



CHALLENGES AND IMPLICATIONS OF GREEN FINANCING ADOPTION AMONG SMES IN UTTAR PRADESH: THE MEDIATING ROLE OF PERCEIVED ENVIRONMENTAL AND ECONOMIC BENEFITS

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1. INTRODUCTION

Green financing has emerged as a critical mechanism for promoting sustainable economic development and environmentally responsible industrial growth across the globe. Governments, financial institutions, and international agencies are increasingly emphasizing green investment practices to address environmental degradation, climate change, and resource depletion (Schaltegger & Burritt, 2018). Green finance refers to financial investments directed toward environmentally sustainable projects, renewable energy adoption, pollution control, and eco-friendly technologies (Taghizadeh-Hesary & Yoshino, 2019). In recent years, Small and Medium Enterprises (SMEs) have gained considerable attention because of their contribution to employment generation, industrial development, and economic growth. However, SMEs also contribute significantly to environmental pollution due to unsustainable production and operational practices (Yadav & Pathak, 2017).

In India, especially in Uttar Pradesh, SMEs represent a substantial segment of the industrial economy. Despite increasing awareness regarding sustainability, the adoption of green financing among SMEs remains relatively low because of financial constraints, inadequate awareness, limited institutional support, and technical barriers (Kumar & Rao, 2015). Green financing enables SMEs to improve environmental performance, enhance operational efficiency, and achieve long-term economic sustainability (OECD, 2017). Nevertheless, the successful adoption of green finance depends upon multiple factors including awareness, government support, institutional accessibility, managerial capability, and perceived environmental and economic benefits (Banga, 2019).

Previous studies have shown that awareness and knowledge positively influence environmentally sustainable business practices (Chen et al., 2018; Wang et al., 2020). Similarly, perceived economic and environmental benefits encourage enterprises to invest in sustainable technologies and financing mechanisms (Zhang et al., 2019). However, SMEs continue to face barriers such as high implementation costs, perceived risks, and inadequate financial infrastructure (Ayyagari et al., 2016). Financial institutions and government agencies therefore play a crucial role in facilitating green financing adoption through favorable policies, incentives, and financial products (Volz, 2018).



Despite the growing importance of green finance, empirical research on green financing adoption among SMEs in Uttar Pradesh remains limited. Existing studies primarily focus on large corporations and banking institutions, while the unique challenges faced by SMEs remain underexplored (Singh & Bansal, 2021). Furthermore, the mediating role of perceived environmental and economic benefits in influencing green financing adoption has received limited academic attention. Therefore, the present study examines the challenges and implications of green financing adoption among SMEs in Uttar Pradesh by investigating the role of awareness, institutional support, technical capacity, and perceived environmental and economic benefits.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Green Financing and Sustainable Development

Green financing has become a major component of sustainable economic development and environmental governance worldwide (Taghizadeh-Hesary & Yoshino, 2019). It supports investments in renewable energy, waste management, pollution reduction, and environmentally sustainable industrial activities (Volz, 2018). Sustainable finance contributes to economic growth while simultaneously minimizing environmental degradation and climate-related risks (Schmidheiny & Zorraquin, 2016).

SMEs play an important role in economic development, yet they often lack the financial and technical capacity required for adopting environmentally sustainable business models (Kumar & Rao, 2015). Studies indicate that SMEs face challenges such as insufficient capital, inadequate awareness, lack of technical expertise, and weak institutional support in implementing green financing practices (Banga, 2019; OECD, 2017). Moreover, green financing adoption is influenced by organizational readiness, managerial attitude, policy frameworks, and market conditions (Chen et al., 2018).

2.2 Awareness and Knowledge of Green Financing

Awareness and knowledge significantly influence SMEs' intention to adopt green financing mechanisms. Enterprises with greater understanding of environmental sustainability, green financial products, and regulatory incentives are more likely to engage in sustainable financing practices (Wang et al., 2020). Awareness helps organizations evaluate the long-term environmental and economic benefits associated with green investments (Yadav & Pathak, 2017).

Research indicates that insufficient awareness remains one of the primary barriers to green financing adoption among SMEs in developing economies (Ayyagari et al., 2016). SME owners often lack information regarding government subsidies, green credit schemes, and sustainability-focused financial instruments (Singh & Bansal, 2021). According to Chen et al. (2018), awareness positively influences organizational readiness and sustainable investment behavior. Similarly, Zhang et al. (2019) found that knowledge regarding environmental benefits enhances firms' willingness to adopt green technologies.



In the context of Uttar Pradesh, SMEs continue to experience limited exposure to green financing opportunities due to inadequate training, lack of awareness campaigns, and restricted access to sustainability information (Banga, 2019). Therefore, awareness and knowledge are expected to influence green financing adoption behavior among SMEs.

Hypothesis 1 (H1)

Awareness and knowledge have a significant positive impact on the adoption of green financing among SMEs in Uttar Pradesh.

2.3 Perceived Environmental and Economic Benefits

Perceived environmental and economic benefits refer to SMEs' expectations regarding the positive outcomes associated with green financing adoption. Environmental benefits include pollution reduction, energy efficiency, sustainable resource utilization, and improved environmental compliance (Schaltegger & Burritt, 2018). Economic benefits include cost reduction, improved operational efficiency, enhanced competitiveness, and long-term profitability (Volz, 2018).

Several studies have emphasized that perceived benefits significantly affect firms' sustainability decisions (Taghizadeh-Hesary & Yoshino, 2019; Wang et al., 2020). SMEs are more likely to adopt green financing when they perceive tangible economic gains alongside environmental advantages (Zhang et al., 2019). Perceived benefits also influence managerial attitudes toward risk-taking and investment decisions (Chen et al., 2018).

2.4 Perceived Cost and Risk of Green Investments

High investment costs and financial risks are major barriers to green financing adoption among SMEs (Ayyagari et al., 2016). Many SME owners perceive green technologies and sustainable practices as expensive and uncertain in terms of returns (OECD, 2017). Perceived risks related to repayment obligations, operational disruptions, and uncertain market conditions further discourage adoption behavior (Banga, 2019).

However, studies suggest that strong perceptions regarding environmental and economic benefits can reduce the negative effect of perceived costs and risks (Volz, 2018). SMEs may become more willing to adopt sustainable financing when long-term benefits outweigh short-term investment concerns (Schmidheiny & Zorraquin, 2016).

2.5 Technical and Managerial Capacity

Technical and managerial capability is another important determinant of green financing adoption. SMEs with skilled managers and adequate technical expertise are more capable of evaluating sustainability opportunities and implementing environmentally responsible projects (Kumar & Rao, 2015). Managerial competence enhances firms' ability to access green financial products and utilize sustainable technologies effectively (Singh & Bansal, 2021).



Lack of technical knowledge and operational expertise often restrict SMEs from adopting green finance initiatives despite favorable environmental attitudes (Chen et al., 2018).

2.6 Role of Financial Institutions and Government Support

Government agencies and financial institutions play a critical role in encouraging green financing adoption among SMEs. Financial institutions provide green credit facilities, sustainability-linked loans, and environmentally focused investment schemes (Volz, 2018). Similarly, government incentives, subsidies, tax benefits, and favorable regulatory policies create a supportive environment for sustainable financing adoption (Taghizadeh-Hesary & Yoshino, 2019).

Studies reveal that effective institutional support significantly enhances SME confidence and willingness to invest in green financing initiatives (Wang et al., 2020; OECD, 2017). Conversely, procedural complexities and weak institutional frameworks reduce SMEs' access to sustainable financial products (Ayyagari et al., 2016).

2.7 Mediating Role of Perceived Environmental and Economic Benefits

Perceived environmental and economic benefits act as a mediating mechanism influencing SMEs' green financing adoption behavior. SMEs that recognize the strategic and financial advantages of green finance are more likely to overcome barriers related to risk, cost, and technical limitations (Schaltegger & Burritt, 2018).

These perceived benefits positively influence managerial attitudes, organizational readiness, and sustainability-oriented investment decisions (Zhang et al., 2019). Consequently, environmental and economic benefits mediate the relationship between awareness, institutional support, technical capability, and green financing adoption behaviour.

Hypothesis 2 (H2)

Perceived environmental and economic benefits mediate the relationship between the independent variables and the adoption of green financing among SMEs in Uttar Pradesh.

2.8 Objectives of the Study

1. To examine the awareness and knowledge of SME owners regarding the adoption of green financing in Uttar Pradesh.
2. To examine the influence of perceived environmental and economic benefits on the adoption of green financing among SMEs in Uttar Pradesh.

3. RESEARCH METHODOLOGY

3.1 Research Design

The present study adopts a descriptive and quantitative research design to investigate the challenges and implications of green financing adoption among SMEs in Uttar Pradesh. Quantitative research methods enable the systematic measurement and analysis of relationships



among variables associated with green financing adoption (Creswell, 2014). Descriptive research design is appropriate because it facilitates the examination of awareness, institutional support, financial accessibility, and managerial capability among SMEs (Sekaran & Bougie, 2016).

3.2 Population and Sampling

The target population comprises SMEs operating in manufacturing and service sectors across Uttar Pradesh. SME owners and managerial personnel responsible for financial and operational decision-making were selected as respondents.

The study utilized stratified random sampling to ensure proportional representation across industrial sectors and geographical regions including Noida, Agra, Kanpur, Moradabad, Varanasi, and Lucknow. Stratified sampling enhances representativeness and minimizes sampling bias (Hair et al., 2017). A total of 600 SMEs formed the study sample.

3.3 Data Collection Methods

Both primary and secondary data sources were used in the study. Primary data were collected using structured questionnaires distributed through online and offline modes among SME owners and managers. Secondary data were obtained from government reports, MSME databases, journal articles, and sustainability reports to strengthen the theoretical foundation of the study (Bryman, 2016).

The questionnaire employed a five-point Likert scale ranging from “Strongly Disagree” to “Strongly Agree” to measure respondents’ perceptions regarding green financing adoption (Likert, 1932).

3.4 Reliability and Validity

The reliability and validity of the instrument were ensured through pilot testing, Cronbach’s alpha, and factor analysis. Cronbach’s alpha values above 0.70 confirmed internal consistency reliability (Nunnally & Bernstein, 1994). Construct validity was established through exploratory and confirmatory factor analysis procedures (Hair et al., 2017).

3.5 Data Analysis Techniques

The collected data were analyzed using SPSS and SmartPLS software. Statistical tools included descriptive statistics, regression analysis, factor analysis, and Structural Equation Modelling (SEM). SEM was employed to examine direct and mediated relationships among variables because of its suitability for complex multivariate analysis (Kline, 2015).

4. DATA ANALYSIS AND INTERPRETATION

4.1 Hypothesis Testing for Direct Effect



Table 1: Path Coefficient Analysis for H1

Construct	Original Sample (O)	Sample Mean (M)	STDEV	P-Value	2.5%	97.5%
AKGF → AGF	-0.189	-0.186	0.779	0.002	-0.714	0.302

Source: Author's Compilation

Interpretation

The path coefficient analysis revealed a statistically significant relationship between Awareness and Knowledge about Green Financing (AKGF) and Adoption of Green Financing (AGF). The original sample estimate ($\beta = -0.189$, $p = 0.002$) indicates a negative relationship between awareness and adoption behavior. However, the confidence interval includes zero, suggesting instability in the coefficient estimate (Hair et al., 2017).

The findings indicate that awareness alone may not guarantee green financing adoption unless supported by institutional frameworks, technical capability, and financial accessibility (Chen et al., 2018; Wang et al., 2020). Similar findings were reported by Banga (2019), who emphasized that awareness without supportive infrastructure has limited practical impact on sustainability adoption.

Figure 1: Direct Relationship between Awareness and Green Financing Adoption

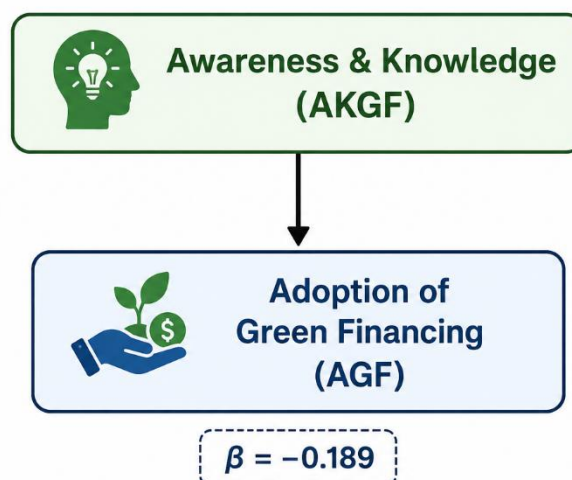


Figure 1: Direct Relationship between Awareness and Green Financing Adoption

4.2 Mediation Analysis for H2



Table 2: Indirect Path Coefficients for Mediation Analysis

Mediated Path	Beta	STDEV	P-Value	Lower Limit	Upper Limit
PEEBGF → PCRGF → AGF	0.444	0.081	0.001	0.305	0.627
PEEBGF → AKGF → AGF	-0.126	0.162	0.003	-0.475	0.204
PEEBGF → AFRCW → AGF	-0.724	0.149	0.020	-1.045	-0.455
PEEBGF → TMC → AGF	0.590	0.147	0.019	0.363	0.987
PEEBGF → RFIPGF → AGF	-0.102	0.085	0.003	-0.321	0.030
PEEBGF → PRSG → AGF	1.033	0.190	0.040	0.625	1.368

Source: Author's Compilation

Figure 2
Mediating Role of Perceived Environmental and Economic Benefits

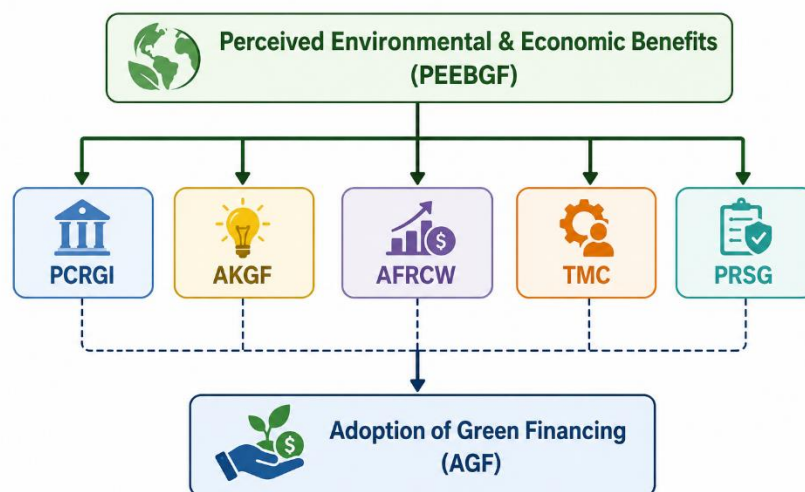


Figure 2: Mediating Role of Perceived Environmental and Economic Benefits

4. Discussion of Findings

The findings of the study indicate that green financing adoption among SMEs in Uttar Pradesh is influenced by multiple interconnected organizational, institutional, and environmental factors. The direct relationship between awareness and adoption revealed a statistically significant but negative coefficient, indicating that awareness alone is insufficient to guarantee adoption behaviour. This finding aligns with previous studies emphasizing that awareness without institutional support, technical capability, and financial accessibility may not translate into practical implementation of sustainable financing practices (Banga, 2019; Chen et al., 2018).



The mediation analysis demonstrated that perceived environmental and economic benefits play a critical role in influencing adoption behaviour among SMEs. Among all mediated pathways, policy and regulatory support emerged as the strongest positive mediator, suggesting that government incentives, subsidies, and sustainability-oriented regulations significantly strengthen SMEs' willingness to adopt green financing. Similar observations were reported by Volz (2018), who emphasized the importance of institutional frameworks in sustainable finance adoption.

Technical and managerial capability also positively mediated the relationship between perceived benefits and adoption behaviour. This finding indicates that SMEs possessing adequate managerial expertise and technical knowledge are more likely to implement environmentally sustainable financial practices effectively (Kumar & Rao, 2015). The result further confirms the importance of capacity-building initiatives for SME sustainability transformation.

Conversely, access to financial resources and the role of financial institutions exhibited negative mediation effects, indicating structural and institutional barriers in the green finance ecosystem. SMEs continue to face difficulties in obtaining affordable green credit because of procedural complexities, collateral requirements, and limited availability of sustainability-focused financial products (OECD, 2017). Similarly, financial institutions have not fully developed SME-oriented green financing mechanisms, thereby restricting adoption despite positive environmental perceptions.

The findings also suggest that perceived environmental and economic benefits significantly shape managerial attitudes toward sustainability investments. SMEs recognizing long-term environmental and financial advantages are more willing to tolerate investment risks and operational uncertainties associated with green financing adoption (Taghizadeh-Hesary & Yoshino, 2019).

Overall, the study highlights that successful green financing adoption among SMEs requires an integrated ecosystem comprising awareness programs, policy support, institutional efficiency, technical capability, and accessible financial infrastructure. These findings contribute significantly to sustainability finance literature and provide important practical implications for policymakers, financial institutions, and SME stakeholders in emerging economies.

5. CONCLUSION, RECOMMENDATIONS, AND FUTURE RESEARCH DIRECTIONS

5.1 Conclusion

The present study examined the challenges and implications of green financing adoption among SMEs in Uttar Pradesh by analyzing the influence of awareness, institutional support, technical capability, and perceived environmental and economic benefits. The findings indicate that green financing adoption is shaped by multiple organizational, financial, and policy-related factors. Although SMEs increasingly recognize the importance of environmental sustainability, several barriers continue to restrict effective adoption of green financial practices.



The study revealed that awareness and knowledge regarding green finance significantly influence adoption behavior; however, awareness alone is insufficient to ensure implementation. SMEs require institutional guidance, financial accessibility, and managerial competence to translate sustainability awareness into practical action. The findings further demonstrated that perceived environmental and economic benefits play a significant mediating role in influencing green financing adoption. SMEs that perceive long-term environmental advantages and economic gains are more willing to adopt sustainable financing practices despite associated investment costs and operational risks.

Among the mediated pathways, policy and regulatory support emerged as the strongest positive driver of green financing adoption. Government initiatives, subsidies, tax incentives, and favorable sustainability regulations significantly enhance SMEs' confidence and willingness to engage in green investments. Technical and managerial capability also positively influenced adoption behavior, emphasizing the importance of organizational readiness and sustainability-oriented managerial expertise.

Conversely, limited access to financial resources and inefficiencies within financial institutions were identified as major barriers to green financing adoption. SMEs continue to experience challenges related to high financing costs, collateral requirements, procedural complexities, and limited availability of SME-focused green financial products. These structural barriers restrict the practical implementation of environmentally sustainable projects despite positive environmental attitudes among SMEs.

The study contributes to sustainability finance literature by providing empirical evidence regarding the determinants and mediating mechanisms influencing green financing adoption among SMEs in Uttar Pradesh. The findings offer valuable insights for policymakers, financial institutions, sustainability practitioners, and SME stakeholders regarding the development of supportive green finance ecosystems.

Overall, the study concludes that successful green financing adoption requires a comprehensive and collaborative approach involving government support, institutional efficiency, financial accessibility, awareness generation, and managerial capacity development. Such integrated efforts are essential for promoting environmentally sustainable industrial growth and long-term economic development among SMEs in emerging economies.

5.2 Recommendations

Based on the findings of the study, several recommendations can be proposed to enhance green financing adoption among SMEs in Uttar Pradesh. First, government agencies should strengthen policy frameworks and introduce SME-specific green financing schemes to encourage sustainable investment behavior. Financial incentives such as subsidies, tax exemptions, reduced interest rates, and credit guarantees can significantly reduce the financial burden associated with green investments. Policymakers should also simplify procedural requirements and create transparent regulatory mechanisms to improve SMEs' access to green finance.



Second, awareness and training programs should be organized regularly to educate SME owners and managers regarding the environmental, operational, and economic benefits of green financing. Many SMEs continue to lack adequate understanding of green financial instruments, government schemes, and sustainability practices. Workshops, seminars, digital campaigns, and industry collaborations can help improve sustainability awareness and managerial readiness for green investments.

Third, financial institutions should design customized green financial products specifically tailored for SMEs. Banks and non-banking financial institutions should simplify loan procedures, reduce collateral requirements, and develop flexible repayment mechanisms to improve financial accessibility. Financial institutions should also establish dedicated sustainability advisory units to guide SMEs regarding green investment opportunities and environmentally responsible business practices.

Fourth, technical and managerial capacity-building initiatives should be promoted among SMEs to enhance organizational readiness for green financing adoption. Government agencies, universities, industry associations, and sustainability organizations should collaborate to provide technical assistance, sustainability consulting, and managerial training programs. Such initiatives can improve SMEs' ability to evaluate environmental risks, implement green technologies, and manage sustainable business operations effectively.

Fifth, stronger collaboration between government agencies, financial institutions, industry bodies, and environmental organizations is essential for creating a supportive green finance ecosystem. Public-private partnerships can help develop sustainable financing infrastructure and improve the availability of environmentally focused financial products and services.

Finally, sustainability reporting and environmental performance assessment mechanisms should be encouraged among SMEs. Transparent sustainability practices can improve SMEs' credibility and increase their eligibility for green financing opportunities. Encouraging environmentally responsible business behavior will not only support climate goals but also enhance SMEs' long-term competitiveness, operational efficiency, and market reputation.

Thus, a coordinated approach involving policy support, financial accessibility, institutional efficiency, awareness generation, and capacity development is essential for promoting widespread adoption of green financing among SMEs in Uttar Pradesh.

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