



CIRCULAR ECONOMY FINANCING: DEVELOPING MODELS FOR SUSTAINABLE SMALL AND MEDIUM ENTERPRISES (SMES)

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Article Info

Received: December 06, 2025

Revised: March 11, 2026

Accepted: May 06, 2026

Online Version: June 30, 2026

Abstract

Transitioning from linear economic systems toward circular economy models has become a strategic priority for achieving sustainable development. Small and Medium Enterprises (SMEs) play a crucial role in this transition due to their significant contribution to economic growth, employment creation, and innovation. This study aims to develop an integrated financing model that supports circular economy implementation while enhancing environmental performance, organizational resilience, and long-term business sustainability. A mixed-methods research design was employed, combining qualitative exploration with quantitative analysis. Data were collected from SME owners, managers, financial professionals, and sustainability practitioners. Structural Equation Modeling was utilized to examine relationships among financing accessibility, financial innovation, circular economy implementation, environmental performance, and sustainable business outcomes. Findings reveal that financing accessibility and financial innovation significantly influence circular economy adoption and organizational resilience. Environmental performance was found to mediate the relationship between circular business practices and sustainable business outcomes. The study concludes that an integrated circular economy financing model can serve as an effective mechanism for accelerating sustainable SME transformation. Financial ecosystems that combine accessible capital, innovative financial products, and sustainability objectives are essential for supporting circular economic development.

Keywords: Circular Economy, Financial Innovation, SME Sustainability



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Journal Homepage

<https://research.adra.ac.id/index.php/jmf>

How to cite:

Siahaan, D. (2026). Circular Economy Financing: Developing Models for Sustainable Small and Medium Enterprises (Smes). *Journal Markcount Finance*, 4(3), 234–250.
<https://doi.org/10.70177/jmf.v4i3.3990>

Published by:

Yayasan Adra Karima Hubbi

INTRODUCTION

Global economic development has generated substantial improvements in productivity, industrial growth, and living standards over the past century. Resource-intensive production systems, however, have simultaneously contributed to environmental degradation, excessive waste generation, biodiversity loss, and climate-related challenges. Traditional linear economic models characterized by the sequence of extraction, production, consumption, and disposal increasingly face criticism due to their limited capacity to ensure long-term sustainability. Governments, international organizations, businesses, and academic institutions are therefore seeking alternative economic approaches capable of balancing economic growth with environmental responsibility. Circular economy principles have emerged as a promising framework for addressing these interconnected challenges by promoting resource efficiency, waste reduction, and regenerative production systems (Nikishyna, 2025; Tarantino, 2026).

The circular economy represents a transformative paradigm that seeks to extend product lifecycles, maximize resource utilization, encourage recycling and reuse, and minimize environmental impacts throughout value chains. Adoption of circular business practices has expanded across multiple sectors, including manufacturing, agriculture, energy, construction, and consumer goods industries. Organizations increasingly recognize that circular economy strategies can generate both environmental and economic benefits through improved operational efficiency, innovation, and resilience. Policy initiatives at national and international levels have further accelerated interest in circular transitions as part of broader sustainable development agendas. Successful implementation of circular economy principles, however, often requires substantial organizational, technological, and financial adaptation.

Small and Medium Enterprises (SMEs) occupy a central position within global economic systems due to their contributions to employment generation, innovation, local development, and economic diversification. SMEs constitute the majority of business entities in many countries and play a significant role in achieving sustainability objectives. Limited access to financial resources, technological capabilities, and specialized expertise frequently constrains their ability to adopt circular business models. Financing challenges represent one of the most significant barriers to circular transformation among SMEs. Understanding how innovative financing mechanisms can support sustainable SME development has therefore become an important area of academic and policy interest (Alahmadi, 2025; Hariyani, 2024).

Transitioning toward circular economy practices requires investments in new technologies, resource-efficient processes, sustainable infrastructure, waste recovery systems, and innovative business models. Many SMEs face difficulties securing adequate financial support for such investments due to limited collateral, perceived risk profiles, and insufficient financial capacity. Conventional financing mechanisms often prioritize short-term financial performance while undervaluing long-term environmental and social benefits associated with circular initiatives (Nwaila, 2024; Raut, 2025). These limitations create significant obstacles for SMEs seeking to implement sustainable business transformations.

Financial institutions frequently encounter challenges in evaluating circular economy projects because traditional risk assessment frameworks are not always designed to capture the unique characteristics of circular business models. Uncertainty regarding future returns, technological performance, and market acceptance may discourage investment in circular initiatives. Existing financial products may therefore inadequately address the needs of SMEs pursuing resource-efficient and environmentally sustainable strategies. Such conditions

contribute to a persistent financing gap within the circular economy ecosystem (Mahmood, 2026; Pérez, 2024).

Questions remain regarding the design of financing models capable of supporting both economic viability and environmental sustainability among SMEs. Existing approaches often focus on isolated financing instruments rather than integrated frameworks capable of addressing multiple dimensions of circular business development. Limited understanding of the relationships among financing structures, sustainability performance, innovation capacity, and SME resilience restricts efforts to promote broader circular economy adoption. Comprehensive investigation is therefore required to identify financing mechanisms capable of facilitating sustainable SME transformation (Mahmood, 2026; Wu, 2026).

This study aims to examine the financing challenges faced by SMEs in implementing circular economy practices and identify the factors influencing access to sustainable financial resources. Particular attention is directed toward understanding how financial institutions, policymakers, investors, and SMEs interact within circular economy ecosystems. Analysis seeks to provide a comprehensive understanding of the financial barriers affecting circular business adoption (Girard, 2024; Santolin, 2025).

Another objective of the study is to develop a financing model capable of supporting sustainable SME participation in circular economy initiatives. Investigation focuses on the integration of financial accessibility, environmental performance, innovation capacity, risk management, and long-term business sustainability. Examination of these dimensions is expected to generate insights regarding the characteristics of effective circular economy financing frameworks.

The study further aims to evaluate the potential impact of innovative financing mechanisms on SME competitiveness, environmental outcomes, and sustainable development objectives. Findings are expected to contribute practical recommendations for financial institutions, government agencies, investors, and business leaders seeking to accelerate circular economy transitions. Achievement of these objectives may support the development of more inclusive and sustainable economic systems.

Previous studies have extensively explored the theoretical foundations and practical applications of the circular economy. Existing literature has examined resource efficiency, sustainable production systems, waste management strategies, industrial symbiosis, and circular business model innovation. Research has consistently emphasized the environmental and economic benefits associated with circular practices. Significant attention has also been devoted to policy frameworks supporting circular transitions at local, national, and international levels (Agrawal, 2024; Amegboleza, 2026).

Current scholarship concerning circular economy financing has primarily focused on green finance, sustainable investment, environmental risk assessment, and climate-related financial instruments. Several studies have investigated the role of banks, venture capital, impact investors, and public funding programs in supporting sustainable business initiatives. Existing research frequently examines financing mechanisms at the macroeconomic or sectoral level while providing limited attention to the specific financing needs of SMEs operating within circular economy contexts (Belyamani, 2025; Singh, 2025).

Integrated financing models linking financial accessibility, circular business performance, innovation adoption, and long-term sustainability outcomes remain relatively underdeveloped in the literature. Limited empirical and conceptual research has examined how

diverse financing instruments can be combined to address the unique challenges faced by SMEs during circular transformation processes. Existing studies often analyze financial barriers and sustainability outcomes separately rather than investigating their interconnected relationships. Addressing this gap can contribute to a more comprehensive understanding of sustainable financing strategies for circular economy development (Ghosh, 2025; Kesavan, 2025).

The novelty of this study lies in its development of an integrated financing framework specifically designed for SMEs operating within circular economy environments. Existing research frequently evaluates financing instruments individually or focuses on broad sustainability objectives without adequately addressing the distinctive requirements of circular business models. This study advances the literature by examining how multiple financing mechanisms can be strategically combined to support sustainable SME transformation. Such an approach provides a more comprehensive perspective on financing innovation within circular economy ecosystems (Pariso, 2026; Véliz, 2025).

Innovative value is further reflected in the integration of circular economy theory, sustainable finance principles, SME development frameworks, and innovation management perspectives within a single analytical model. The proposed framework explores interactions among financial accessibility, environmental performance, resource efficiency, technological innovation, and business resilience. Examination of these relationships contributes new theoretical insights regarding the mechanisms through which financing structures influence sustainable business outcomes.

The significance of this research extends beyond academic inquiry to encompass practical and policy implications. Governments increasingly seek effective strategies for promoting sustainable economic growth and environmental responsibility. Financial institutions require more sophisticated approaches for evaluating and supporting circular business initiatives. SME managers need accessible financing solutions capable of facilitating innovation and long-term competitiveness. Findings from this study are expected to provide valuable guidance for designing financing ecosystems that strengthen SME participation in circular economy transitions while contributing to broader sustainability objectives (Munonye, 2025; Shebanin, 2024).

RESEARCH METHOD

Research Design

This study employed a mixed-methods research design using an exploratory sequential approach to develop and validate a financing model for sustainable Small and Medium Enterprises (SMEs) operating within circular economy ecosystems. The mixed-methods design was selected because the study sought to explore the complex relationships among financing accessibility, circular business practices, innovation capacity, environmental performance, and long-term business sustainability. Qualitative exploration was conducted during the initial stage to identify key dimensions and mechanisms influencing circular economy financing. Quantitative analysis was subsequently employed to validate the proposed model and examine causal relationships among the identified variables (Miassi, 2024; Omrany, 2025).

The conceptual framework of the study was developed by integrating Circular Economy Theory, Sustainable Finance Theory, Resource-Based View (RBV), and SME Development Theory. Circular Economy Theory provided insights into resource efficiency, waste

minimization, and regenerative business practices. Sustainable Finance Theory contributed perspectives regarding financial instruments supporting environmental and social objectives. Resource-Based View was employed to examine how financing resources influence organizational capabilities and competitive advantage. Integration of these theoretical perspectives enabled the construction of a comprehensive model capable of explaining financing dynamics within circular economy transitions (Gallego-Schmid, 2025; Véliz, 2025).

Structural Equation Modeling (SEM) was adopted as the primary analytical technique for the quantitative phase of the study. Application of SEM facilitated simultaneous examination of multiple latent variables and complex interrelationships among financing mechanisms, innovation adoption, environmental performance, and SME sustainability outcomes. This approach provided a robust methodological foundation for evaluating both measurement validity and structural relationships within the proposed financing model.

Population and Samples

The population of the study consisted of SME owners, managers, financial officers, sustainability practitioners, banking professionals, impact investors, venture capital representatives, and policymakers involved in circular economy initiatives. Participants were selected from manufacturing, agribusiness, recycling, renewable energy, sustainable packaging, waste management, and environmentally oriented service sectors. These stakeholders were considered appropriate because they possess direct knowledge regarding financing challenges and sustainability practices associated with circular business models.

Sampling for the qualitative phase was conducted using purposive sampling techniques. Twenty-five experts representing financial institutions, circular economy enterprises, government agencies, sustainability consultants, and academic researchers participated in in-depth interviews. Selection criteria emphasized professional experience in sustainable finance, SME development, environmental innovation, and circular economy implementation. Expert insights were utilized to identify critical factors influencing financing accessibility and circular business performance (Matos, 2024; Mignacca, 2026).

The quantitative phase involved 420 respondents drawn from SMEs actively engaged in circular economy activities. Sample size determination followed established recommendations for Structural Equation Modeling to ensure statistical reliability and model stability. Stratified purposive sampling was employed to ensure representation across industries, enterprise sizes, and stages of circular economy adoption. Such diversity enhanced the generalizability of the findings and strengthened the validity of the proposed financing framework.

Instruments

Data collection utilized a structured questionnaire developed from validated instruments reported in previous studies concerning sustainable finance, circular economy adoption, SME performance, and environmental innovation. The questionnaire consisted of demographic information and measurement items representing the latent constructs within the conceptual model. Variables included financing accessibility, financial innovation, circular business implementation, environmental performance, organizational resilience, and sustainable business outcomes.

A five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was employed to measure respondent perceptions. Financing accessibility was assessed through indicators related to credit availability, investment support, financial flexibility, and access to sustainable financial products. Circular economy implementation was measured through

resource efficiency practices, waste reduction strategies, product lifecycle management, and recycling initiatives. Sustainability outcomes included economic performance, environmental impact reduction, operational resilience, and long-term business viability.

Validity and reliability procedures were implemented prior to hypothesis testing. Content validity was evaluated through expert review involving specialists in finance, sustainability, circular economy, and SME development. Construct validity was assessed using Confirmatory Factor Analysis (CFA), while reliability was examined through Cronbach's alpha, composite reliability, and Average Variance Extracted (AVE). Acceptance thresholds exceeding 0.70 for reliability measures and 0.50 for AVE values were applied to confirm satisfactory measurement quality.

Procedures

The research process commenced with an extensive review of literature concerning circular economy principles, sustainable finance, SME development, environmental innovation, and green investment mechanisms. Findings from the literature review were synthesized to establish the conceptual framework and identify preliminary variables relevant to financing circular business transitions. Qualitative interview protocols were subsequently developed to explore stakeholder experiences and perceptions regarding financing challenges and opportunities.

Semi-structured interviews were conducted with selected experts during the qualitative phase. Interview data were transcribed, coded, and analyzed using thematic analysis techniques. Emergent themes were utilized to refine the conceptual model and develop measurement indicators for the quantitative instrument. Expert feedback contributed to improving the relevance, clarity, and comprehensiveness of the proposed financing framework.

The quantitative phase involved administration of the questionnaire through online and direct survey distribution methods. Preliminary data screening included examination of missing values, outlier detection, normality assessment, and descriptive statistical analysis. Confirmatory Factor Analysis was performed to validate the measurement model before proceeding to structural analysis (Jan, 2025; Petrukha, 2025).

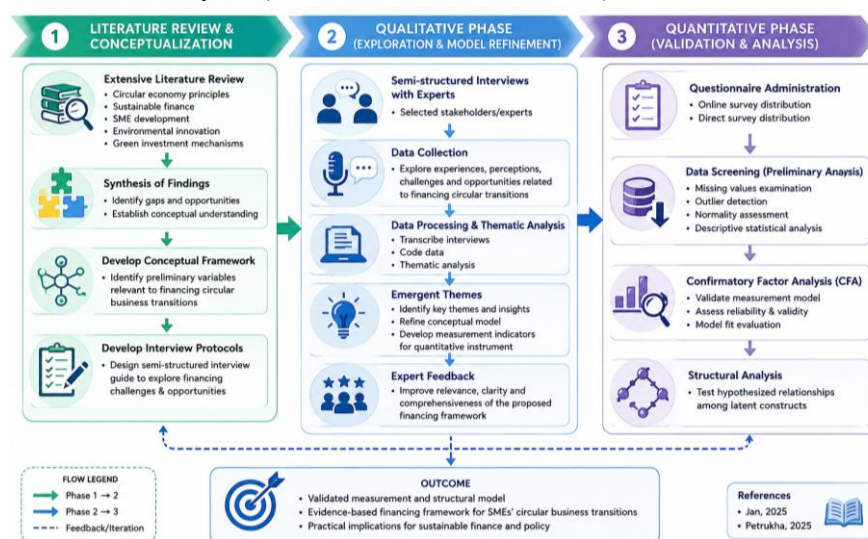


Figure 1. Sequential Research Process of the Mixed-Methods Study on Circular Business Transition Financing

Structural Equation Modeling was subsequently employed to test the hypothesized relationships among financing accessibility, financial innovation, circular economy implementation, environmental performance, and sustainable SME outcomes. Interpretation of the results focused on identifying the financing mechanisms most capable of supporting circular business transformation and long-term sustainability. Findings were then synthesized into an integrated circular economy financing model designed to guide policymakers, financial institutions, investors, and SME managers in promoting sustainable enterprise development.

RESULTS AND DISCUSSION

The study involved 420 respondents representing owners, managers, financial officers, sustainability coordinators, and decision-makers from Small and Medium Enterprises actively implementing circular economy practices. Respondents were distributed across manufacturing (31.4%), agribusiness (22.1%), recycling and waste management (18.6%), renewable energy enterprises (14.3%), and sustainable service sectors (13.6%). Average organizational age was 8.7 years, while average operational experience among respondents reached 10.2 years. These characteristics indicate that participants possessed substantial experience regarding financing challenges and sustainability-oriented business development.

Descriptive statistical analysis revealed positive perceptions regarding circular economy financing and sustainable business performance. Financing accessibility achieved a mean score of 4.11 (SD = 0.57), financial innovation recorded 4.08 (SD = 0.61), circular economy implementation achieved 4.19 (SD = 0.54), environmental performance scored 4.24 (SD = 0.52), organizational resilience reached 4.15 (SD = 0.58), and sustainable business outcomes recorded 4.27 (SD = 0.50).

Table 1. Descriptive Statistics of Circular Economy Financing and SME Sustainability Variables

Variable	Mean	SD
Financing Accessibility	4.11	0.57
Financial Innovation	4.08	0.61
Circular Economy Implementation	4.19	0.54
Environmental Performance	4.24	0.52
Organizational Resilience	4.15	0.58
Sustainable Business Outcomes	4.27	0.50

The descriptive results indicate that participating SMEs generally demonstrate strong engagement with circular economy principles. High scores for circular economy implementation suggest that many organizations have adopted practices such as resource efficiency, waste minimization, recycling systems, and sustainable product lifecycle management. These findings reflect growing awareness of environmental sustainability as a strategic business objective rather than solely a regulatory requirement.

Positive evaluations of financing accessibility and financial innovation indicate increasing availability of sustainable financing instruments. Respondents reported benefits from green loans, sustainability-linked financing, impact investment programs, and public support mechanisms. Such financing arrangements appear to facilitate organizational investment in environmentally responsible technologies and operational innovations. The

findings suggest that financial support plays an important role in enabling circular business transformation.

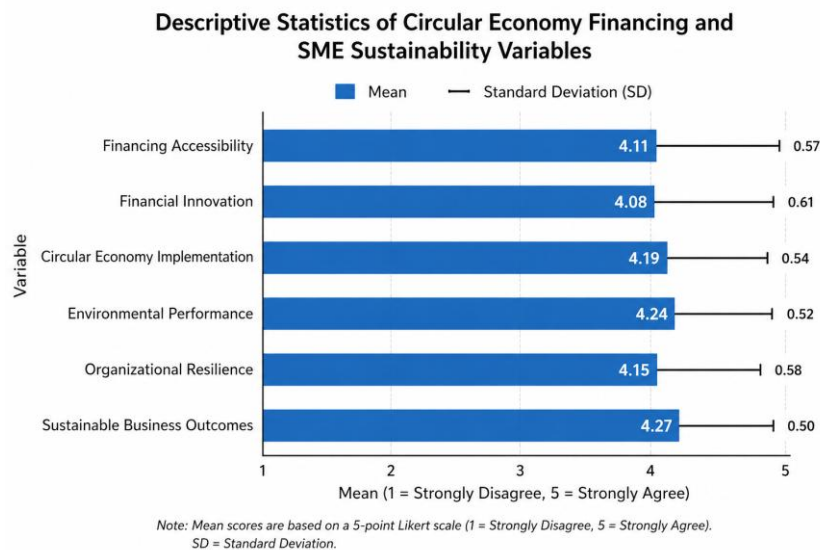


Figure 2. Mean Scores of Circular Economy Financing and SME Sustainability Variables

Assessment of the measurement model demonstrated satisfactory psychometric properties across all constructs. Standardized factor loadings ranged from 0.742 to 0.927, exceeding recommended thresholds for construct validity. Composite reliability values varied between 0.871 and 0.944, while Cronbach's alpha coefficients ranged from 0.835 to 0.931. Average Variance Extracted values exceeded 0.50 for all latent variables, confirming acceptable convergent validity.

Discriminant validity assessment further confirmed adequate differentiation among financing accessibility, financial innovation, circular economy implementation, environmental performance, organizational resilience, and sustainable business outcomes. Cross-loading analysis and Fornell-Larcker criterion evaluation indicated strong measurement quality and conceptual distinctiveness. These results support the suitability of the measurement model for subsequent structural analysis.

Structural Equation Modeling results revealed significant positive relationships among the principal constructs. Financing accessibility demonstrated a strong positive influence on circular economy implementation ($\beta = 0.642$, $p < 0.001$), while financial innovation significantly affected organizational resilience ($\beta = 0.571$, $p < 0.001$). Organizations with greater access to sustainable financing mechanisms exhibited higher levels of environmental innovation and operational adaptability. These findings indicate that financing support is a critical driver of circular business transformation.

Circular economy implementation demonstrated a substantial positive effect on environmental performance ($\beta = 0.718$, $p < 0.001$), while environmental performance significantly influenced sustainable business outcomes ($\beta = 0.694$, $p < 0.001$). The structural model explained 69.2% of the variance in circular economy implementation and 74.6% of the variance in sustainable business outcomes. Model fit indicators demonstrated satisfactory performance, including CFI = 0.958, TLI = 0.951, RMSEA = 0.041, and SRMR = 0.036.

Analysis of structural pathways revealed that environmental performance partially mediated the relationship between circular economy implementation and sustainable business

outcomes. Enterprises implementing resource-efficient and waste-reduction strategies achieved stronger environmental results, which subsequently contributed to enhanced competitiveness, operational efficiency, and long-term sustainability. Environmental performance therefore functions as an important mechanism linking circular practices with organizational success.

Relationships among financing accessibility, financial innovation, and organizational resilience were similarly significant. Sustainable financing instruments enabled organizations to invest in technological upgrades, resource recovery systems, and innovative business processes. Increased resilience allowed SMEs to adapt more effectively to market fluctuations, regulatory changes, and environmental uncertainties. These interconnected relationships highlight the strategic importance of financing ecosystems in supporting sustainable development.

A representative case study involved a medium-sized manufacturing enterprise specializing in sustainable packaging solutions. Prior to obtaining green financing support, the company relied on conventional production methods characterized by high material waste and limited recycling capacity. Access to a sustainability-linked financing program enabled investment in advanced recycling technologies, resource recovery infrastructure, and environmentally efficient production systems.

Performance evaluations conducted over three years indicated a 38% reduction in material waste, a 29% decrease in energy consumption, and a 34% increase in recycled material utilization. Revenue growth reached 21%, while operational costs declined by 17%. These improvements demonstrate the capacity of targeted financing mechanisms to facilitate circular economy transitions and generate both environmental and economic benefits.

A second case study involved a recycling-oriented SME operating within the waste management sector. The organization received impact investment funding specifically designed to support circular business innovation. Financial resources were allocated toward digital waste tracking systems, material recovery technologies, and stakeholder collaboration platforms intended to improve resource circulation efficiency.

Outcome assessments revealed a 41% increase in material recovery rates and a 27% improvement in operational productivity. The enterprise expanded its customer base and strengthened partnerships with suppliers, municipalities, and community organizations. Enhanced access to financing contributed significantly to organizational growth and sustainability performance. These findings illustrate the practical effectiveness of innovative financing models in supporting circular business ecosystems.

The manufacturing case demonstrates how sustainable financing can accelerate technological adoption and environmental innovation. Access to financial resources enabled the organization to overcome investment barriers associated with circular economy implementation. Improvements in waste reduction, energy efficiency, and resource utilization suggest that financing mechanisms can directly influence environmental performance outcomes.

Observations from the recycling enterprise highlight the role of impact-oriented financing in fostering business innovation and stakeholder collaboration. Financial support facilitated the development of new operational capabilities that improved both economic and environmental performance. Such findings indicate that financing should be viewed as a strategic enabler of organizational transformation rather than merely a source of capital.

Consistency between the quantitative findings and case study evidence strengthens confidence in the proposed financing model. Positive relationships among financing accessibility, circular economy implementation, environmental performance, and business sustainability were reflected in practical organizational experiences. Similar patterns emerged across different sectors despite variations in operational context and business structure.

Broader explanatory trends indicate that sustainable financing mechanisms generate greater impact when integrated with innovation strategies, environmental objectives, and organizational resilience initiatives. Financial support alone may be insufficient unless accompanied by managerial commitment and strategic implementation of circular practices. Effective financing ecosystems therefore require coordination among financial institutions, policymakers, investors, and SMEs.

The findings indicate that financing accessibility and financial innovation are critical determinants of successful circular economy implementation among SMEs. Organizations benefiting from sustainable financing instruments demonstrated stronger environmental performance, greater resilience, and improved long-term business outcomes. Circular economy financing therefore functions as a strategic catalyst for sustainable enterprise transformation.

Overall evidence suggests that integrated financing models combining financial accessibility, innovation support, and sustainability objectives offer substantial potential for advancing circular economy transitions. Financial institutions and policymakers can enhance SME participation in sustainable development by expanding access to specialized financing products and strengthening supportive financing ecosystems. These findings highlight the importance of aligning financial systems with environmental and economic sustainability goals.

The findings demonstrate that financing accessibility and financial innovation are fundamental drivers of circular economy implementation among Small and Medium Enterprises (SMEs). Organizations with greater access to sustainable financing instruments exhibited stronger adoption of resource-efficient technologies, waste reduction strategies, recycling systems, and environmentally responsible business practices. Structural Equation Modeling results confirmed that financing accessibility significantly influences circular business transformation and organizational resilience. These findings suggest that financial resources function not only as operational support mechanisms but also as strategic enablers of sustainability-oriented innovation.

Environmental performance emerged as one of the most influential mediating variables within the proposed financing model. SMEs that successfully implemented circular economy principles achieved measurable improvements in resource efficiency, energy conservation, waste minimization, and environmental responsibility. Enhanced environmental performance subsequently contributed to stronger sustainable business outcomes, including improved competitiveness, operational efficiency, and long-term viability. Such results indicate that environmental sustainability and economic performance can reinforce one another within circular business ecosystems.

Organizational resilience was also significantly influenced by sustainable financing mechanisms. Enterprises receiving access to innovative financing products demonstrated greater adaptability to market uncertainty, regulatory changes, and environmental challenges. Financial support enabled investments in technological modernization and operational flexibility, thereby strengthening organizational capacity to respond to dynamic business

conditions. These findings highlight the strategic importance of financial innovation in promoting business sustainability.

Case study evidence further supported the quantitative findings. SMEs that benefited from green loans, impact investment funds, and sustainability-linked financing programs reported substantial improvements in environmental and economic performance indicators. Consistency between statistical analysis and practical case experiences strengthens confidence in the validity of the proposed circular economy financing framework.

The findings are consistent with existing circular economy literature emphasizing the importance of financial resources in facilitating sustainable business transitions. Previous studies have identified financing constraints as one of the principal barriers preventing SMEs from adopting circular business models. Similar patterns emerged in the present study, where financing accessibility demonstrated a strong positive effect on circular economy implementation and environmental performance (Anokye, 2025; Petrukha, 2025).

Results also align with sustainable finance research highlighting the role of green finance, environmental investment, and sustainability-linked financial products in supporting business innovation. Earlier investigations reported that organizations receiving sustainability-oriented financial support were more likely to invest in environmentally responsible technologies and operational improvements. Comparable outcomes were observed among participating SMEs within this study.

Differences emerge when comparing the present findings with studies that focus primarily on environmental outcomes without considering the broader financing ecosystem. Much of the existing literature treats circular economy implementation as an operational or technological challenge. Findings from this study suggest that financial accessibility, innovation capacity, organizational resilience, and sustainability outcomes are deeply interconnected. Circular economy adoption therefore appears to depend on integrated financial and organizational strategies rather than isolated environmental initiatives.

Variations also appear in relation to traditional SME financing research. Conventional financing studies often evaluate business performance through profitability, liquidity, and growth indicators. Findings from the present study demonstrate that sustainable financing mechanisms generate value extending beyond financial returns by contributing to environmental performance, resilience, and long-term sustainability. This broader perspective expands current understanding of financing effectiveness within sustainable development contexts (Bauwens, 2024; Pariso, 2026).

The findings signify a transformation in the role of finance within contemporary business ecosystems. Financial systems are no longer limited to supporting economic expansion but increasingly function as instruments for achieving environmental and social objectives. Sustainable financing appears capable of directing organizational behavior toward long-term value creation rather than short-term profit maximization.

Evidence also signifies that SMEs possess substantial potential to contribute to circular economy transitions when appropriate financial support is available. Resource limitations frequently constrain sustainable innovation among smaller enterprises. Access to tailored financing mechanisms enables SMEs to overcome these barriers and participate more actively in environmental transformation processes.

Patterns identified throughout the analysis further signify that sustainability should be viewed as an integrated organizational capability. Environmental performance, financial

stability, innovation capacity, and resilience are not independent outcomes but mutually reinforcing dimensions of business success. Organizations capable of aligning these elements are better positioned to achieve sustainable competitive advantages.

Results additionally signify the growing importance of ecosystem-based approaches to sustainable development. Circular economy implementation cannot be achieved through individual organizational efforts alone. Collaboration among financial institutions, governments, investors, technology providers, and SMEs appears essential for creating supportive environments that facilitate sustainable business transformation.

Implications for policymakers involve the necessity of expanding financing programs specifically designed to support circular economy initiatives among SMEs. Regulatory frameworks should encourage financial institutions to develop products that recognize the long-term environmental and economic benefits associated with circular business models. Public incentives may further reduce investment risks and stimulate broader adoption of sustainable practices (Khan, 2024; Li, 2025).

Implications for financial institutions concern the development of innovative financing mechanisms capable of addressing the unique characteristics of circular economy projects. Traditional lending models may inadequately capture environmental value creation and sustainability-related opportunities. More sophisticated evaluation frameworks are therefore required to assess circular business potential accurately.

Implications for SME managers involve the importance of integrating financing strategies with sustainability objectives. Access to capital alone may not guarantee successful circular transformation. Strategic planning, innovation management, and organizational commitment remain essential for maximizing the benefits associated with sustainable financing programs.

Implications for investors extend to the recognition that environmental and social performance can contribute positively to long-term business value. Impact investment, sustainability-linked financing, and green capital allocation may simultaneously generate financial returns and sustainable development outcomes. Such findings support the continued expansion of sustainable investment ecosystems.

The observed outcomes can be explained by the resource-intensive nature of circular economy implementation. Adoption of resource recovery systems, recycling infrastructure, energy-efficient technologies, and sustainable production processes often requires substantial financial investment. Organizations with greater financing accessibility are therefore better positioned to undertake these transformations.

Positive relationships between financing accessibility and organizational resilience emerge because financial resources provide flexibility during periods of uncertainty. Sustainable financing enables firms to invest proactively in innovation, risk mitigation, and operational adaptation. Enhanced resilience consequently improves organizational capacity to respond effectively to environmental and market challenges.

Environmental performance demonstrated strong influence on sustainable business outcomes because efficiency improvements frequently generate both ecological and economic benefits. Reduced resource consumption, lower waste generation, and optimized production processes contribute to cost savings and operational effectiveness. Environmental sustainability therefore functions as a source of competitive advantage rather than merely a compliance obligation (Dzingirai, 2026; Li, 2025).

Financial innovation exerted significant effects because traditional financing products often fail to address the specific requirements of circular business models. Innovative financing instruments reduce barriers associated with technological uncertainty and long investment horizons. Such mechanisms improve access to resources necessary for implementing sustainability-oriented business strategies.

Future research should investigate the applicability of circular economy financing models across different industries, geographical regions, and institutional environments. Comparative studies may provide deeper understanding of how contextual factors influence financing effectiveness and sustainability outcomes. Such investigations would strengthen the generalizability of the proposed framework.

Longitudinal research designs could further examine how financing mechanisms influence organizational sustainability over extended periods. Dynamic analysis may reveal how relationships among financing accessibility, innovation adoption, environmental performance, and business resilience evolve throughout different stages of circular transformation.

Methodological advancements should incorporate hybrid analytical approaches combining quantitative modeling, case study investigation, and systems analysis. Integration of multiple methods may provide more comprehensive insights into the complexity of circular economy financing ecosystems. Such approaches could improve understanding of causal mechanisms and stakeholder interactions (Putri, 2025; Sharma, 2025).

Practical initiatives should focus on establishing collaborative financing platforms that connect SMEs, investors, financial institutions, governments, and sustainability organizations. Development of integrated financing ecosystems may accelerate circular economy adoption while enhancing environmental performance and economic resilience. Continued innovation in sustainable finance represents a critical pathway toward achieving long-term sustainable development objectives.

CONCLUSION

The most important finding of this study is the identification of financing accessibility and financial innovation as the primary catalysts driving successful circular economy implementation among Small and Medium Enterprises (SMEs). The results demonstrate that sustainable financing mechanisms do not merely provide capital for operational activities but function as strategic enablers of environmental innovation, organizational resilience, and long-term business sustainability. Circular economy implementation was found to significantly enhance environmental performance, which subsequently contributed to improved sustainable business outcomes. This finding distinguishes the study from conventional SME financing research by demonstrating that financial support generates multidimensional value extending beyond economic growth to include environmental stewardship and organizational adaptability. An integrated financing ecosystem combining accessible capital, sustainability-oriented financial products, and innovation support emerged as the most effective pathway for accelerating circular business transformation.

The principal contribution of this research lies in both its conceptual and methodological advancements. Conceptually, the study develops an integrated Circular Economy Financing Model that combines Circular Economy Theory, Sustainable Finance Theory, Resource-Based View, and SME Development Theory within a unified analytical framework. The proposed

model explains how financing accessibility, financial innovation, environmental performance, and organizational resilience interact to influence sustainable business outcomes. Methodologically, the use of a mixed-methods approach and Structural Equation Modeling provides a comprehensive mechanism for examining complex relationships among financial, environmental, and organizational variables. This integrated perspective extends existing literature by positioning sustainable finance as a strategic mechanism capable of simultaneously generating economic, environmental, and social value for SMEs.

Several limitations should be acknowledged. The study focuses primarily on SMEs operating within selected circular economy sectors and relies partly on self-reported organizational data, which may influence the generalizability of the findings. Variations in regulatory environments, industry structures, financial market maturity, and cultural contexts may produce different financing dynamics across regions. Cross-sectional data also limit the ability to capture long-term changes in organizational sustainability performance. Future research should employ longitudinal designs, cross-country comparisons, and sector-specific analyses to examine the evolution of circular economy financing over time. Particular attention should be directed toward digital finance, green fintech platforms, impact investment ecosystems, sustainability-linked lending, and public-private financing partnerships. Such investigations may contribute to the development of more adaptive, inclusive, and effective financing models capable of supporting global transitions toward sustainable circular economies.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Google Assisted to assist in improving grammar, language quality, and overall readability of the text. After using this tool, the author(s) Carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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