knowledge sharing.

Stage of Green Growth

The stages of green growth in SMEs reflect a progressive shift from initial awareness to full-scale ecosystem development, with distinct geographical concentrations at each stage (Table 7). The first stage, Awareness & Planning, is predominantly observed in developing Asian economies, with significant activity in Pakistan, Thailand, and Indonesia. This stage is characterized by increased understanding of environmental issues and initial planning for adopting green practices, with key stakeholders including policymakers, SME managers, and industry associations, as outlined by Gorondutse et al. (2020) and Noranarttakun & Pharino (2021).

An instance of Initial Implementation is observed in European nations (with emphasis on EU countries, Poland, Romania and Ukraine) where SMEs begin practising basic green activities aimed at resource efficiency and first stage green innovations. SMEs, their employees, environmental consultants and financial institutions are key stakeholders in this stage (Bassi, Guidolin, 2021; Wysocki, 2021). China is dominating the Advanced Integration stage with 14 studies that is able to deeply integrate green practises into business operations such as green product innovations and development of supply chain. Ha et al. (2024), Kim et al. (2021), and Chau et al. (2024) all point to the important role suppliers, customers and research institutions play here.

The Transformation & Leadership stage is primarily evident in advanced economies such as the In advanced economies like the USA, South Korea and Nordic countries, this Transformation & Leadership stage is very pronounced as SMEs

Table 5. **Analysis of Green Innovation in SMEs, by Sectors**

a) General Sectors

Drivers	Barriers	Evolution Pattern
Manufacturing – 15 studies (57.7%)		
• External pressures: Customer and regulatory demands (Ha et al., 2024) • Innovation focus: Green product development (Lutfi et al., 2023) • Operational benefits: Efficiency gains and cost reduction (Kim et al., 2021)	• Resource limitations: Financial constraints (Wang et al., 2023) • Technical gaps: Limited green technology expertise (Lutfi et al., 2023) • Implementation challenges: High transition costs (Fahad et al., 2022)	Moving from compliance-driven to strategic adoption
Textile Industry – 3 (11.5%)		
• Stakeholder pressure: Multiple stakeholder demands (Hossain et al., 2024) • Competitive advantage: Market differentiation (Chau et al., 2024) • Technology adoption: Green solutions implementation (Hossain et al., 2024)	• Environmental impacts: Severe water pollution issues • Technical limitations: Limited environmental expertise • Resource intensity: High implementation costs	Rapid transformation due to environmental urgency
Technology Services – 2 studies (7.7%)		
• Market orientation: Regional customer demands (Tian et al., 2023) • Service innovation: Low-carbon solutions (Huang et al., 2022) • Digital transformation: Technology-enabled sustainability	• Knowledge gaps: Technical expertise limitations • Market limitations	Leading in digital green solutions

b) Diversified Service Industries – 6 Studies (23.1%)

Drivers	Barriers	Evolution Pattern
A. Hospitality (1 study)		
• Customer expectations (Elshaer et al., 2023) • Green management practices	• Cultural resistance • Change management challenges	Gradual adoption as customer awareness grows
B. Retail/Warehousing (1 study)		
• Customer integration (Bolaji et al., 2024) • Green purchasing practices	• Infrastructure limitations • ICT capability gaps	Increasing green initiatives in supply chains
C. Specialized Sectors (4 studies)		
• Sector-specific regulations • Resource efficiency opportunities • Market competitiveness	• High operating costs • Technical implementation challenges • Limited expertise	Gradual transition with incentives for compliance

Source: authors.

Table 6. **Cross-Sectoral Insights**

Innovation Patterns
• Manufacturing leads in systematic adoption • Service sectors focus on customer-driven innovation • Technology sector emphasizes digital solutions • Specialized industries develop niche approaches
Implementation Challenges
• Resource constraints affect all sectors but manifest differently • Technical barriers show sector-specific characteristics • Cultural resistance varies by industry maturity
Success Factors
• Strong stakeholder engagement • Clear regulatory frameworks • Adequate resource allocation • Employee commitment • Technology integration
Future Research Needs
• More cross-sector comparative studies • Investigation of failed implementations • Long-term impact assessments • Focus on emerging sectors
Source: authors.

have fully embraced sustainability to fit it in the heart of their business model. Transformation is driven by industry leading SMEs, investors, broader society and international organisations (Tekala et al., 2024; Mubeen et al., 2024; Eckersley, 2016). In China's developed regions, advanced EU countries and countries including Singapore/Japan, the final stage – the Ecosystem Development stage – has some but limited presence. At this stage, wider green business ecosystemness is built around cross sectoration and policy contribution through working with stake holders namely governments, academics, NGOs, and the public at large (Tereshchenko et al., 2023; Zorpas, 2024; Maesaroh et al., 2024).

Case Study: Green Transformation of SMEs in Indonesia

With rising levels of environmental sustainability around the globe, businesses across the world are feeling increasing pressure to minimally impact the environment. In this respect, Micro, Small and Medium Enterprises (MSMEs) in Indonesia have assumed an important role in pushing for lasting economic growth. As SME's play a very important role in Indonesia's economy, their transition towards greener business models is crucial for Indonesia's long term sustainability. Government led initiatives as well as private sector driven initiatives for SMEs to take up environmentally responsible practises have been taken. This study provides a brief overview of the green growth adoption in the SME sector in Indonesia, featuring key elements of SME on the incorporation of sustainability in their operations and practise, thus contributing to a greener future.

Management Methods Used

Bank Indonesia (BI) has developed a green business model specifically for SMEs, structured into three stages: Eco-Adopter, Eco-Entrepreneur, and Eco-Innovator. This model allows SMEs to gradually adopt environmentally friendly practices, starting from basic sustainability principles

Table 7. **Stages of Green Growth**

Characteristics	Involved Stakeholders	Geographical Concentration
Stage 1. Awareness & Planning (Gorondutse et al., 2020; Noranarttakun, Pharino, 2021)		
• Increased awareness of environmental issues • Initial planning for adopting green practices	• Government (policymakers) • SME Managers • Industry Associations	Developing Asian economies: • Pakistan (5 studies) • Thailand (5 studies) • Indonesia (3 studies)
Stage 2. Initial Implementation (Wysocki, 2021; Bassi, Guidolin, 2021)		
• Early adoption of green practices • Focus on resource efficiency • Implementation of basic green innovations	• SMEs • Employees • Environmental Consultants • Financial Institutions	European nations: • EU countries (5 studies) • Poland, Romania, Ukraine
Stage 3. Advanced Integration (Ha et al., 2024; Kim et al., 2021; Chau et al., 2024)		
• Deep integration of green practices into operations • Green product and process innovations • Development of green supply chains	• SMEs • Suppliers • Customers • R&D Institutions	China dominance: • 14 studies focused on advanced integration • Strong emphasis on technology integration
Stage 4. Transformation & Leadership (Tekala et al., 2024; Mubeen et al., 2024; Eckersley, 2016)		
• Business model transformation toward sustainability • Leadership in green innovation • Significant contribution to green economy	• SMEs as industry leaders • Investors • Society • International Organizations	Advanced economies: • USA (2 studies) • South Korea • Germany & Nordic countries
Stage 5. Ecosystem Development (Tereshchenko et al., 2023; Zorpas, 2024; Maesaroh et al., 2024)		
• Green business ecosystem development • Cross-sector collaboration • Contribution to green policies and standards	• SMEs • Government • Academics • NGOs • General Public	Limited presence: • China's developed regions • Advanced EU economies • Singapore/Japan
Source: authors.		

and advancing to more innovative green strategies. One interviewee shared, «The gradual approach of the green business model is critical for us as SMEs; it allows us to adapt at a comfortable pace, first understanding the basics before moving to more complex green innovations.» Through these stages, BI helps SMEs integrate sustainability into their operations over time, ensuring that businesses evolve to meet environmental demands. In addition to the green business model, BI supports green financing through regulations such as Green Loan to Value (LTV) and Financing to Value (FTV), which facilitate capital access for SMEs wishing to adopt green business practices. As some financial experts noted, the financing programs like Green Loan and FTV are essential for us as they provide the necessary capital to make our green transformation possible (respondents 2 and 8).

Furthermore, BI enhances the capacity of SME owners through integrated education and training programs based on the green knowledge economy. These programs are vital for equipping SMEs with the skills needed to implement sustainable practices effectively. An interviewee emphasized, «The training on green technologies and circular economy principles has given us a solid foundation to apply sustainable practices in our daily operations. It's not just theory; we are learning how to turn these concepts into tangible actions.» These training programs introduce green technologies and the principles of circular economy practices, focusing on reducing waste and using resources efficiently. By providing these educational resources, BI helps SMEs gain the knowledge and tools required to successfully integrate sustainability into their businesses (respondents 1 and 5).

Emerging Trends in Green Transformation

Over recent years, SME owners have been becoming more aware of environmental sustainability importance. However, although knowledge about climate change leaves something to be desired, many SMEs have already begun to adapt to environmental friendly practises in their operations. For example, the fashion industry SMEs put in place the implementation of sustainable production methods like using eco-friendly fabrics or decreasing water waste usage in their manufacturing. SME owner Michael Hardie explains that as one grows, 'we are emerging to the fact that sustainable practise is not only best for the planet but is business sense as well.' We need to act responsibly." This trend towards responsible business practises also represents the wider movement towards ecological diversification demonstrating that SMEs are embracing ecological diversification as part of their core strategies (Bassi, Guidolin, 2021; Hossain et al., 2024).

Apart from this, some of the SMEs have also adopted some circular economy methods like the recycle and reuse of materials. Let's take the example of electronics SMEs who are reusing the old devices for electronics repair and refurbishment which helps in reducing e waste. Another entrepreneur mentioned, 'We've begun reusing our packaging materials, and invest in recycling processes; it's a little change, but it makes a big difference when it comes to reducing waste.' These businesses promote practises consistent with circular economy principles, which help to achieve more sustainable long-term environmental ambitions. This presents a trend that SMEs are not only implementing eco-friendly practises but actually making major adjustments to become generally more resource efficient (Hossain et al., 2024; Zorpas, 2024).

Additionally, consumer demand for eco-friendly products has increased resulting in pressures upon SMEs to innovate and supply green market products. SMEs in the food and beverage industry for example, have introduced plant based products and organic food options to cater for the rise in demand for sustainable consumption. "There's definitely been an increased demand for the products that are environmentally conscious; we've adjusted products lines to meet that demand," a product manager noted. In addition to offering SMEs a way to meet continually evolving market needs, this innovation is also helping them cut their environmental footprint. These transitions have been enabled by support from the government and critcal financial institutions, namely Bank Indonesia. Policies, financing, and training programmes that these institutions are patronising are helping SMEs to transition to more sustainable business Heises. "When institutions like Bank Indonesia back us up, it is a game changer for us to be able to implement greener solutions," said one financial expert (Chatzistamoulou, Tyllianakis, 2022; Ling, Wang, 2024).

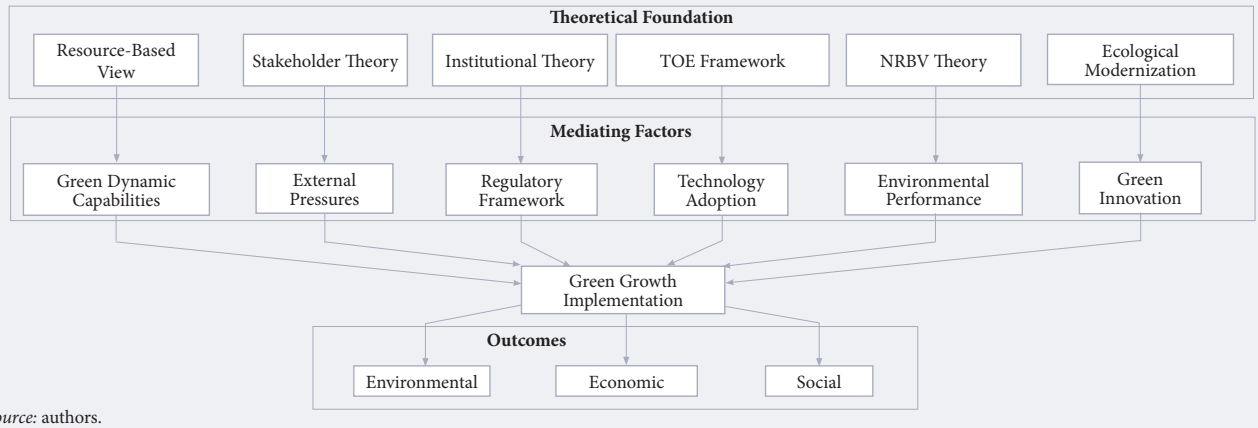
Green Growth Framework for SMEs

This study proposes both theoretical and conceptual frameworks of green growth in SME by the basis of the systematic literature review. The theoretical framework integrates six major theories: Resource Based View (RBV) for how firms utilise internal resources to provide competitive advantage, Stakeholder Theory for external pressures and expectations, Institutional Theory for regulatory and normative pressures, Technology Organisation Environment (TOE) Framework for technology adoption patterns, Natural Resource Based View (NRBV) for the relationship between environmental strategies and performance, and Ecological Modernization Theory for technological advancement in the realm of environmental protection. The conceptual framework aims to offer a more practically oriented perspective, which shows context-dependent relationships between sources of external driver (government policies, market pressures, stakeholder demands), inner capabilities (green innovation, resource efficiency, environmental management), contextual factors (industry type, geographic location, economic development), and implementation stages (from awareness to ecosystem development) resulting in environmental, economic, and social outcomes. Together, these frameworks offer complementary perspectives: studies by Silva et al. (2021), Tian et al. (2023), and Ha et al. (2024) provide evidence of the theoretical framework which provides the academic background for understanding the green growth mechanisms, and the conceptual framework offers a practical road map for the implementation to SMEs (Figure 3).

The green growth framework for SMEs offers a logical way to understand how can small and medium enterprises move towards more sustainable business models. The model of green growth, shown in Figure 4, both delineates the dimensions and contextual factors that enable green growth. Due to their agility and capacity of innovation, SMEs are a crucial component in global economies but they are simply different to larger chains when it comes to embracing sustainability in its operations. The framework deciphers certain critical aspects like environmental innovation and resource efficiency to help SMEs adopt greener practises that drive for long term sustainability, and decrease their environmental footprint (Gandhi et al., 2018).

The framework further shows how global, industry specific and organisational factors are connected though green growth analysis at various levels of analysis. Generally, policies at national and international levels … offer incentives and regulatory measures that encourage environmentally friendly practises (Rennings, 2000). The sector specific trends are influencing more at the industry level, where the adoption of sustainable technologies is being driven by sector specific innovation and competition (Tereshchenko et al., 2023). In the

Figure 3. **Theoretical Framework**



Source: authors.

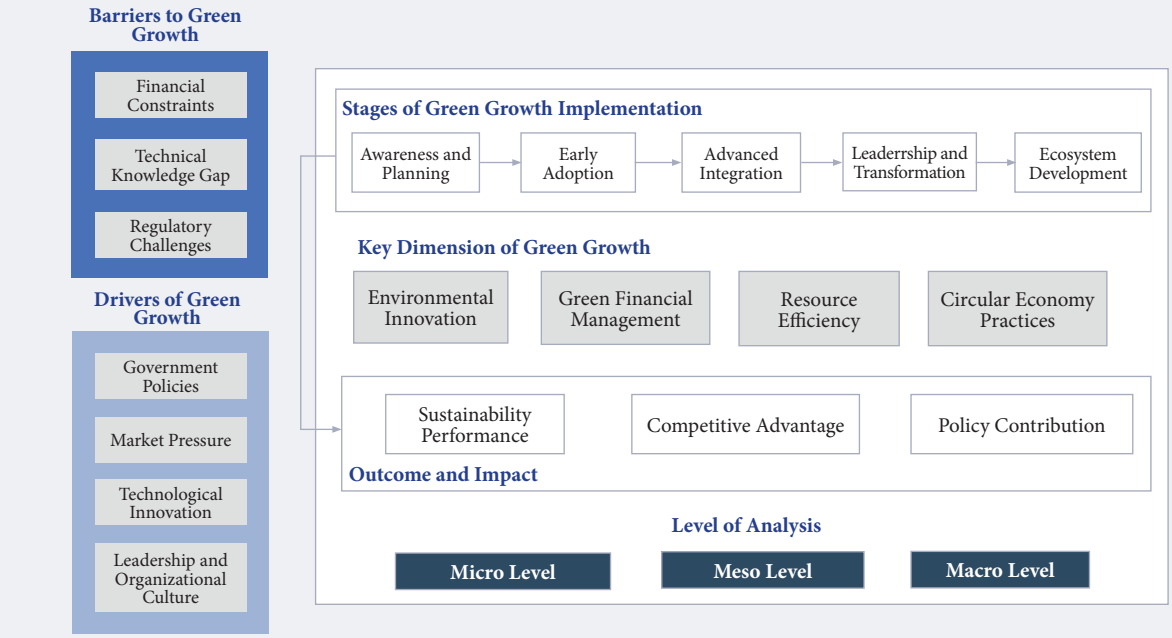
more granular, however, leadership of individual SMEs and organisational culture determine the mode of implementation for green growth strategies (Schaltegger, Wagner, 2011).

More importantly, the framework also lists the drivers and barriers that would likely dictate whether the green growth practise will be adopted. However, essential momentum to help SMEs spar with the depth of green transformation (García-Quevedo et al., 2020) are driven by government policies or technological innovations. However, this process is not without difficulties, since SMEs face difficulties in terms of insufficient financial resources or, quite frequently, lack of technical expertise, and thus slow adoption of green technologies (Del Río et al., 2016). It is important to understand these barriers before we can develop targeted interventions supporting SMEs to overcome these obstacles.

Therefore, the stages of green growth implementation highlighted in the framework understand the iterative nature of sustainability integration. Usually, SME green growth emergence does not follow a linear progression, but is patterned by changing the market forces, leadership decisions, and environmental awareness (Musa et al., 2016). The framework takes this process and frames it as a series of stages that can help guide SMEs from basic resource efficiency to more advanced green strategies and, in turn, towards a comprehensive, ecosystem driven sustainability practise. It indicates the importance of continued support from sectoral stakeholders in fostering and maintaining a conducive environment for sustained green growth of the SME sector (Porter, van der Linde, 1995).

Based on insights drawn from the existing framework, we see how whilst insights into what drives the green growth

Figure 4. **Model of Green Growth**



Source: authors.

Table 8. **Future Research Agenda, by Themes**

a) Digitalization and Green Innovation

Subthemes	• Big data analytics • AI-driven business model innovation • Digital transformation
Research gaps	• Lack of understanding of the impact of digitalization on SMEs' environmental performance • Limited studies on AI use in green innovation for SMEs
Future research avenues	• Investigating the effectiveness of big data analytics in improving SMEs' environmental performance (Anwar et al., 2024) • Exploring the role of AI in driving sustainable business model innovation (Shaik et al., 2024) • Analyzing the impact of digital transformation on green economy implementation in SMEs (Islam et al., 2023; Philbin et al., 2022)
Research Questions (RQ)	**RQ1: How can big data analytics enhance the environmental efficiency of SMEs?** **RQ2: To what extent can AI drive sustainable business model innovation in SMEs?** **RQ3: What is the impact of digital transformation on the implementation of green economy practices in SMEs?**

b) Green Finance and Sustainable Investment

Subthemes	• Green credit systems • Blockchain in green finance • Green investment in SMEs
Research gaps	• Lack of understanding of the effectiveness of green credit for SMEs • Limited research on the role of blockchain in reducing greenwashing
Future research avenues	• Evaluating the impact of green credit systems on SMEs' environmental performance (Ling & Wang, 2024) • Investigating the potential of blockchain to enhance transparency and effectiveness in green finance (Ling & Wang, 2024) • Analyzing the factors influencing green investment decisions in SMEs (Bouchmel et al., 2024)
Research Questions (RQ)	**RQ4: How do green credit systems affect the environmental and financial performance of SMEs?** **RQ5: To what extent can blockchain technology reduce greenwashing in green finance for SMEs?** **RQ6: What factors most influence green investment decisions in SMEs?**

c) Circular Economy and Resource Management

Subthemes	• Circular economy practices in SMEs • Material flow cost accounting • Waste management and recycling
Research gaps	• Lack of studies on circular economy implementation across different SME sectors • Limited research on the effectiveness of material flow accounting in SMEs
Future research avenues	• Developing circular economy models suitable for SMEs in various sectors (Zorpas, 2024) • Investigating the impact of material flow accounting on resource efficiency in SMEs (Aranda-Usón et al., 2024) • Exploring innovations in waste management and recycling for SMEs (Tereshchenko et al., 2023)
Research Questions (RQ)	**RQ7: How can circular economy models be tailored for different SME sectors?** **RQ8: What is the impact of material flow accounting on SMEs' resource efficiency and profitability?** **RQ9: What innovations in waste management are most effective for SMEs?**

d) Post-Pandemic Resilience and Sustainability

Subthemes	• SME adaptation to post-COVID-19 changes • Green innovation as a recovery strategy • Green supply chain resilience
Research gaps	• Lack of understanding of the long-term impacts of COVID-19 on SME sustainability practices • Limited studies on the role of green innovation in economic recovery
Future research avenues	• Investigating SME adaptation strategies to post-pandemic business environment changes (Du et al., 2023) • Analyzing the role of green innovation in improving SMEs' business resilience (Zulkiffli et al., 2022) • Exploring the development of resilient green supply chains for SMEs (Kim et al., 2021)
Research Questions (RQ)	**RQ10: What adaptation strategies are most effective for SMEs in facing post-pandemic business environment changes?** **RQ11: How can green innovation enhance SMEs' business resilience?** **RQ12: What are the key characteristics of resilient green supply chains for SMEs?**

e) Green Policies and Regulations

Subthemes	• Effectiveness of government incentives • Cross-sector policy harmonization • Standardization of green practices for SMEs
Research gaps	• Lack of comprehensive evaluation of the impact of green policies on SMEs • Limited studies on cross-sector policy harmonization
Future research avenues	• Evaluating the effectiveness of various types of government incentives in promoting green practices adoption in SMEs (Qin, Hong, 2023) • Analyzing the challenges and opportunities in cross-sector green policy harmonization (Chatzistamoulou, Tyllianakis, 2022) • Developing a framework for green practice standardization and certification suitable for SMEs (Noranarttakun, Pharino, 2021)
Research Questions (RQ)	**RQ13: What types of government incentives are most effective in promoting green practice adoption in SMEs?** **RQ14: How can green policies be effectively harmonized across sectors to support SMEs?** **RQ15: How can a suitable and implementable standard for green practices be developed for SMEs?**

Source: authors.

has been attained, more work still needs to be done to understand how SME can truly capitalise on digitalization, circular economy models and green finance, so as to promote their own sustainability towards more enhanced levels. Furthermore, as SMEs strive to bounce back from global shocks such as the COVID-19 pandemic, the investigation of the role of resilience in green practises seems to have become more integral to their development. Future work should focus on these emerging trends to develop the tools and concepts needed to overcome barriers and succeed in a green economy from SME.

Table 8 summarizes the key themes, research gaps and proposed future research avenues on the considered topic.

Conclusion

This study provides a comprehensive analysis of the green growth landscape within small and medium-sized enterprises (SMEs), exploring key dimensions such as environmental innovation, circular economy practices, and green financial management. Through a systematic literature review, it highlights the multi-level factors influencing green growth, from national policies at the macro level to organizational dynamics at the micro level. By dissecting drivers such as government policies, market pressures, and technological innovations, as well as identifying barriers such as financial constraints and knowledge gaps, the study presents a nuanced understanding of the complexities SMEs face in adopting sustainable practices. The findings offer significant insights for policymakers, business leaders, and researchers, guiding the development of strategies to foster green innovation and sustainability across the SME sector.

Further research around these key areas will provide invaluable insights to SMEs into both the landscape of green growth and the transition towards more sustainable business practises as the landscape of green growth for SMEs evolves. This systematic literature review follows by presenting the key themes, research gaps and proposed future research avenues (Table 8). This summary provides scholars and practitioners with a clear direction for advancing green growth research, particularly in the case of SMEs. Future research can address the identified gaps and explore new research areas by ensuring that SMEs become effective in adopting, and scaling sustainable practises to contribute to a deeper understanding of how SMEs can be effectively adopted and scaled for sustainable practise and thus build a more sustainable global economy.

References

Aboalhool T., Alzubi A., Iyiola K. (2024) Humane Entrepreneurship in the Circular Economy: The Role of Green Market Orientation and Green Technology Turbulence for Sustainable Corporate Performance. *Sustainability*, 16(6), 2517. https://doi.org/10.3390/su16062517

Abualfaraa W., AlManei M., Kaur R., Al-Ashaab A., McLaughlin P., Salonitis K. (2023) A Synergetic Framework for Green and Lean Manufacturing Practices in SMEs: Saudi Arabia Perspective. *Sustainability,* 15(1), 596. https://doi.org/10.3390/su15010596

Ahsan M.J. (2024) Green leadership and innovation: Catalysts for environmental performance in Italian manufacturing. *International Journal of Organizational Analysis* (ahead-of-print). https://doi.org/10.1108/IJOA-04-2024-4450

Anwar M., Khan S.Z., Saleem I. (2024) Big data analytics adoption and green supply chain management performance in SMEs. *Journal of Cleaner Production*, 315, 128053. https://doi.org/10.1016/j.jclepro.2023.128053

Aranda-Usón A., Portillo-Tarragona P., Scarpellini S., Llena-Macarulla F. (2024) Material flow cost accounting for sustainability and circular economy: An SME perspective. *Sustainability,* 12(5), 2067. https://doi.org/10.3390/su12052067

Aras G., Crowther D. (2008) Governance and sustainability: An investigation into the relationship between corporate governance and corporate sustainability. *Management Decision*, 46(3), 433–448. https://doi.org/10.1108/00251740810863870

Arcuri M.C., Pisani R. (2021) Is Trade Credit a Sustainable Resource for Medium-Sized Italian Green Companies? *Sustainability,* 13(5), 2872. https://doi.org/10.3390/su13052872

Arulrajah A.A., Opatha H.H.D.N.P., Nawaratne N.N.J. (2016) Green human resource management practices: A review. *Sri Lankan Journal of Human Resource Management*, 5(1), 5624. https://doi.org/10.4038/sljhrm.v5i1.5624

Ashton L.M., Hutchesson M.J., Rollo M.E., Morgan P.J., Collins C.E. (2017) Motivators and Barriers to Engaging in Healthy Eating and Physical Activity: A Cross-Sectional Survey in Young Adult Men. *American Journal of Men's Health*, 11(2), 330–343. https://doi.org/10.1177/1557988316680936

Ashton W.S., Russell S., Futch E. (2017) The adoption of green business practices among small US Midwestern manufacturing enterprises. *Journal of Environmental Planning and Management*, 60(12), 2133–2149. https://doi.org/10.1080/09640568.2017.1281107

Barney J. (1991) Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99–120. https://doi.org/10.1177/014920639101700108

Bassi F., Guidolin M. (2021) Employment implications of green growth: Linking jobs, sustainability, and inclusion in SMEs. *Sustainable Development,* 29(2), 334–348. https://doi.org/10.1002/sd.2147

Bolaji A.I., Aluko O.E., Akinola O. (2024) Green purchasing and supply chain management practices in SMEs. *Journal of Supply Chain Management,* 14(1), 53–70. https://doi.org/10.1111/jscm.2024.14001

Bouchmel I., Ftiti Z., Louhich W., Omri A. (2024) Financing sources, green investment, and environmental performance: Cross-country evidence. *Journal of Environmental Management*, 353, 120230. https://doi.org/10.1016/j.jenvman.2024.120230

Bramer W.M., Rethlefsen M.L., Kleijnen J., Franco O.H. (2018) Optimal database combinations for literature searches in systematic reviews: A prospective exploratory study. *Systematic Reviews,* 7(1), 1–12. https://doi.org/10.1186/s13643-018-0611-0

Braun V., Clarke V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Bu Q., Wang Z., Su B. (2020) Environmental orientation and green supply chain management in Chinese SMEs. *Business Strategy and the Environment,* 29(7), 2885–2899. https://doi.org/10.1002/bse.2567

Cecere G., Mazzanti M. (2017) Green jobs and eco-innovations in European SMEs. *Resource and Energy Economics*, 49(C), 86–98. https://doi.org/10.1016/j.reseneeco.2017.03.003

Chatzistamoulou N., Tyllianakis E. (2022) Harmonizing green policies across sectors: Challenges and opportunities for SMEs. *Environmental Policy and Governance,* 32(1), 89–103. https://doi.org/10.1002/eet.1947

Chau T.T., Do T.A., Nguyen T.D. (2024) Enhancing competitiveness in textile SMEs through green technology adoption. *Journal of Business Research*, 140, 42–52. https://doi.org/10.1016/j.jbusres.2023.02.001

Chen D., Haiqing Hu H., Chang C.P. (2023) Green finance, environment regulation, and industrial green transformation for corporate social responsibility. *Corporate Social Responsibility and Environmental Management*, 30(5), 2166–2181. https://doi.org/10.1002/csr.2476

Cheng M., Liu G., Xu Y., Chi M. (2024) What hinders Internet of Things (IoT) adoption in the Chinese construction industry: A mixed-method. *Journal of Civil Engineering and Management*, 30(1), 1–18. https://doi.org/10.3846/jcem.2024.19961

Civelek M.E., Kabaklarli E., Sahin Y. (2023) The role of dynamic capabilities in marketing communication strategies for SMEs in the steel industry. *Journal of Strategic Marketing,* 31(2), 123–137. https://doi.org/10.1080/0965254X.2022.2029432
Del Río P., Peñasco C., Romero-Jordán D. (2016) What drives eco-innovators? A critical review of the empirical literature based on econometric methods. *Journal of Cleaner Production,* 112, 2158–2170. https://doi.org/10.1016/j.jclepro.2015.09.009
Denyer D., Tranfield D. (2009) Producing a systematic review. In: The Sage Handbook of Organizational Research Methods (eds. D.A. Buchanan, A. Bryman), Tousand Oaks, CA: Sage, pp. 671–689.
Dimaggio P., Powell W.W. (1983) The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160. http://dx.doi.org/10.17323/1726-3247-2010-1-34-56
Domaracká L., Seňová A., Kowal D. (2023) Evaluation of Eco-Innovation and Green Economy in EU Countries. *Energies,* 16(2), 962. https://doi.org/10.3390/en16020962
Du J., Ye X., Jankowski P., Sanchez T.W., Mai G. (2024) Artificial intelligence enabled participatory planning: A review. International Journal on the Unity of the Sciences, 28(2), 183–210. https://doi.org/10.1080/12265934.2023.2262427
Ebrahimi P., Mirghafoori S.H., Saghafi F. (2017) Green entrepreneurship and green innovation for SME development in market turbulence. *Eurasian Business Review,* 7(2), 203–228. https://doi.org/10.1007/s40821-017-0076-6
Ebrahimi P., Rad A.A., Sepahvandi M.A. (2017) The impact of green innovation on competitive advantage in manufacturing companies. *Marketing and Branding Research*, 4(1), 26–38. https://doi.org/10.33844/mbr.2017.60302
Eckersley R. (2016) National identities, international roles, and the legitimation of climate leadership: Germany and Norway compared. *Environmental Politics*, 25(1), 180–201. https://doi.org/10.1080/09644016.2015.1076278
Elshaer I.A., Saad S.K., Taher M. (2023) The impact of environmental expectations on green management practices in the hospitality industry. *International Journal of Hospitality Management,* 104, 103170. https://doi.org/10.1016/j.ijhm.2022.103170
Fadly D. (2020) Greening Industry in Vietnam: Environmental Management Standards and Resource Efficiency in SMEs. *Sustainability,* 12(18), 7455. https://doi.org/10.3390/su12187455
Fahad S., Wang J., Khan A. (2022) Technical barriers to green technology adoption in manufacturing SMEs. *Journal of Technology Management & Innovation,* 17(1), 44–56. https://doi.org/10.4067/S0718-27242022000100044
Freeman, R.E. (1984) *Strategic Management: A Stakeholder Approach*, Boston: Pitman.
Gandhi N., Thanki S., Thakkar J. (2018) Ranking of drivers for integrated lean-green manufacturing for Indian manufacturing SMEs. *Journal of Cleaner Production,* 171, 675–689. https://doi.org/10.1016/j.jclepro.2017.10.041
Gandhi N.M., Selladurai V., Santhi P. (2018) Green management: Concept and strategies for climate change mitigation in SMEs. *Journal of Cleaner Production,* 174, 81–88. https://doi.org/10.1016/j.jclepro.2017.10.215
Gao L., Yang F. (2023) Do resource slack and green organizational climate moderate the relationships between institutional pressures and corporate environmental responsibility practices of SMEs in China? *Environment, Development and Sustainability*, 25(11), 13495–13520. https://doi.org/10.1007/s10668-022-02628-5
García-Quevedo J., Jové-Llopis E., Martínez-Ros E. (2020) Barriers to the adoption of green practices in firms: The impact of regulatory constraints and lack of technical knowledge. *Business Strategy and the Environment*, 29(5), 2064–2076. https://doi.org/10.1002/bse.2476
Ghisellini P., Cialani C., Ulgiati S. (2016) A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production,* 114, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007
Gorondutse A.H., Hilman H., Nasidi M. (2020) Stakeholder engagement and sustainability awareness in SMEs: The role of green policies. *Sustainable Development*, 28(3), 562–572. https://doi.org/10.1002/sd.2010
Gull M., Rashid M., Hassan S., Rehman S. (2024) Role of top management green commitment, adaptability culture and green product innovation in boosting organizational green performance in Pakistan. *Research Journal of Textile and Apparel*, 28(4), 1066–1090. https://doi.org/10.1108/RJTA-12-2022-0159
Ha B.C., Nguyen T.T., Pham N.H. (2024) Green supply chain management practices in SMEs: A multi-perspective analysis. *Journal of Environmental Management,* 330, 117055. https://doi.org/10.1016/j.jenvman.2023.117055
Hart S.L. (1995) A Natural-Resource-Based View of the Firm. *The Academy of Management Review*, 20(4), 986–1014. https://doi.org/10.2307/258963
Hillary R. (2004) Environmental management systems and the smaller enterprise. *Journal of Cleaner Production*, 12(6), 561–569. https://doi.org/10.1016/j.jclepro.2003.08.006
Hossain T., Rahman S., Islam N. (2024) Environmental sustainability practices in textile SMEs: An emerging economy perspective. *Sustainable Production and Consumption,* 27, 80–93. https://doi.org/10.1016/j.spc.2023.03.003
Huang Y., Wu S., Zhang Z. (2022) Low-carbon service innovation and regional market orientation in technology SMEs. *Journal of Business Research,* 137, 23–36. https://doi.org/10.1016/j.jbusres.2021.08.062
Huo M., Li C., Liu R. (2023) Climate policy uncertainty and corporate green innovation performance: From the perspectives of organizational inertia and management internal characteristics. *Managerial and Decision Economics,* 45(1), 3981. https://doi.org/10.1002/mde.3981
Ilyas G.B., Rahmi S., Tamsah H., Munir A.R., Putra A.H.P.K. (2020) Reflective Model of Brand Awareness on Repurchase Intention and Customer Satisfaction. T*he Journal of Asian Finance, Economics and Business*, 7(9), 427–438. https://doi.org/10.13106/JAFEB.2020.VOL7.NO9.427
Islam A.A.A., Trinugroho I., Suryanto S. (2023) SMEs' Flight to Digital and Green Economy: Evidence from Indonesia. *International Journal of Business and Society,* 24(1), 362–379. https://doi.org/10.33736/ijbs.5622.2023
Kannan S., Gambetta N. (2025) Technology-driven Sustainability in Small and Medium-sized Enterprises: A Systematic Literature Review. *Journal of Small Business Strategy*, 35(1), 129–157. https://doi.org/10.53703/001c.126636
Khan M., Ajmal M.M., Jabeen F., Talwar S., Dhir A. (2023) Green supply chain management in manufacturing firms: A resource-based viewpoint. *Business Strategy and the Environment*, 32(4), 1603–1618. https://doi.org/10.1002/bse.3207
Kim D., Park S., Lee J. (2021) Green supply chain management and its impact on SME performance: Evidence from South Korea. *International Journal of Production Economics,* 231, 107837. https://doi.org/10.1016/j.ijpe.2020.107837
Koirala S., Arora A., Yadav D. (2019) Promoting green growth in SMEs through sustainable financial management. *Journal of Sustainable Finance & Investment,* 9(3), 205–223. https://doi.org/10.1080/20430795.2019.1645592
Li W., Xiao X., Yang X., Li L. (2023) How Does Digital Transformation Impact Green Supply Chain Development? An Empirical Analysis Based on the TOE Theoretical Framework. *Systems*, 11(8), 416. https://doi.org/10.3390/systems11080416
Ling F., Wang Y. (2024) Blockchain technology in green finance: Addressing transparency and greenwashing in SMEs. *Journal of Financial Technology,* 12(4), 177–194. https://doi.org/10.1080/20430795.2024.1775689
Lutfi A., Idris F., Ibrahim M. (2023) Green HRM and sustainable performance in manufacturing SMEs. *Journal of Business Strategy,* 44(1), 37–51. https://doi.org/10.1108/JBS-07-2022-0167
Maesaroh I., Dewi I.J., Ginting G. (2024) Tourists' Attitudes Towards Halal Tourism: The Roles of Place Attachment and Religiosity. *Jurnal Penelitian dan Pengembangan Kepariwisataan Indonesia*, 18(1), 61–76. https://doi.org/10.47608/jki.v18i12024.61-76
Maniu I., Costache C., Dumitrașcu D.D. (2021) Adoption of Green Environmental Practices in Small and Medium-Sized Enterprises: Entrepreneur and Business Policies Patterns in Romania. *Sustainability*, 13(9), 4968. https://doi.org/10.3390/su13094968
Morrison A., Gregory T.S., Thoms B.D. (2012) Language bias in systematic reviews: Implications for health research. *Journal of Multilingual and Multicultural Development,* 33(4), 389–402. https://doi.org/10.1080/01434632.2012.689807
Mubeen M., Rizwan M., Yousaf Z. (2024) Green innovation leadership and SME growth: A mediation model. *Journal of Innovation & Knowledge,* 10(1), 45–63. https://doi.org/10.1016/j.jik.2023.100299

Murray A., Skene K., Haynes K. (2017) The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context. Journal of Business Ethics, 140, 369–380. https://doi.org/10.1007/s10551-015-2693-2
Musa H., Baporikar N., Gunasekaran A. (2016) Sustainable green growth in small and medium enterprises. *International Journal of Sustainable Development and World Ecology*, 23(2), 106–113. https://doi.org/10.1080/13504509.2015.1100875
Musa H., Chinniah M. (2016) Malaysian SMEs development: Future and challenges on going green. *Procedia — Social and Behavioral Sciences*, 224, 254–262. https://doi.org/10.1016/j.sbspro.2016.05.457
Muzamwese T.C. (2016) Challenges and opportunities for mainstreaming industrial energy efficiency in small-to-medium-sized industries in Zimbabwe. *WIREs Energy and Environment*, 5(5), 510–518. https://doi.org/10.1002/wene.203
Namagembe S., Ryan S., Sridharan R. (2019) Green supply chain practice adoption and firm performance: manufacturing SMEs in Uganda. Management of Environmental Quality, 30(1), 5–35. https://doi.org/10.1108/MEQ-10-2017-0119
Naruetharadhol K., Kwon J.H., Cho Y. (2021) Open innovation for eco-innovation in SMEs: A case study of Thailand. *Technology in Society*, 65, 101642. https://doi.org/10.1016/j.techsoc.2021.101642
Noranarttakun P., Pharino C. (2021) How does the Green Industry Policy Impact a Developing Country? A Case Study of the Electronic Products and Electrical Equipment Manufacturing Sector in Thailand. *Environment and Natural Resources Journal,* 19(5), 402–412. http://dx.doi.org/10.32526/ennrj/19/2021028
OECD (2019) *OECD work on green growth*, Paris: OECD.
Oliveira N., Secchi D. (2023) Theory Building, Case Dependence, and Researchers' Bounded Rationality: An Illustration From Studies of Innovation Diffusion. *Sociological Methods and Research*, 52(2), 993–1042. https://doi.org/10.1177/0049124120986201
Page M.J., McKenzie J.E., Bossuyt P.M., Boutron I., Hoffmann T.C., Mulrow C.D., Shamseer L., Tetzlaff J.M., Akl E.A., Brennan S.E., Chou R., Glanville J., Grimshaw J.M., Hróbjartsson A., Lalu M.M., Li T., Loder E.W., Mayo-Wilson E., McDonald S., McGuinness L.A., Stewart L.A., Thomas J., Tricco A.C., Welch V.A., Whiting P., Moher D. (2021) The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ,* 372, 71. https://doi.org/10.1136/bmj.n71
Parker C.M., Redmond J., Simpson M. (2009) A Review of Interventions to Encourage SMEs to Make Environmental Improvements. *Environment and Planning C: Politics and Space*, 27(2), 279–301. https://doi.org/10.1068/c0859b
Passaro R., Quinto I., Scandurra G., Thomas A. (2023) The drivers of eco-innovations in small and medium-sized enterprises: A systematic literature review and research directions. *Business Strategy and the Environment*, 32(4), 1432–1450. https://doi.org/10.1002/bse.3197
Perez J.A.E., Galindo S.M., Mario S., Farooq M., Ejaz S., Ahmed S., Ejaz F. (2024) Examining pro-environmental behavior through green human resource management and green innovation moderating role of environmental strategy. *Asia Pacific Management Review*, 100345.https://doi.org/10.1016/j.apmrv.2024.100345
Philbin S., Viswanathan R., Telukdarie A. (2022) Understanding how digital transformation can enable SMEs to achieve sustainable development: A systematic literature review. *Small Business International Review*, 6(1), e473. https://doi.org/10.26784/sbir.v6i1.473
Phonthanukitithaworn C., Maitree N., Naruetharadhol P. (2024) Eco-innovation policies for food waste management: a European Union-ASEAN comparison. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(2), 100295. https://doi.org/10.1016/j.joitmc.2024.100295
Polas M.R.H., Saha R.K., Tabash M.I. (2022) How does tourist perception lead to tourist hesitation? Empirical evidence from Bangladesh. *Environment, Development and Sustainability*, 24, 3659–3686. https://doi.org/10.1007/s10668-021-01581-z
Porter M.E., van der Linde C. (1995) Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives,* 9(4), 97–118. https://doi.org/10.1257/jep.9.4.97
Qin C., Hong Y.T. (2023) Quadripartite Evolutionary Game of Sustainable Development of Supply Chain Finance with Government Participation. *Sustainability,* 15(4), 3788. https://doi.org/10.3390/su15043788
Rajapakse A.M., Mudunkotuwa D.Y., Sanjula S.N., Nishantha K., Bandara T.R. (2022) Cement and Clay Bricks Reinforced with Coconut Fiber and Fiber Dust. *Advances in Technology,* 2(3), 233–248. https://doi.org/10.31357/ait.v2i3.5534
Rennings K. (2000) Redefining innovation: Eco-innovation research and the contribution from ecological economics. *Ecological Economics,* 32(2), 319–332. https://doi.org/10.1016/S0921-8009(99)00112-3
Revell A., Stokes D., Chen H. (2009) Small businesses and the environment: Turning over a new leaf? *Business Strategy and the Environment*, 19(5), 273–288. https://doi.org/10.1002/bse.628
Rizos V., Behrens A., Kafyeke T. (2016) Circular economy practices in SMEs: The role of green policies and stakeholder engagement. *Journal of Cleaner Production,* 115, 389–400. https://doi.org/10.1016/j.jclepro.2016.01.130
Schaltegger S., Wagner M. (2011) Sustainable entrepreneurship and sustainability innovation: Categories and interactions. *Business Strategy and the Environment,* 20(4), 222–237. https://doi.org/10.1002/bse.682
Shaik S., Agarwal R., Khan Z. (2024) AI-driven business model innovation for green practices in SMEs. *Journal of Business Innovation,* 7(2), 51–67. https://doi.org/10.1016/j.businnov.2023.02.006
Tekala T., Mihai M., Petro S. (2024) Leadership in green entrepreneurship: The case of Turkish SMEs. *Journal of Small Business Management*, 62(1), 56–73. https://doi.org/10.1080/00472778.2023.2018337
Tereshchenko E., Gkountouna O., Rao D.P.K., Abubakar A.M. (2023) Green growth, waste management, and environmental impact reduction success cases from small and medium enterprises context: A systematic mapping study. *IEEE Access,* 11, 34817–34834. https://doi.org/10.1109/ACCESS.2023.3261323
Tian Y., Huang Z. (2023) Regional market orientation and low-carbon service innovation in SMEs: A Chinese perspective. *Sustainability,* 15(3), 1175. https://doi.org/10.3390/su15031175
Van Q.L., Nguyen T.V., Nguyen M.H. (2019) Sustainable development and environmental policy: The engagement of stakeholders in green products in Vietnam. *Business Strategy and the Environment*, 28, 675–687.
Wang L., Rehman A., Xu Z., Amjad F., Rehman S. (2023) Green Corporate Governance, Green Finance, and Sustainable Performance Nexus in Chinese SMES: A Mediation Moderation Model. *Sustainability,* 15(13), 9914. https://doi.org/10.3390/su15139914
Woo H., Kim D., Lee J. (2014) Environmental innovation and green growth in SMEs: Labor productivity and green supply chains. *Journal of Cleaner Production*, 112, 1172–1185. https://doi.org/10.1016/j.jclepro.2015.02.031
Wysocki S. (2021) Initial adoption of green practices in European SMEs: Policy and practical implications. *Sustainability,* 13(7), 3561. https://doi.org/10.3390/su13073561
Yousaf Z. (2021) Green dynamic capabilities, green innovation, and value co-creation in SMEs. *Journal of Business Research*, 132, 386–398. https://doi.org/10.1016/j.jbusres.2021.04.050
Zhang P., Zhou D., Guo J. (2023) Policy complementary or policy crowding-out? Effects of cross-instrumental policy mix on green innovation in China. *Technological Forecasting and Social Change*, 192, 122530. https://doi.org/10.1016/j.techfore.2023.122530
Zorpas A. (2024) Circular economy strategies for SMEs: Exploring sustainability impacts and best practices. *Journal of Sustainable Business,* 17(1), 93–105. https://doi.org/10.1002/jsb.252
Zulkiffli W., Almahariq A., Mohd Z. (2022) Green innovation and SME business resilience: Post-pandemic recovery strategies. *Journal of Business and Industrial Marketing,* 37(10), 1576–1589. https://doi.org/10.1108/JBIM-03-2021-0184