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Sustainability trends in green financing for SMEs

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Sustainability Trends in Green Financing for SMEs

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Abstract - **Green financing has emerged as a key tool for promoting sustainability among Small and Medium Enterprises (SMEs), yet many still face challenges in accessing the funds required for transition. Critical enablers such as corporate governance, stakeholder engagement, and supportive regulatory incentives expand opportunities for SMEs to adopt sustainable practices. While green finance fosters environmental responsibility, innovation, and transparency through sustainability reporting, implementation remains uneven. Barriers including unclear regulations, collateral demands, low financial literacy, and limited sectoral access continue to slow adoption. This paper reviews global patterns, drivers, and obstacles shaping green financing for SMEs, drawing evidence from China, Pakistan, Malaysia, Indonesia, Vietnam, the United States, and Europe. By examining regional contexts, the study highlights the conditions that enable or restrict financing uptake and offers insights for strengthening SME development through sustainable finance.**
Keywords - **Green financing, Green corporate governance, Sustainability trends, SMEs**

I.INTRODUCTION

Small and Medium Enterprises (SMEs) are widely regarded as central drivers of economic growth, employment generation, and innovation. However, they often encounter structural barriers in obtaining financial resources needed to transition toward sustainability. Green financing has emerged as a crucial solution, referring to the channeling of financial resources into projects and enterprises that deliver environmental benefits while supporting long-term economic growth [1]. This includes financial instruments such as loans, bonds, equity, and credit facilities that fund renewable energy, energy efficiency, sustainable agriculture, waste management, and clean technology initiatives.

Recent studies emphasize that green financing enhances both the environmental and financial performance of SMEs by aligning business models with sustainability objectives. In China, for example, green corporate governance combined with financing mechanisms has been shown to improve SMEs' sustainable outcomes, demonstrating governance as a critical enabler [2]. Similarly, research on Pakistan's textile and leather sectors shows that targeted green financial interventions foster cleaner production processes and sustainable industrial growth [1]. Sustainability reporting, particularly when combined with digital tools, has also emerged as a significant factor in strengthening transparency and accountability, thereby easing access to finance [3], [6].

Globally, SMEs are increasingly pressured to adopt sustainable practices not only by regulators but also by consumers and international supply chains. Evidence indicates that embedding data-driven financial models and environmentally responsible strategies within SME operations improves competitiveness and supports long-term growth [4], [5]. Yet, widespread adoption remains uneven due to barriers such as regulatory uncertainty, high compliance costs, limited financial literacy, and underdeveloped institutional structures [10]–[13], [15].

In response to these dynamics, this paper undertakes a systematic literature review to analyze global sustainability trends in green financing for SMEs. Drawing on examples from China, Pakistan, Malaysia, Indonesia, Vietnam, Europe, and the United States, it explores the enablers, constraints, and technological innovations shaping SME access to green finance. The aim is to provide an integrated perspective on how SMEs can leverage sustainable financing for growth, while also identifying policy and research gaps that must be addressed for broader adoption.

II.METHODOLOGY

This study follows a literature review approach to explore global trends in green financing for Small and Medium Enterprises (SMEs). The literature was sourced from a mix of peer-reviewed journal articles, conference papers, and institutional reports, primarily accessed through reliable databases like Scopus, Web of Science, ScienceDirect, and Google Scholar. Additionally, grey literature and policy documents from respected organizations such as UNEP and the German Development Institute were included to provide a comprehensive perspective. We focused on research published between 2014 and 2025 to capture both foundational knowledge and recent developments in the field. After applying clear inclusion and exclusion criteria, 21 key studies were chosen for in-depth analysis. These studies span a range of geographical regions, including China, Pakistan, Malaysia, Indonesia, Vietnam, the United States, and Europe, ensuring a well-rounded and diverse outlook on the topic.

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III. LITERATURE REVIEW

A. Definition of Green Financing

Green financing refers to the provision of financial resources for projects and enterprises that generate environmental benefits while supporting sustainable economic growth [1]. Within the SME context, it enables businesses to adopt sustainable practices and strengthen competitiveness. In China, for example, the integration of corporate governance with green finance has been shown to enhance SMEs' sustainable performance [2]. In Pakistan's textile and leather industries, access to green financial tools has encouraged cleaner production methods and long-term growth [1]. Additionally, sustainability reporting and the use of digital systems improve accountability and transparency, making financing more accessible [3], [6].

Lindenberg [18] describes green finance as covering both public and private investments, environmental protection efforts, and supporting institutional frameworks. Ozili [19] highlights its role in mobilizing financial flows toward achieving Sustainable Development Goals (SDGs). Similarly, Hu [20] stresses the importance of embedding ecological considerations into financial systems, while UNEP [21] situates green finance as a core component of the broader sustainable finance agenda.

B. Global Sustainable Trends

Sustainable financing has become a global priority for SMEs, with studies consistently showing that it strengthens both environmental and financial performance. In China, governance-based financing models improved SME sustainability outcomes [2]. Pakistan's experience with targeted financing confirmed the role of green finance in enabling cleaner production [1]. In the United States, incorporating green financing into business strategies was found to enhance competitiveness [5]. Globally, sustainability reporting supported by digitization has emerged as a significant trend, improving accountability and stakeholder trust [3], [6]. Export-driven SMEs have also benefited from adopting green innovation and readiness, boosting their performance in international markets [8].

C. Key Enablers of Green Financing

Several factors have been identified as critical to the success of green financing. Leadership commitment and organizational readiness have been highlighted as essential for facilitating SME transitions [7]. Sustainability reporting plays a dual role by ensuring compliance while strengthening credibility with stakeholders [6]. Entrepreneurial orientation and innovation also serve as important enablers, driving competitiveness and export performance [8], [9]. Comparative studies in Malaysia and Indonesia show that supportive institutional frameworks significantly amplify the positive impacts of green finance [14].

D. Barriers to Green Finance

Despite progress, many obstacles hinder the adoption of green financing by SMEs. European businesses often struggle with resource limitations, regulatory ambiguity, and high compliance costs [13]. In India, fragmented policies and weak institutional systems act as major barriers [15]. Malaysian SMEs face constraints such as limited access to capital, insufficient training, and technological gaps [11]. Broader studies classify these barriers into financial, technological, and informational categories, with knowledge gaps emerging as a recurring issue preventing SMEs from pursuing sustainable practices [10], [12].

E. Regional Evidence

The effectiveness of green financing varies across regions. In Pakistan's textile and leather sectors, green finance has supported industry-specific improvements [1]. In China, corporate governance is a key factor driving the effectiveness of financial mechanisms [2]. Studies in Malaysia and Indonesia reveal that institutional frameworks are vital for ensuring financial sustainability [14]. In Vietnam, SMEs achieved performance improvements through green financing when they possessed sufficient readiness and capability [17]. European SMEs, by contrast, continue to face barriers despite some supportive enablers [13], whereas U.S. SMEs benefit from integrating sustainability into financial planning [5].

F. Technology and Innovation

Technological progress has become a decisive factor in expanding SME access to green finance. Digitalization has enhanced reporting transparency and accountability [3]. Fintech solutions enable SMEs to embed sustainability criteria into financial decision-making [4]. Greentech ecosystems, which combine finance, technology, and sustainability, have emerged as collaborative platforms supporting adoption [16]. Entrepreneurial innovation and green-oriented strategies further increase access to finance and boost competitiveness [8], [9].

IV. RESULTS

The review of selected studies provides detailed insights into how SMEs engage with green financing and the implications of these practices. Findings are organized into five thematic areas:

A. Global Sustainable Trends

Research consistently shows that SMEs across the world are adopting sustainability goals through green financing initiatives. In China, Wang et al. [2] found that when governance structures were linked to financing, SMEs achieved significant improvements in both

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financial and environmental performance. Similar evidence from Pakistan's textile and leather industries highlights that access to targeted green financing encouraged cleaner production practices and sustainable growth [1]. In the United States, Ogunyemi and Ishola [5] reported that embedding green financing into SME strategies enhanced competitiveness in global markets. Sustainability reporting has also emerged as a worldwide practice, acting both as a compliance tool and as a way to strengthen reputation, with Appiah-Kubi et al. [3] and Atanasov [6] stressing the role of digital tools in boosting accountability. Singh et al. [8] further showed that export-oriented SMEs achieved superior performance internationally when they adopted green innovation and readiness, linking sustainability directly to global trade competitiveness.

B. Key Enablers of Green Financing

Leadership and governance have been repeatedly identified as essential for green transitions. Huy and Phuc [7] emphasized that leadership commitment and organizational readiness were critical factors in Vietnam's SME sustainability journey. Atanasov [6] and Appiah-Kubi et al. [3] found that sustainability reporting not only ensured regulatory compliance but also strengthened external trust. Entrepreneurial orientation was equally important, as Aftab et al. [9] showed that adopting green entrepreneurial practices significantly boosted firm performance. Comparative studies from Malaysia and Indonesia further confirmed that supportive policies and institutional structures magnify the benefits of green finance [14].

C. Barriers to Green Finance

Despite opportunities, SMEs face considerable challenges in adopting green financing. Musa and Chinniah [11] highlighted that Malaysian SMEs often struggle with limited access to capital, insufficient training, and weak institutional support. Rekik and Bergeron [10] pointed to informational and technological gaps as key obstacles to adoption. Alayón et al. [12] categorized barriers into financial, organizational, and technological dimensions, underscoring the systemic nature of the challenges. In Europe, Moursellas et al. [13] identified high compliance costs, market pressures, and limited resources as significant limitations. Kaushik [15] added that in India, fragmented policies and low levels of financial literacy further restrict SME participation in green finance.

D. Regional Evidence

Regional evidence underscores both similarities and differences in green financing adoption. In Malaysia and Indonesia, Abidin et al. [14] showed that supportive institutional frameworks improved SMEs' financial sustainability. Thuong [17] reported that in Vietnam, the effectiveness of green financing depended on organizational readiness. In Pakistan, Kumar et al. [1] observed that access to green finance encouraged cleaner production, while Wang et al. [2] highlighted the importance of governance in China. In Europe, barriers outweighed enablers [13], while in the U.S., SMEs benefited from integrating sustainability directly into financing strategies [5].

E. Technology and Innovation

Technological advancements are playing a decisive role in enabling green financing. Appiah-Kubi et al. [3] and Atanasov [6] stressed that digital reporting tools enhanced transparency and accountability. Ogunyemi and Ishola [4] demonstrated how fintech solutions allow SMEs to incorporate sustainability metrics into financial planning. Zournatzidou [16] highlighted the significance of Greentech ecosystems as platforms that link finance, technology, and sustainability. Singh et al. [8] found that innovation readiness strengthens the link between green finance and competitiveness, while Aftab et al. [9] emphasized the contribution of green entrepreneurship to SME excellence.

V. DISCUSSION

The evidence confirms that green financing plays a pivotal role in supporting SMEs' sustainability transitions, although adoption varies significantly across contexts. SMEs in developing economies often encounter greater barriers than those in developed markets. For example, in Malaysia and India, systemic obstacles such as high compliance costs, fragmented regulations, and low financial literacy restrict adoption [11], [15]. Nevertheless, targeted programs such as Pakistan's textile sector initiatives demonstrate that access to green finance can lead to measurable environmental and industrial improvements [1]. In contrast, SMEs in advanced economies like the United States benefit from stronger institutional support and consumer-driven incentives, which make the adoption process smoother [5]. These differences highlight the context-dependent nature of green finance effectiveness.

Entrepreneurial orientation emerges as a strategic asset that mediates the relationship between green financing and firm performance [9]. From a theoretical perspective, institutional theory provides a useful lens, as practices such as corporate governance and sustainability reporting strengthen organizational legitimacy and stakeholder confidence [2], [6].

The findings carry practical implications for multiple stakeholders. Policymakers should address systemic barriers by developing clearer regulatory frameworks, offering subsidies, and improving financial literacy programs. Financial institutions are encouraged to design SME-friendly instruments such as green credit products and digital finance platforms. SMEs themselves should invest in innovation and adopt sustainability reporting systems to enhance access to funding. For export-oriented SMEs, incorporating green strategies can also create new opportunities in international markets [8].

VI. LIMITATIONS and FUTURE RESEARCH

The review draws solely on secondary literature and does not include empirical data collection, which restricts

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the ability to validate findings through direct SME perspectives. Limited attention has been given to the potential role of fintech and blockchain in expanding SME access to sustainable finance. Moreover, there is a lack of longitudinal studies assessing the long-term outcomes of green financing initiatives. Future research should also examine the impact of consumer and market pressures as additional determinants of adoption.

VII. CONCLUSION

This review underscores the dual importance of green financing: it not only advances environmental sustainability but also enhances the competitiveness of SMEs. The findings show that governance structures, innovation, sustainability reporting, and supportive institutions are vital enablers of adoption, while persistent barriers such as weak policies, high costs, and knowledge gaps continue to limit progress. Regional comparisons reveal that SMEs in developed economies benefit from stronger institutional frameworks, whereas firms in developing contexts often rely on targeted sector-specific initiatives to realize the benefits of green financing. At the same time, technological drivers including digitalization, fintech solutions, and Greentech ecosystems are transforming access to sustainable finance, although further study is needed to understand their long-term effects. Importantly, SMEs that embrace green financing not only improve their environmental performance but also strengthen resilience and competitiveness in global markets. Moving forward, collaboration among governments, financial institutions, and SMEs will be crucial to removing barriers, promoting digital financial ecosystems, and expanding research into underexplored regions. Ultimately, green financing should be regarded both as an environmental necessity and as a strategic business opportunity, positioning SMEs as active contributors to global sustainability agendas.

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