

Explaining Sustainable Green Entrepreneurship in the Disruptive Era: Integrating Psychological, Marketing, and Institutional Perspectives

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Abstract

This study examines the relationships among entrepreneur-level characteristics, marketing literacy, personal attitude, regulatory support, and Sustainable Green Entrepreneurship (SGE) among MSMEs in Aceh Province. Specifically, it investigates the mediating role of personal attitude in the relationships between entrepreneur-level characteristics, marketing literacy, and SGE, as well as the moderating role of regulatory support in the relationship between personal attitude and SGE. Using survey data collected from 323 MSME owners and managers, the proposed relationships were examined using covariance-based structural equation modelling (CB-SEM). The findings indicate that entrepreneur-level characteristics and marketing literacy are significantly associated with personal attitude and SGE. Personal attitude partially mediates the relationships between entrepreneur-level characteristics, marketing literacy, and SGE. Furthermore, regulatory support significantly moderates the relationship between personal attitude and SGE. The positive interaction indicates that the negative association between personal attitude and SGE becomes less negative as regulatory support increases, although the conditional relationship remains negative at low, mean, and high levels of regulatory support. These findings indicate that SGE is associated with entrepreneurial characteristics, marketing capability, sustainability-oriented attitudes, and the institutional conditions within which MSMEs operate.

Model Sustainable Green Entrepreneurship di Era Disruptif: Integrasi Entrepreneur-level characteristics, Literasi Pemasaran, Personal Attitude, dan Regulasi

Abstrak

Penelitian ini mengkaji hubungan antara karakteristik pada tingkat wirausahawan, literasi pemasaran, sikap pribadi, dukungan regulasi, dan Sustainable Green Entrepreneurship (SGE) pada UMKM di Provinsi Aceh. Secara khusus, penelitian ini menganalisis peran mediasi sikap pribadi dalam hubungan antara karakteristik pada tingkat wirausahawan, literasi pemasaran, dan SGE, serta peran moderasi dukungan regulasi dalam hubungan antara sikap pribadi dan SGE. Dengan menggunakan data survei yang dikumpulkan dari 323 pemilik dan manajer UMKM, hubungan yang diajukan dalam penelitian ini diuji menggunakan covariance-based structural equation modelling (CB-SEM). Hasil penelitian menunjukkan bahwa karakteristik pada tingkat wirausahawan dan literasi pemasaran memiliki hubungan yang signifikan dengan sikap pribadi dan SGE. Sikap pribadi memediasi secara parsial hubungan antara karakteristik pada tingkat wirausahawan, literasi pemasaran, dan SGE. Selain itu, dukungan regulasi secara signifikan memoderasi hubungan antara sikap pribadi dan SGE. Interaksi positif menunjukkan bahwa hubungan negatif antara sikap pribadi dan SGE menjadi semakin lemah seiring dengan meningkatnya dukungan regulasi, meskipun hubungan kondisional tersebut tetap negatif pada tingkat dukungan regulasi yang rendah, sedang, maupun tinggi. Temuan ini menunjukkan bahwa SGE berkaitan dengan karakteristik kewirausahaan, kemampuan pemasaran, sikap yang berorientasi pada keberlanjutan, serta kondisi kelembagaan tempat UMKM menjalankan kegiatannya.

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INTRODUCTION

Sustainability has become a central issue in entrepreneurship as businesses face increasing pressure to address climate change, environmental degradation, resource scarcity, and changing consumer preferences while maintaining economic competitiveness (Chege & Wang, 2020; Nguyen et al., 2021). In Indonesia, this issue is particularly important because Micro, Small, and Medium Enterprises (MSMEs) contribute approximately 61% of national GDP and employ nearly 97% of the workforce (OECD, 2024). Consequently, MSMEs are expected not only to generate economic value but also to adopt sustainable business practices that enhance long-term competitiveness. This expectation is consistent with Indonesia's national development agenda, which promotes sustainability and green economic transformation. The RPJMN 2025–2029 and Presidential Regulation No. 59/2017 emphasize sustainable development and the achievement of the SDGs in national and regional planning. These policies highlight the importance of sustainable business practices among MSMEs as part of Indonesia's efforts to achieve inclusive, resilient, and environmentally sustainable economic growth.

The importance of sustainable entrepreneurship is highly relevant in Aceh Province, where MSMEs dominate regional economic activities across food processing, handicrafts, manufacturing, and agriculture (Badan Pusat Statistik Provinsi Aceh, 2024). Central Statistics Agency (BPS) of Aceh reported that 98.74% of the 432.8 thousand non-agricultural businesses recorded in the 2016 Economic Census were classified as micro and small enterprises (Badan Pusat Statistik Provinsi Aceh, 2017). This large presence of MSMEs is particularly relevant given that Aceh's economy grew by 4.66% in 2024, indicating continued economic activity

and growth in the region (Badan Pusat Statistik Provinsi Aceh, 2025). These figures highlight the important role of MSMEs in Aceh's economic structure and strengthen the need to encourage sustainable business practices among MSMEs. Although Aceh experienced positive economic growth in 2024, many MSMEs continue to encounter challenges related to innovation, digital transformation, environmental management, and market competitiveness. These conditions have increased attention toward Sustainable Green Entrepreneurship (SGE), which integrates economic, environmental, and social objectives into entrepreneurial activities.

Previous studies have identified entrepreneurs' individual characteristics as important antecedents of sustainable entrepreneurial behavior. Proactive personality and entrepreneurial self-efficacy have been associated with greater capability to identify green opportunities and implement sustainable innovations (Baah et al., 2020; Li, Makhdoom, et al., 2020; Kumar & Shukla, 2022). However, empirical findings remain inconsistent. Seroka & Stolka & Fijorek (2020) found that proactive personality significantly promotes sustainable entrepreneurial behavior, whereas Guo (2022) and Lopes et al. (2024) argued that entrepreneur-level characteristics alone are insufficient because contextual and psychological factors substantially influence sustainability-oriented decisions. Similar inconsistencies are found for risk aversion and need for achievement. While some studies suggest that higher risk tolerance and achievement motivation encourage green innovation (Maharani et al., 2020; Gupta, 2025), others report that these characteristics often prioritize short-term business performance rather than environmental objectives, particularly among resource-constrained MSMEs (Ahmed, 2022; Dzomonda & Neneh, 2023). These mixed findings indicate that the relationship between entrepreneur-

level characteristics and SGE has not yet been conclusively established.

Marketing literacy has also emerged as an important capability for supporting sustainable entrepreneurship. Entrepreneurs with strong marketing literacy are better able to recognize market opportunities, communicate environmental value, and develop competitive strategies (Agu et al., 2022; Budi et al., 2025). Nevertheless, previous evidence is equally inconsistent, which may be attributed to differences in business sectors, levels of digitalization, firm size, and market conditions. For instance, the role of marketing literacy may vary across sectors because consumer preferences, competitive pressures, and opportunities to communicate environmental value differ between industries. Similarly, differences in digitalization may affect entrepreneurs' ability to use marketing knowledge to access markets, engage consumers, and promote sustainable products or practices. These contextual differences may explain why the contribution of marketing literacy to sustainable entrepreneurship varies across studies. Several studies reported that marketing literacy strengthens green innovation and sustainable competitiveness, whereas others concluded that marketing capability alone does not necessarily encourage environmentally responsible entrepreneurial behavior because firms frequently prioritize conventional market performance over sustainability goals (Guo, 2022; Minh & Cuong, 2026). These contradictory findings suggest that additional explanatory mechanisms are required.

The Theory of Planned Behavior provides a useful perspective by emphasizing personal attitude as a key determinant of behavioral intention and actual behavior. Entrepreneurs with positive attitudes toward sustainability are more likely to transform their personal characteristics and competencies into environmentally responsible actions (Peng et al., 2021; Prabowo et al., 2022). However, empirical

studies examining the mediating role of personal attitude in explaining the relationships between entrepreneur-level characteristics, marketing literacy, and SGE remain limited, particularly in developing-country MSMEs.

Although previous research has examined psychological characteristics, entrepreneurial competencies, and sustainability separately, few studies have integrated these perspectives into a comprehensive framework. Existing literature primarily investigates either the direct influence of entrepreneur-level characteristics or the role of marketing capability, providing limited understanding of the psychological mechanism through which these factors shape sustainable entrepreneurial behavior. This gap leaves the process linking entrepreneurial characteristics and capabilities to SGE insufficiently explained.

Unlike previous studies that examined psychological antecedents or marketing capability separately, this study integrates psychological, cognitive, behavioural, and institutional perspectives into a single research framework. Specifically, this study examines four entrepreneur-level characteristics: proactiveness, entrepreneurial self-efficacy, risk aversion, and need for achievement, and investigates their aggregate relationships with SGE through the mediating role of personal attitude.

These four dimensions represent conceptually distinct characteristics and are not assumed to be interchangeable manifestations of a single homogeneous personality trait. Proactiveness, entrepreneurial self-efficacy, risk aversion, and need for achievement may contribute differently to entrepreneurial decision-making. In particular, risk aversion has a theoretically different directional implication from proactiveness, entrepreneurial self-efficacy, and need for achievement. Proactiveness, entrepreneurial self-efficacy, and need for achievement may facilitate sustainability-oriented entrepreneurial action, whereas risk aversion may constrain such action

when sustainable investments are perceived as uncertain or risky.

Accordingly, the aggregate relationship examined in this study represents the combined empirical association of these theoretically distinct characteristics rather than an assumption that all dimensions have identical directional effects. The positive structural hypotheses therefore refer to the overall empirical association represented by the entrepreneur-level characteristics construct and should not be interpreted as evidence that each underlying dimension independently exerts a positive effect on SGE.

The contribution of this study lies in integrating entrepreneur-level characteristics and marketing literacy as antecedents associated with sustainability-oriented personal attitude and examining regulatory support as a contextual boundary condition of the personal attitude–SGE relationship among MSMEs in Aceh Province.

Hypothesis Development

The Relationship between Entrepreneur-level Characteristics and Personal Attitude

Entrepreneur-level characteristics can shape how entrepreneurs evaluate sustainability-oriented business opportunities and form attitudes toward SGE. Proactiveness may encourage entrepreneurs to identify and pursue emerging environmental opportunities, while entrepreneurial self-efficacy may strengthen their confidence in implementing unfamiliar or sustainability-oriented business practices. Need for achievement may further encourage persistence and long-term orientation toward value creation. In contrast, risk aversion may reduce favorable evaluations of sustainable entrepreneurship when green investments are perceived as uncertain, costly, or financially risky.

Thus, these characteristics are theoretically heterogeneous and should not be assumed to exert identical directional

effects on personal attitude. In this study, they are considered jointly as entrepreneur-level characteristics, and the hypothesis concerns their aggregate empirical relationship with personal attitude (Santos & Liguori, 2019; Liu et al., 2022; Dzomonda & Neneh, 2023; Zhang & Chen, 2023).

Although the four dimensions may differ in their theoretical mechanisms and directional implications, this study does not hypothesize an identical effect for each dimension. Instead, entrepreneur-level characteristics are examined as an aggregate higher-order construct, and H1 concerns the overall empirical association between the higher-order construct and personal attitude. The positive directional hypothesis therefore refers to the aggregate structural relationship rather than to an assumption that every underlying dimension independently exerts a positive effect.

Accordingly, entrepreneurs with stronger entrepreneur-level characteristics are expected to develop more favorable attitudes toward SGE. Recent empirical studies further indicate that entrepreneur-level characteristics are positively associated with green entrepreneurial outcomes, while specific traits such as openness to experience can foster more favorable evaluations of green entrepreneurial opportunities (Rafiq et al., 2024; Lwin et al., 2026). These findings suggest that personality characteristics can shape entrepreneurs' perceptions and evaluations of green entrepreneurial opportunities, thereby contributing to more favorable attitudes toward SGE. Accordingly, entrepreneurs with stronger positive personality characteristics are expected to develop more favorable attitudes toward SGE.

H1: Entrepreneur-level characteristics positively affect personal attitude.

The Relationship between Marketing Literacy and Personal Attitude

Marketing literacy enables entrepreneurs to understand market dynamics, eva-

luate business information, and recognize green market opportunities. According to the Theory of Planned Behavior, greater knowledge enhances cognitive evaluation, leading to more positive attitudes toward entrepreneurial behavior. Empirical studies also indicate that marketing literacy improves entrepreneurs' perceptions of digital marketing, customer value, and sustainability-oriented business opportunities (Gaber et al., 2019; Nguyen et al., 2021; Appiah et al., 2023; Alhamami et al., 2024). Therefore, entrepreneurs with higher marketing literacy are expected to possess stronger personal attitudes toward SGE.

H2: Marketing literacy positively affects personal attitude.

The Relationship between Entrepreneur-level Characteristics and Sustainable Green Entrepreneurship (SGE)

Entrepreneur-level characteristics may influence SGE through different and potentially opposing mechanisms. Proactiveness may encourage entrepreneurs to identify and pursue emerging green opportunities, while entrepreneurial self-efficacy may increase confidence in implementing sustainability-oriented practices. Need for achievement may support persistence and long-term investment in business improvement. Risk aversion, however, may reduce willingness to undertake sustainability-related investments when such investments involve uncertainty, substantial initial costs, or uncertain returns.

Given these theoretically heterogeneous dimensions, the present study does not interpret the positive structural coefficient as evidence that each underlying characteristic has an identical positive relationship with SGE. Instead, the hypothesis concerns the aggregate association represented by the entrepreneur-level characteristics construct. A significant positive coefficient therefore indicates that the combined empirical configuration of the four dimensions is positively associated

with SGE in the observed MSME sample. The finding should not be interpreted as demonstrating that risk aversion itself positively affects SGE (Baah et al., 2020; Li, Murad, et al., 2020).

Entrepreneur-level characteristics represent important psychological resources that encourage sustainable entrepreneurial behavior. Proactiveness and entrepreneurial self-efficacy enhance entrepreneurs' ability to identify green opportunities and implement eco-innovation, whereas need for achievement promotes continuous improvement and responsible resource utilization. Although risk aversion may discourage sustainable investment, the overall influence of positive personality characteristics is expected to strengthen SGE (Uysal et al., 2022; Acharya & Berry, 2023; Nawaz et al., 2024). Risk aversion treated as a negatively oriented indicator within the entrepreneur-level characteristics construct and is reverse-coded so that higher scores consistently represent more favorable personality characteristics for SGE. Thus, after reverse coding, risk aversion is incorporated into the overall entrepreneur-level characteristics construct in the same directional manner as the other indicators.

H3: Entrepreneur-level characteristics are positively associated with SGE.

The Relationship between Marketing Literacy and Sustainable Green Entrepreneurship (SGE)

Marketing literacy is a strategic capability that helps entrepreneurs identify environmentally conscious markets, communicate green value propositions, and respond to changing consumer preferences. Consistent with the Resource-Based View, marketing literacy represents an intangible resource that enhances competitive advantage through market knowledge and customer engagement. Previous studies have shown that digital marketing capability and sustainability-oriented marketing knowledge support green innovati-

on and sustainable business performance (Karmugilan & Pachayappan, 2020; Agu et al., 2022; Camacho & Barrios, 2022; Dash et al., 2023; El-Gohary et al., 2023). Thus, stronger marketing literacy is expected to promote SGE.

H4: Marketing literacy positively affects SGE.

The Relationship between Personal Attitude and Sustainable Green Entrepreneurship (SGE)

The Theory of Planned Behavior explains that personal attitude is a key determinant of entrepreneurial behavior. Entrepreneurs who perceive sustainable entrepreneurship as valuable are more likely to adopt environmentally responsible business practices, implement green innovation, and balance economic, environmental, and social objectives. Previous studies consistently report that favorable attitudes strengthen sustainable entrepreneurial intention and behavior (Chege & Wang, 2020; Ye et al., 2020; Peng et al., 2021; Hirschfeld & Wagner, 2022; Al-Ma'mary, 2025).

H5: Personal attitude positively affects SGE.

The Mediating Role of Personal Attitude on the Relationship between Entrepreneur-level Characteristics and SGE

The Theory of Planned Behavior suggests that individual characteristics and capabilities may influence entrepreneurial behavior through personal evaluations of the behavior. In the context of sustainable entrepreneurship, entrepreneurs' psychological characteristics may shape how they evaluate the desirability and feasibility of sustainability-oriented business practices. Proactiveness, entrepreneurial self-efficacy, and need for achievement may facilitate favorable sustainability-oriented evaluations, whereas risk aversion may constrain such evaluations when sustainable activities are perceived as uncertain or risky. Personal attitude may therefore provide a

mechanism through which the combined configuration of entrepreneur-level characteristics is translated into SGE (Hirschfeld & Wagner, 2022; Wardana et al., 2023; Nguyen & Kanbach, 2024; Rofiaty et al., 2024). Accordingly, this study examines whether personal attitude mediates the aggregate relationship between entrepreneur-level characteristics and SGE.

H6: Personal attitude mediates the relationship between entrepreneur-level characteristics and SGE.

The Mediating Role of Personal Attitude on the Relationship between Marketing Literacy and SGE

Marketing literacy may influence SGE through a distinct cognitive mechanism from entrepreneur-level characteristics. Rather than reflecting stable personal characteristics, marketing literacy provides entrepreneurs with the knowledge and cognitive tools needed to interpret market information, understand customer needs, identify green market opportunities, and evaluate the value of sustainability-oriented products and practices. This knowledge can reduce uncertainty about the market potential of sustainable offerings and help entrepreneurs recognize how environmental benefits can be translated into customer value and competitive advantage. Consequently, entrepreneurs with stronger marketing literacy are more likely to form favorable evaluations of sustainability-oriented business activities, which can strengthen their personal attitudes toward SGE.

Within the Theory of Planned Behavior, such cognitive evaluations are important because behavioral attitudes develop from individuals' beliefs about the expected outcomes of a behavior and their evaluation of those outcomes (Ajzen, 1991). Thus, marketing literacy can strengthen positive behavioral beliefs by enabling entrepreneurs to better understand the economic and market benefits associated with sustainable entrepreneur-

ship. Empirical studies also indicate that marketing knowledge and literacy can strengthen entrepreneurial capabilities and support sustainability-oriented business outcomes (Nawi et al., 2019; Pratono et al., 2019; Shahzad et al., 2020; Tuan, 2023).

Recent evidence further suggests that green marketing knowledge is positively associated with green entrepreneurial intention, highlighting the role of marketing-related knowledge in developing sustainability-oriented entrepreneurial decisions (Atmaja & Atmaja, 2026).

Accordingly, marketing literacy is expected to influence SGE indirectly by shaping entrepreneurs' cognitive evaluations of the feasibility, benefits, and market attractiveness of sustainable entrepreneurship, which subsequently foster more favorable personal attitudes toward SGE.

H7: Personal attitude mediates the relationship between marketing literacy and SGE.

The Moderating Role of Regulatory Support

Institutional theory emphasizes that supportive regulations facilitate the conversion of entrepreneurial intentions into actual behavior. Regulatory support, including environmental policies, financial incentives, certification systems, and entrepreneurship programs, reduces institutional barriers and encourages sustainable business practices. Previous studies demonstrate that institutional support strengthens the relationship between entrepreneurial attitudes and sustainable entrepreneurial behavior (Omri, 2020; Dekel-Dachs et al., 2021; Qazi et al., 2021; Mambali et al., 2024; Sharma & Subba, 2025).

Therefore, regulatory support is expected to strengthen the influence of personal attitude on SGE.

H8: Regulatory support moderates the relationship between personal attitude and SGE.

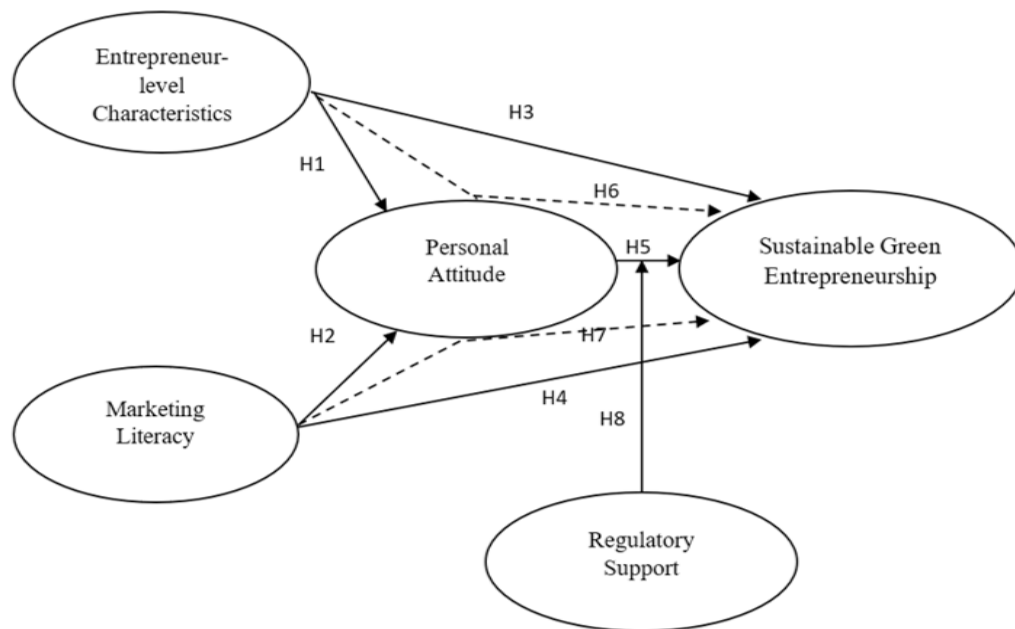


Figure 1. Conceptual Model

METHOD

Research Design

This study employed a quantitative explanatory design based on the positivist paradigm to examine the relationships

among entrepreneur-level characteristics, marketing literacy, personal attitude, regulatory support, and SGE. The proposed model incorporates both mediating and moderating relationships. Covariance-Based Structural Equation Modeling

(CB-SEM) using IBM SPSS AMOS was selected because it enables simultaneous estimation of direct, indirect, and interaction effects while providing comprehensive model-fit evaluation for theory testing.

Population and Sample

The target population comprised owners or managers of Micro, Small, and Medium Enterprises (MSMEs) operating in Aceh Province who were directly involved in business management and strategic decision-making. Eligible enterprises were required to (1) operate legally, (2) have been in operation for at least one year, and (3) be managed by an owner or manager with direct knowledge of the enterprise's business activities.

The estimated sampling population consisted of 74,810 MSMEs across five business sectors, namely manufacturing, agribusiness, trade, tourism and hospitality, and services (Dinas Koperasi dan Usaha Kecil Menengah Aceh, 2025). Because a complete sector-specific census was not available, the sectoral population was estimated using available administrative information and sectoral employment data as a proxy. The resulting estimated distribution was 7,250 MSMEs in manufacturing (9.69%), 38,022 in agribusiness (50.82%), 15,359 in trade (20.53%), 5,662 in tourism and hospitality (7.57%), and 8,518 in services (11.39%).

A proportionate stratified random sampling technique was applied, with the five business sectors serving as the sampling strata. The sampling frame was constructed from the available administrative listing of MSMEs used by the relevant authority to estimate the provincial MSME population. The frame was organized by business sector, and enterprises meeting the inclusion criteria were identified within each stratum. The sample size of 323 respondents was then allocated proportionately to the estimated population of each stratum, resulting in 31 respondents from manufacturing, 164 from agribusiness, 66

from trade, 24 from tourism and hospitality, and 38 from services.

Within each stratum, eligible enterprises were assigned identification numbers and selected using a random-selection procedure until the required allocation was reached. For enterprises with more than one eligible owner or manager, the individual directly responsible for strategic or operational decision-making was selected as the respondent. After data screening, 323 completed and eligible questionnaires were retained for analysis. The sectoral population figures are treated as estimates rather than a complete census because they were derived partly from an employment-based proxy; nevertheless, the sampling frame, sectoral estimates, proportional allocation, and random-selection procedure provide an auditable basis for the sampling process.

Data Collection Procedure

Primary data were collected using a structured self-administered questionnaire distributed through online platforms and direct field surveys. Participation was voluntary and anonymous, and respondents provided informed consent before completing the questionnaire. Only fully completed questionnaires meeting the inclusion criteria were retained for analysis.

Before the main survey, the questionnaire underwent expert review to assess content validity and contextual relevance. The instrument was subsequently pilot-tested to evaluate item clarity, wording, and respondent comprehension before full-scale data collection.

Measurement of Variables

The research model comprised entrepreneur-level characteristics and marketing literacy as exogenous variables, personal attitude as the mediating variable, regulatory support as the moderating variable, and SGE as the endogenous variable.

Entrepreneur-level characteristics

were operationalized as a higher-order construct comprising four distinct first-order constructs: proactiveness, entrepreneurial self-efficacy, risk aversion, and need for achievement. The construct was measured using 18 indicators, which were distributed across the four dimensions. Thus, the 18 indicators did not form a single first-order reflective construct or a composite index. Instead, each set of indicators measured its respective first-order dimension, while the four dimensions jointly represented the broader entrepreneur-level characteristics construct.

Each first-order construct was assessed separately using confirmatory factor analysis to establish its measurement quality before the higher-order construct was evaluated. The higher-order specification was then assessed based on the relationships between the four first-order dimensions and the overall construct. The measurement assessment therefore distinguished the validity and reliability of the individual dimensions from the adequacy of the higher-order construct.

Given the conceptual differences among the four dimensions, entrepreneur-level characteristics was specified as an aggregate higher-order construct rather than a unidimensional personality trait. Proactiveness, entrepreneurial self-efficacy, risk aversion, and need for achievement represent different aspects of entrepreneur characteristics and are therefore not treated as interchangeable indicators of a single homogeneous attribute. In particular, risk aversion may have a theoretically different directional implication from the other dimensions. Consequently, a positive relationship involving the higher-order construct indicates the overall association of the aggregated entrepreneur-level characteristics with the endogenous construct and should not be interpreted as evidence that all four dimensions independently have positive effects.

The adequacy of the higher-order

specification was evaluated separately from the measurement properties of the four first-order constructs. Accordingly, the analysis reports the relevant higher-order loadings or weights and their significance, as well as reliability, convergent validity, and discriminant validity where applicable. For a formative higher-order specification, collinearity diagnostics among the dimensions were additionally assessed. This procedure ensures that the higher-order construct is interpreted only after the measurement quality of its underlying dimensions has been established.

Marketing literacy was measured using 3 indicators, personal attitude using 8 indicators, regulatory support using 3 indicators, and SGE using 6 indicators. All measurement items were adapted from previously validated instruments in the entrepreneurship, sustainability, and marketing literature and refined to reflect the Indonesian MSME context through expert judgment and language adaptation.

Data Screening

Prior to hypothesis testing, the dataset was screened to ensure its suitability for CB-SEM analysis. Because all substantive variables were collected from the same respondents using a single questionnaire, common method bias was considered as a potential source of measurement distortion. Procedural remedies included voluntary and anonymous participation, informed consent, and questionnaire wording designed to minimize ambiguity and reduce evaluation apprehension. As a statistical diagnostic, Harman's single-factor test was also conducted. The first unrotated factor accounted for 32.847% of the total variance, which is below the conventional 50% benchmark. This result indicates that no single factor accounted for the majority of the observed variance. However, the Harman test does not establish the complete absence of common method bias; therefore, the possibility of residual common

method variance cannot be entirely excluded, particularly given the cross-sectional and self-reported nature of the data.

Validity and Reliability

The measurement model was evaluated using confirmatory factor analysis (CFA) in AMOS. Rather than relying solely on Pearson correlations and Cronbach's alpha, the assessment considered standardized factor loadings, composite reliability (CR), average variance extracted (AVE), and discriminant validity.

Standardized factor loadings were examined to assess the contribution of each indicator to its respective latent construct. CR was used to assess internal consistency, while AVE was examined to establish convergent validity. Indicators were retained when their standardized loadings and the corresponding construct-level reliability and validity statistics met the criteria specified for the measurement model.

Discriminant validity was assessed by comparing the square root of the AVE for each construct with the correlations between constructs. The results were used to determine whether the constructs represented empirically distinguishable concepts.

The high Cronbach's alpha values observed for personal attitude ($\alpha = 0.970$) and SGE ($\alpha = 0.961$) indicate very high internal consistency. However, because very high reliability coefficients can also reflect substantial similarity among items, the indicators were further examined through their standardized CFA loadings and substantive content. Item retention was therefore not justified solely by the magnitude of Cronbach's alpha. The measurement model was retained only when the indicators provided theoretically meaningful coverage of the respective constructs and demonstrated satisfactory measurement properties. No indicator was retained or removed solely on the basis of Cronbach's

alpha. Decisions concerning indicator retention were based on standardized factor loadings, construct reliability, convergent validity, discriminant validity, and the substantive relevance of each indicator to its respective construct.

Data Analysis

Hypothesis testing was conducted using Covariance-Based Structural Equation Modeling (CB-SEM) with IBM SPSS AMOS following the two-step approach. The measurement model was evaluated first through CFA, followed by assessment of the structural model. Direct effects were estimated using Critical Ratio (CR) and probability values, mediation effects were examined using bootstrapping procedures, and moderating effects were analyzed using latent interaction analysis. Overall model fit was evaluated using multiple goodness-of-fit indices, including Chi-square/df, GFI, AGFI, CFI, TLI, and RMSEA.

Mediation effects were assessed using bootstrapping to estimate the significance and confidence intervals of the indirect effects. The indirect effect was considered statistically significant when its bootstrap confidence interval did not include zero. Direct, indirect, and total effects were examined jointly to determine whether the mediation was partial or full.

RESULT AND DISCUSSION

Based on 323 respondents, most SMEs owners were male (65.9%). The majority were aged between 31 and 45 years (48.9%) and held a bachelor's degree (58.3%). In terms of business experience, most respondents had operated their businesses for 3 – 5 years (42.7%). Furthermore, 72.1% of respondents had asset values below IDR 50 million, indicating that most businesses were classified as small and medium enterprises.

Table 1. Respondent Characteristics

Category	Classification	Frequency (n=323)	Percentage (%)
Gender	Male	213	65.9
	Female	110	34.1
Age	<30 years	72	22.3
	31 – 45 years	158	48.9
	>45 years	93	28.8
Education	Senior high school	61	18.8
	Diploma	74	22.9
	Bachelor's degree	188	58.3
Business Experience	<3 years	81	25.1
	3 – 5 years	138	42.7
	>5 years	104	32.2
Asset Value	<IDR 50 million	233	72.1
	50 – 500 million	90	27.9

Source: Processed Data (2026)

The measurement model was assessed using confirmatory factor analysis following the two-step procedure for covariance-based SEM. The evaluation covered factor loadings, reliability and convergent validity (see Table 2), discriminant validity, and overall model fit. All retained

indicators exceeded the conventional 0.70 loading threshold. Because entrepreneur-level characteristics were specified as a higher-order entrepreneurial dispositional profile, reliability and validity statistics for its first-order dimensions are reported separately.

Table 2. Standardized Factor Loading, Composite Reliability, Average Variance Extracted

Construct	Indicator	Standardized Factor Loading	CR	AVE
Proactiveness	PR1	0.774	0.891	0.622
	PR2	0.845		
	PR3	0.775		
	PR4	0.814		
	PR5	0.858		
Entrepreneurial Self-Efficacy	ESE1	0.866	0.904	0.703
	ESE2	0.836		
	ESE3	0.825		
	ESE4	0.858		
Risk Aversion	RA1	0.910	0.937	0.788
	RA2	0.903		
	RA3	0.907		
	RA4	0.840		
Need for Achievement	NA1	0.885	0.923	0.707
	NA2	0.916		
	NA3	0.855		
	NA4	0.841		
	NA5	0.778		

Marketing Literacy	ML1	0.961		
	ML2	0.965	0.957	0.882
	ML3	0.943		
Personal Attitude	PA1	0.875		
	PA2	0.869		
	PA3	0.907		
	PA4	0.882	0.950	0.706
	PA5	0.868		
	PA6	0.790		
	PA7	0.829		
	PA8	0.788		
Regulatory Support	RS1	0.904		
	RS2	0.902	0.880	0.710
	RS3	0.885		
SGE	SGE1	0.910		
	SGE2	0.893		
	SGE3	0.891	0.941	0.728
	SGE4	0.893		
	SGE5	0.869		
	SGE6	0.885		

Source: Processed Data (2026)

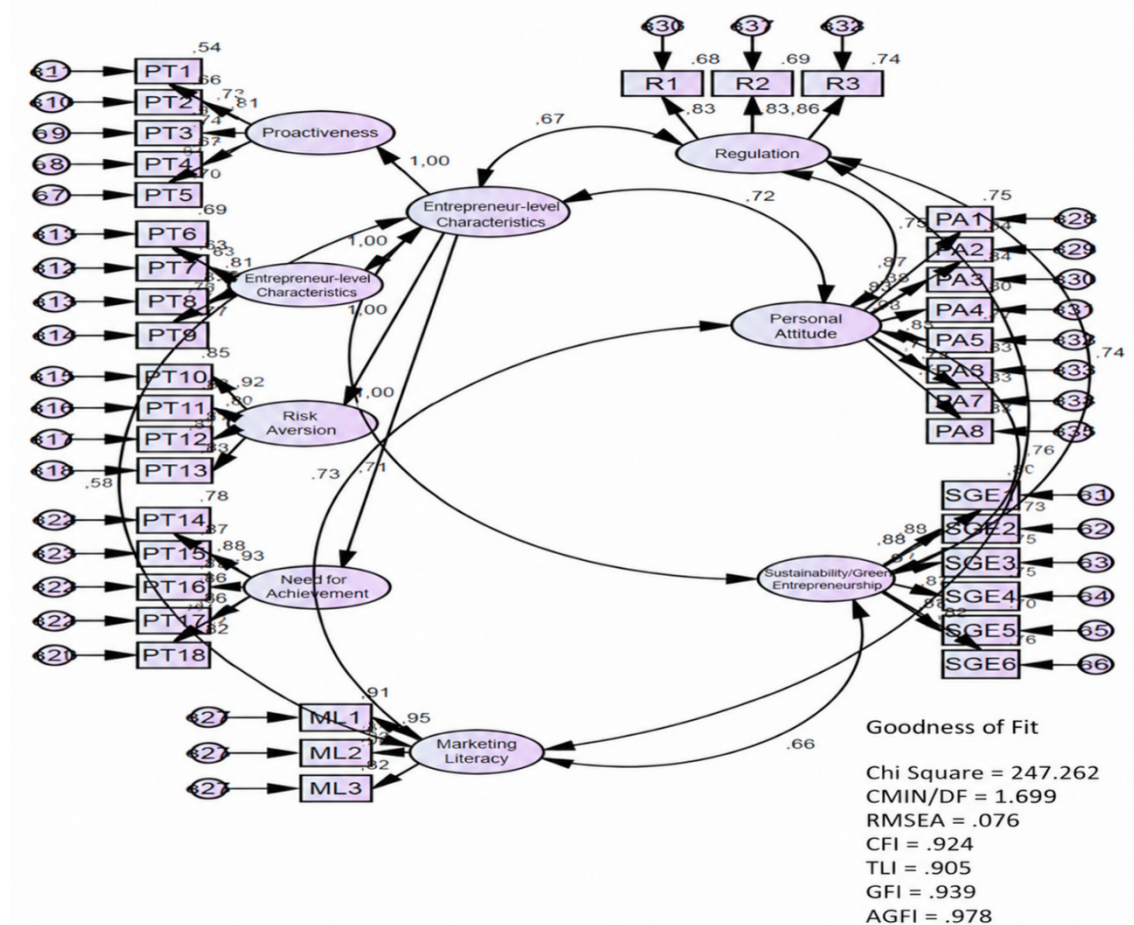


Figure 2. The Result of Full Model Analysis

Table 3. Discriminant Validity

Constructs	EC	ML	PA	RS	SGE
Entrepreneur-Level Characteristics	0.839				
Marketing Literacy	0.413	0.867			
Personal Attitude	0.073	0.409	0.811		
Regulatory Support	0.522	0.563	0.201	0.810	
SGE	0.419	0.771	0.387	0.710	0.777

Source: Processed Data (2026)

Table 4. Fit Model for the Structural Model

	χ^2/df	RMSEA	GFI	TLI	CFI	AGFI
	(<3.0)	(<0.08)	(>0.9)	(>0.9)	(>0.9)	(>0.9)
Structural Model	1.699	0.076	0.939	0.905	0.924	0.978

Source: Processed Data (2026)

Direct Effects**Table 5.** Structural Test

Hypothesis	Path	CR	P-Value
H1 (+)	Entrepreneur-level characteristics Personal Attitude	8.305	*
H2 (+)	Marketing Literacy Personal Attitude	8.491	*
H3 (+)	Entrepreneur-level characteristics SGE	5.348	*
H4 (+)	Marketing Literacy SGE	3.109	*
H5 (+)	Personal Attitude SGE	4.812	*

Notes: triple asterisk (***) represents $p < 0.001$; Double asterisk (**) represents 0.01; single asterisk (*) represents $p < 0.05$; ns means not supported.

Source: Processed Data (2026)

The structural model demonstrates that entrepreneur-level characteristics, marketing literacy, and personal attitude jointly explain SGE among MSMEs in Aceh Province. Rather than operating independently, these factors reinforce one another in shaping entrepreneurs' adoption of environmentally sustainable business practices. This finding suggests that sustainable entrepreneurship emerges from the interaction between individual capabilities and strategic resources, rather than from a single determinant. Such a perspective provides a broader explanation of sustainable entrepreneurial behavior by integrating psychological and managerial dimensions that have often been examined separately in previous studies (Ajzen, 1991; Barney, 1991; Scott, 2014; Prabowo et al., 2022).

The positive relationship between entrepreneur-level characteristics and personal attitude indicates that entrepreneurs with higher self-efficacy, proactiveness, resilience, and achievement motivation are more likely to perceive sustainability as an opportunity for long-term business development instead of merely an environmental obligation. This finding is consistent with the Theory of Planned Behavior (TPB), which proposes that favorable attitudes originate from underlying beliefs and personal evaluations before influencing behavior (Ajzen, 1991). In the context of Aceh, where many MSMEs operate under limited access to finance, technology, and broader markets, psychological characteristics become increasingly important because entrepreneurs frequently rely on their own confidence and adaptability to

overcome business uncertainty.

The significant effect of entrepreneur-level characteristics should be interpreted in light of the heterogeneous nature of its underlying dimensions. Although risk aversion may theoretically discourage sustainability-oriented investment when green activities are perceived as uncertain or costly, the other dimensions, particularly proactiveness, entrepreneurial self-efficacy, and need for achievement, may encourage entrepreneurs to identify opportunities, mobilize resources, and persist in implementing sustainability-oriented practices. At the aggregate level, the positive coefficient therefore suggests that the combined configuration of these characteristics is associated with more favorable personal attitudes toward SGE. The result should not be interpreted as evidence that every underlying dimension has an identical positive effect. Rather, the finding indicates that the opportunity-seeking, confidence, and achievement-oriented tendencies represented in the higher-order construct appear to outweigh the potential constraining role of risk aversion in the observed MSME context. This provides a plausible explanation for why the overall entrepreneur-level characteristics construct remains positively associated with personal attitude despite the theoretically mixed direction of its individual dimensions.

The significance of these relationships requires further explanation because the four dimensions of entrepreneur-level characteristics do not necessarily imply the same theoretical direction. Beyond psychological characteristics, the findings also indicate that market-related capability matters for sustainable entrepreneurial behavior. Marketing literacy also has a significant positive effect on personal attitude, suggesting that entrepreneurs who better understand market trends, customer preferences, and digital marketing opportunities are more likely to appreciate the strategic value of sustainability. As con-

sumer demand increasingly favors environmentally responsible products, marketing knowledge enables entrepreneurs to recognize sustainability as a source of competitive differentiation rather than an additional operational burden (Agu et al., 2022; Fernandes et al., 2022; Dash et al., 2023). The findings are consistent with the Resource-Based View by indicating that entrepreneur-level characteristics and marketing literacy can function as intangible resources whose strategic value is realized through their application in sustainability-oriented decision making (Barney, 1991). In Aceh, where digital transformation among MSMEs is still evolving, entrepreneurs with stronger marketing literacy appear better equipped to identify emerging green market opportunities and respond to changing consumer expectations.

The effect of marketing literacy on SGE can be understood through its role in reducing market uncertainty surrounding sustainable products and practices. Entrepreneurs with stronger marketing literacy are better able to identify customer needs, interpret market signals, communicate environmental value, and align sustainability-oriented offerings with market demand. These capabilities can make sustainability appear more commercially feasible rather than merely an additional cost. Marketing literacy may therefore influence SGE not simply because entrepreneurs possess more marketing knowledge, but because such knowledge helps them translate environmental objectives into value propositions, customer communication, and market opportunities. In this sense, marketing literacy provides a practical mechanism through which sustainability can be incorporated into business strategy. The finding is particularly relevant for MSMEs, whose limited resources make the ability to identify commercially viable sustainability opportunities important for converting environmental intentions into actual business practices.

Consequently, entrepreneur-level

characteristics influence sustainable entrepreneurship not only through their direct behavioral effects but also by shaping positive evaluations of sustainability that motivate entrepreneurs to adopt green business practices (Baah et al., 2020; Uysal et al., 2022). This mechanism helps explain why entrepreneur-level characteristics may be particularly relevant in regional MSME contexts where internal entrepreneurial resources can partly compensate for external resource constraints.

The significant direct effects of entrepreneur-level characteristics and marketing literacy on SGE further indicate that psychological resources and strategic capabilities complement one another in promoting sustainable entrepreneurship. Unlike earlier studies that generally examined these determinants independently, the present findings suggest that sustainable entrepreneurial behavior is more accurately explained by their combined influence. This integrated perspective highlights that entrepreneurs require both internal readiness and market capability to transform sustainability into a viable business strate-

gy. The similarity of these findings with previous studies (Chege & Wang, 2020; Ye et al., 2020; Iqbal et al., 2025) reinforces the importance of entrepreneurial capability, while the integrated model proposed in this study provides a more comprehensive explanation of how psychological and strategic resources interact in the MSME context.

Accordingly, initiatives to strengthen SGE in Aceh should combine entrepreneurship education, digital marketing capability development, and sustainability-oriented business support. Such integrated interventions are more likely to enhance both environmental performance and long-term competitiveness by enabling entrepreneurs to leverage intangible resources more effectively in creating sustainable value (Barney, 1991; Soto-Acosta et al., 2016; Onofrei et al., 2026).

Indirect Effects

The direct effects, however, do not fully explain how these resources are translated into sustainable entrepreneurial behaviour.

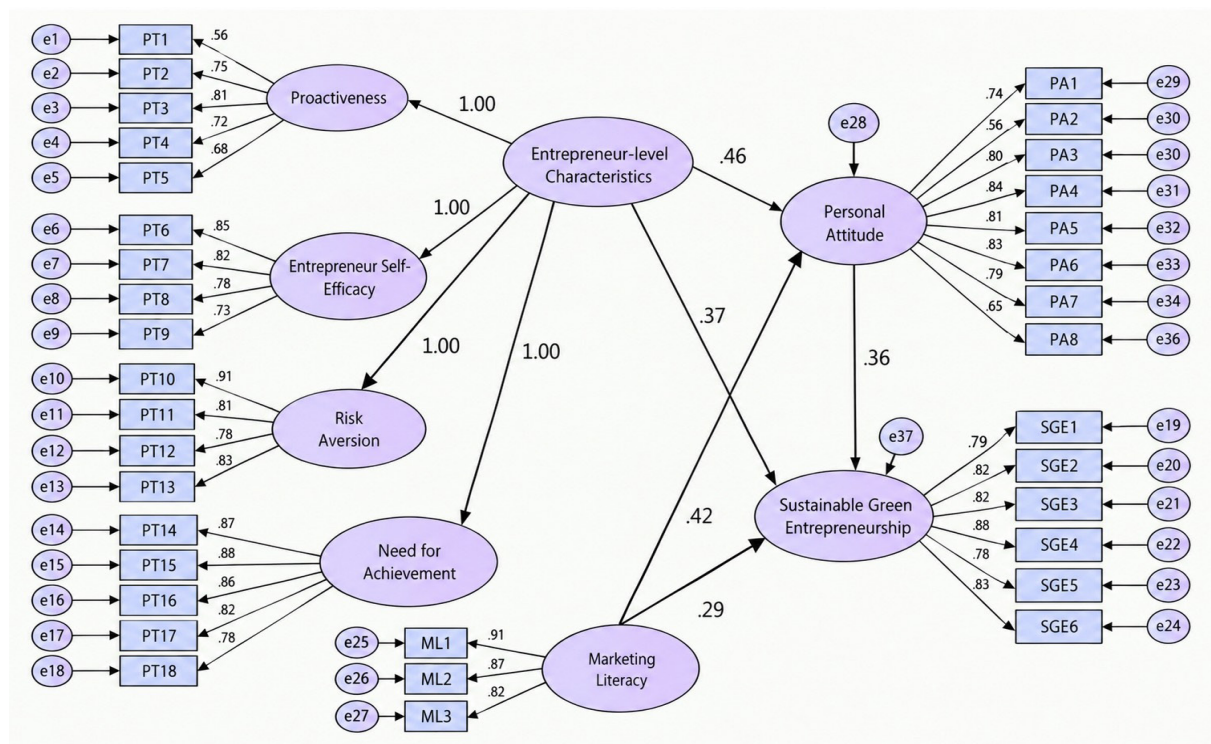


Figure 3. Mediating Effects

Table 6. Results of Mediations Analysis

Hypothesis	Relationship	Direct Effect (β)	Indirect Effect	Total Effect	Significance	Mediation
H6	EC $\rightarrow$ PA $\rightarrow$ SGE	0.369	0.173	0.542	Direct: $p < 0.001$; Indirect: $p = 0.012$	Partial mediation
H7	ML $\rightarrow$ PA $\rightarrow$ SGE	0.203	0.180	0.383	Direct: $p = 0.002$; Indirect: $p = 0.023$	Partial mediation

Note: Entrepreneur-level Characteristics (EC), Marketing Literacy (ML), Personal Attitude (PA), Sustainable Green Entrepreneurship (SGE)

Source: Processed Data (2026)

The mediation analysis provides evidence that personal attitude functions as an intervening mechanism in the relationships between entrepreneur-level characteristics, marketing literacy, and SGE. For entrepreneur-level characteristics, the direct effect on SGE is positive and significant ($\beta = 0.369$, $p < 0.001$), while the indirect effect through personal attitude is also positive and significant ($\beta = 0.173$, $p = 0.012$). The resulting total effect is 0.542, indicating that entrepreneur-level characteristics influence SGE both directly and through personal attitude.

Similarly, marketing literacy has a positive and significant direct effect on SGE ($\beta = 0.203$, $p = 0.002$), while its indirect effect through personal attitude is positive and significant ($\beta = 0.180$, $p = 0.023$). The corresponding total effect is 0.383. Because the direct effects remain significant while the indirect effects through personal attitude are also significant, the evidence supports partial rather than full mediation for both relationships.

These results indicate that personal attitude is not the sole pathway through which entrepreneur-level characteristics and marketing literacy relate to SGE. Rather, favorable sustainability-oriented attitudes provide an additional mechanism through which entrepreneurial characteristics and marketing-related capabilities are translated into SGE practices.

Personal attitude is important because entrepreneurial resources and capabilities do not automatically translate into sustainable action. Entrepreneur-level

characteristics may provide confidence, initiative, and persistence, while marketing literacy may provide the ability to recognize and communicate market opportunities. However, entrepreneurs still need to evaluate whether sustainability is desirable, valuable, and worth pursuing in their business context. Personal attitude represents this evaluative mechanism. It connects what entrepreneurs possess, such as psychological resources and market-related capabilities, with what they are willing to pursue through sustainable business practices. The partial mediation results are therefore theoretically meaningful because they show that entrepreneur-level characteristics and marketing literacy are associated with SGE through two complementary pathways: a direct pathway and an attitude-based pathway. This suggests that strengthening sustainable entrepreneurship requires not only entrepreneurial capabilities and market knowledge but also favorable sustainability-oriented evaluations that make the adoption of green practices more acceptable and strategically meaningful to entrepreneurs.

The Aceh context helps explain why this attitudinal mechanism may be particularly relevant. MSMEs operating under financial, technological, and market constraints may possess limited capacity to adopt sustainability-oriented practices even when entrepreneurs recognize their potential benefits. Under such conditions, personal attitude becomes important because it influences how entrepreneurs evaluate the feasibility and strategic va-

lue of sustainability within their existing resource constraints. Entrepreneurs who perceive sustainability as compatible with long-term business development may be more willing to mobilize their available resources toward green practices, whereas favorable capabilities alone may not be sufficient when sustainability is perceived as costly or difficult to implement. The mediation results therefore suggest that, in the Aceh MSME context, entrepreneurial resources and marketing capabilities become more closely associated with SGE when they are accompanied by favorable sustainability-oriented attitudes.

Compared with earlier studies that examined these relationships separately or focused on student entrepreneurs, this stu-

dy validates the mediating role of personal attitude among established MSMEs, offering a more comprehensive explanation of sustainable entrepreneurship in emerging economies (Anwari & Hati, 2021; Mukhtar et al., 2021; Nguyen et al., 2022; Rabie et al., 2026). Consequently, entrepreneurship programs should integrate psychological development, sustainability awareness, and digital marketing capabilities.

Moderating Effect

While the mediation results highlight the role of internal evaluation, the moderation results indicate that the translation of such evaluation into action is also conditional on the institutional environment.

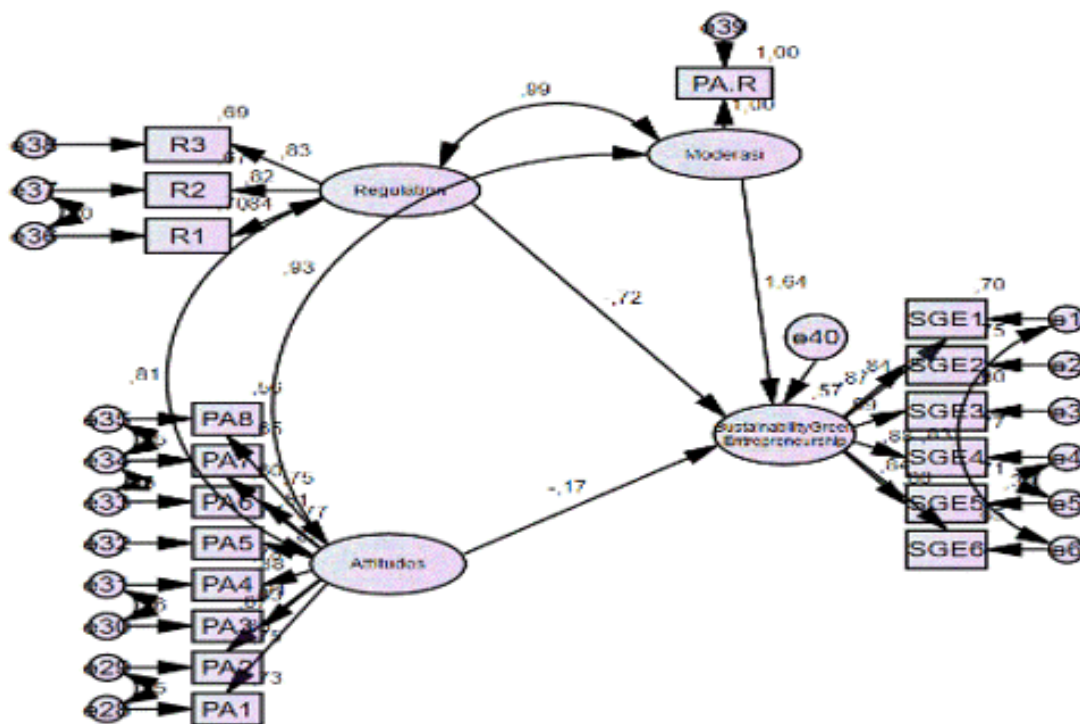


Figure 4. Simple-slope interaction between personal attitude and SGE at low, mean, and high levels of regulatory support

Table 7. Result of the Moderating Analysis

Relationship	B	C.R.	p-value
PA × RS → SGE	0.007	3.817	<0.001
RS → SGE	-0.468	-2.922	0.003
PA → SGE	-0.089	-0.769	0.442

Source: Processed Data (2026)

The moderation analysis shows that the interaction between personal attitude and regulatory support ($\beta = 0.007$, $p < 0.001$). This result demonstrates that regulatory support significantly moderates the relationship between personal attitude and SGE. The significant interaction should be distinguished from any categorical classification of moderator type; the interpretation in this study therefore focuses on the statistically significant interaction and its simple slopes.

In the moderation model, the direct effect of personal attitude on SGE is not significant ($\beta = -0.089$, $p = 0.442$), while the direct effect of regulatory support is significant and negative ($\beta = -0.468$, $p = 0.003$). More importantly, the interaction effect between personal attitude and regulatory support is statistically significant, confirming that regulatory support signifi-

cantly moderates the relationship between personal attitude and SGE. The significant interaction indicates that the strength of the relationship between personal attitude and SGE varies across different levels of regulatory support. Specifically, the relationship becomes less negative as regulatory support increases, although it remains negative at low, mean, and high levels of regulatory support.

Accordingly, the findings are interpreted in terms of the significant moderation effect and its substantive direction rather than through a categorical classification of the moderator type. Overall, the results suggest that regulatory support can attenuate the negative association between personal attitude and SGE, highlighting the importance of the institutional context in shaping the relationship between individual-level attitudes and SGE.

Table 8. Simple-Slope Analysis of the Moderating Effect of Regulatory Support on the Relationship Between Personal Attitude and SGE

Level of Regulatory Support	Simple Slope of PA → SGE	Interpretation
Low (−1 SD)	−0.096	Weakest PA–SGE condition
Medium (Mean)	−0.089	Intermediate condition
High (+1 SD)	−0.082	Relationship becomes less negative

Source: Processed Data (2026)

The simple-slope analysis further clarifies the nature of the interaction. The estimated slope of personal attitude on SGE changes from -0.096 at low regulatory support (-1 SD), to -0.089 at the mean level, and to -0.082 at high regulatory support ($+1$ SD). Thus, as regulatory support increases, the PA–SGE slope becomes less negative. This pattern is consistent with the positive interaction effect and indicates that regulatory support strengthens the relationship between personal attitude and SGE in a more positive direction, although the slope does not become positive at any of the three levels examined.

The simple-slope results further indicate that the interaction should be interpreted as a change in the strength of the PA–SGE association rather than as a re-

versal of its direction. The slope remains negative at low, mean, and high levels of regulatory support, but becomes progressively less negative as regulatory support increases. This pattern suggests that regulatory support may weaken the constraints that prevent sustainability-oriented attitudes from being translated into entrepreneurial practices, without being sufficient to eliminate those constraints entirely. In other words, institutional support appears to improve the conditions under which personal attitude can be associated with SGE, but it does not by itself guarantee that favourable attitudes will result in sustainable entrepreneurial behaviour.

The contrasting direct and interaction effects indicate that regulatory support operates through two different aspects

of the SGE process. The negative direct effect suggests that regulatory support, when considered independently, may be associated with additional institutional demands faced by MSMEs, such as compliance requirements, administrative responsibilities, adjustment costs, or the need to modify existing business practices. These demands may be particularly consequential for resource-constrained MSMEs and may therefore be reflected in a negative direct association with SGE. However, the positive interaction effect indicates that regulatory support changes the extent to which personal attitude is associated with SGE. Entrepreneurs who already hold favourable sustainability-oriented attitudes may be more capable of interpreting regulations, standards, incentives, and institutional programmes as resources that facilitate implementation. Thus, regulatory support may not directly increase SGE for all entrepreneurs, but it may make sustainability-oriented attitudes more actionable by reducing uncertainty and providing institutional guidance for implementation.

The moderation finding suggests that regulatory support operates as a boundary condition in the relationship between personal attitude and SGE. Rather than functioning solely as a direct antecedent of SGE, regulatory support changes the extent to which sustainability-oriented personal attitudes are associated with sustainable entrepreneurial practices. This finding indicates that favorable attitudes toward sustainability may require an enabling institutional environment to be translated more effectively into entrepreneurial action.

The significant negative direct effect of regulatory support on SGE, combined with its positive interaction with personal attitude, provides a more nuanced interpretation of the institutional role of regulation. Regulatory requirements may impose additional compliance responsibilities, adjustment costs, or implementation demands on MSMEs. Such conditions

may explain why regulatory support does not exhibit a uniformly positive direct relationship with SGE. However, entrepreneurs who already possess favorable sustainability-oriented attitudes may be better positioned to respond to regulatory requirements and use available institutional support to implement sustainable practices.

The Aceh institutional context provides an important setting for interpreting this conditional relationship. MSMEs in Aceh operate within a regional environment in which access to finance, technology, markets, and business-support infrastructure may be uneven. In such circumstances, regulatory requirements may be experienced simultaneously as institutional pressure and as a source of guidance and support. For entrepreneurs with limited resources or weak sustainability-oriented attitudes, regulatory demands may increase the perceived difficulty of adopting green practices. For entrepreneurs who already value sustainability, however, the same institutional environment may provide clearer direction, standards, incentives, and support mechanisms that facilitate implementation. The coexistence of a negative direct effect and a positive interaction is therefore consistent with a context in which institutional support may impose demands while also enabling entrepreneurs who are prepared to respond to those demands.

The findings extend Institutional Theory by demonstrating that formal institutions primarily enhance the effectiveness of individual intentions rather than directly determining entrepreneurial behavior (North, 1990; Scott, 2014). They also complement the Theory of Planned Behavior (TPB), which explains that favorable attitudes encourage behavior only when external conditions facilitate behavioral implementation (Ajzen, 1991). In addition, from the perspective of the Resource-Based View (RBV), entrepreneurs' psychological resources generate greater strategic

value when supported by an institutional environment that enables those resources to be effectively utilized (Barney, 1991).

Despite these theoretical contributions, the findings should be interpreted in light of several limitations. First, the cross-sectional research design captures the relationships among personal attitude, regulatory support, and SGE at a single point in time; therefore, causal relationships and changes in entrepreneurial behavior over time cannot be established. Second, the study focuses on formally registered MSMEs in Aceh Province, whose institutional, economic, and socio-cultural conditions may differ from those in other Indonesian regions or countries. Consequently, the findings may not be directly generalizable to MSMEs operating in different institutional environments. Third, the study relies on self-reported questionnaire data, which may be subject to response and common-method biases. Finally, the use of proportionate stratified random sampling across selected business sectors improves sectoral representation within the study population but does not eliminate contextual limitations. Future studies could address these limitations through longitudinal or multi-wave designs, objective or multi-source measures, and comparative studies across provinces, countries, or institutional settings. Such research would help determine whether the observed conditional role of regulatory support is consistent across different entrepreneurial and institutional contexts.

Unlike previous studies that generally reported a positive direct effect of institutional support on sustainable entrepreneurship (Qazi et al., 2021; Chen, 2024), this study shows that regulatory support is more influential as a contextual catalyst than as an independent predictor. This finding constitutes the main contribution of the study by demonstrating that effective sustainability policies should not merely impose regulations but should also strengthen entrepreneurs' readiness to transform

positive sustainability attitudes into sustainable business practices.

Unlike previous studies that generally reported a positive direct effect of institutional support on sustainable entrepreneurship (Qazi et al., 2021; Chen, 2024), this study shows that regulatory support may be more effective as a contextual catalyst than as an independent predictor. This finding has several practical implications for MSMEs in Aceh. First, managerial development programs should focus not only on increasing entrepreneurs' awareness of sustainability but also on developing their ability to translate positive attitudes into practical actions. Relevant training should include green production and resource efficiency, waste reduction and circular practices, energy and water efficiency, environmental compliance and certification, green financial management, and access to green financing. Practical programs involving business diagnostics, mentoring, and sector-specific implementation plans may be particularly useful because they can help MSME owners convert sustainability knowledge and attitudes into feasible business practices.

Second, regulatory support should emphasize facilitation and incentives rather than regulation alone. For MSMEs, relevant policy measures may include simplified environmental licensing and reporting procedures, clear and accessible guidelines for environmental compliance, financial or tax incentives for adopting cleaner technologies, subsidized environmental certification, technical assistance for waste and energy management, and preferential access to government-supported financing for environmentally oriented investments. Such measures can reduce the administrative and financial barriers associated with sustainable business practices while increasing the practical value of regulatory support.

Third, these programs should be designed according to the characteristics of different MSME sectors in Aceh. Manu-

facturing and agribusiness enterprises may benefit more from assistance in cleaner production, waste management, energy efficiency, and resource utilization, whereas tourism and hospitality businesses may require programs focused on sustainable tourism operations, waste reduction, water conservation, and environmentally responsible services. Trade and service businesses may benefit from training in green supply-chain management, sustainable procurement, digital business practices, and energy-efficient operations. A sector-sensitive approach would allow regulatory support to address the specific constraints faced by different MSMEs rather than applying uniform requirements across sectors.

Overall, the findings suggest that policymakers and business-support institutions in Aceh should combine attitude-oriented capacity building with accessible regulatory and financial mechanisms. Rather than relying primarily on additional compliance requirements, an enabling policy environment should make sustainable practices easier, less costly, and more feasible for MSMEs. This approach is consistent with the study's finding that regulatory support becomes more effective when entrepreneurs possess favorable attitudes toward sustainability and are able to translate those attitudes into concrete business practices.

CONCLUSION AND RECOMMENDATION

This study examined how entrepreneur-level characteristics, marketing literacy, personal attitude, and regulatory support jointly influence SGE among MSMEs in Aceh Province. The findings demonstrate that entrepreneur-level characteristics and marketing literacy positively influence both personal attitude and SGE, while personal attitude partially mediates these relationships. Furthermore, regulatory support significantly moderates

the relationship between personal attitude and SGE, indicating that favorable attitudes are more likely to be translated into sustainable entrepreneurial practices when supported by an enabling institutional environment. These findings confirm that sustainable entrepreneurship is shaped by the interaction of individual psychological resources, strategic capabilities, and institutional support rather than by any single factor.

This study examined how entrepreneur-level characteristics, marketing literacy, personal attitude, and regulatory support jointly influence SGE among MSMEs in Aceh Province. The findings show that entrepreneur-level characteristics and marketing literacy positively influence personal attitude and SGE, while personal attitude partially mediates these relationships. The moderation analysis further indicates that the interaction between personal attitude and regulatory support has a positive and significant effect on SGE ($\beta = 1.638$, $p < 0.001$). However, regulatory support has a negative and significant direct effect on SGE ($\beta = -0.723$, $p = 0.003$), whereas personal attitude has no significant direct effect ($\beta = -0.168$, $p = 0.442$). These results indicate that regulatory support does not operate as a uniformly positive direct predictor of SGE; rather, its contribution depends on the level of entrepreneurs' personal attitudes toward sustainable business practices.

Overall, the findings demonstrate that sustainable entrepreneurship is shaped by the interaction of individual psychological resources, strategic capabilities, and institutional conditions rather than by any single factor. In particular, the significant interaction effect suggests that a supportive regulatory environment can strengthen the translation of favorable attitudes into sustainable entrepreneurial practices. The findings therefore highlight the importance of combining entrepreneurial capability development with an enabling institutional environment to promote SGE among

MSMEs in Aceh Province.

This study examined how entrepreneur-level characteristics, marketing literacy, personal attitude, and regulatory support jointly influence SGE among MSMEs in Aceh Province. The findings show that entrepreneur-level characteristics and marketing literacy positively influence personal attitude and SGE, while personal attitude partially mediates these relationships. The moderation analysis further indicates that the interaction between personal attitude and regulatory support has a positive and significant effect on SGE ($\beta = 1.638$, $p < 0.001$). However, regulatory support has a negative and significant direct effect on SGE ($\beta = -0.723$, $p = 0.003$), whereas personal attitude has no significant direct effect ($\beta = -0.168$, $p = 0.442$). These results indicate that regulatory support does not operate as a uniformly positive direct predictor of SGE; rather, its contribution depends on the level of entrepreneurs' personal attitudes toward sustainable business practices.

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The study offers three important contributions. First, theoretically, it extends the Theory of Planned Behavior (TPB) in the context of sustainable entrepreneurship among MSMEs in Aceh Province by demonstrating the role of personal attitude in the relationship between individual and managerial factors and sustainable entrepreneurial behavior. The fin-

dings also enrich the Resource-Based View (RBV) by indicating that intangible resources, such as entrepreneur-level characteristics and marketing literacy, may generate greater strategic value when entrepreneurs possess favorable sustainability-oriented attitudes. In addition, the significant moderating role of regulatory support contributes to Institutional Theory by indicating that institutional conditions can strengthen the translation of favorable attitudes into sustainable entrepreneurial action. The integration of TPB, RBV, and Institutional Theory therefore provides a multidimensional explanation of sustainable entrepreneurship in an emerging regional economy.

Second, methodologically, this study contributes by developing and empirically testing an integrated structural model that incorporates direct, mediating, and moderating relationships using Covariance-Based Structural Equation Modelling (CB-SEM). By simultaneously examining psychological, strategic, and institutional factors, the model provides a more comprehensive analytical framework for understanding sustainable entrepreneurial behaviour than approaches that consider these factors separately. The framework may provide a basis for future research examining sustainable entrepreneurship in comparable institutional and emerging-market contexts.

Third, from a policy perspective, the findings indicate that promoting sustainable entrepreneurship requires coordinated interventions targeting both entrepreneurial capabilities and institutional support. For MSMEs in Aceh, policymakers could consider green financing schemes, incentives for environmentally responsible business practices, and simplified procedures for environmental certification. Universities could strengthen sustainability-oriented marketing literacy, digital entrepreneurship, and green business strategy through project-based learning and business incubation. Local governments

and entrepreneurship-support agencies could also develop collaborative programs connecting MSMEs with financial institutions, digital platforms, technical mentors, and environmental certification providers to facilitate the adoption of sustainable business practices.

This study has several limitations. Its cross-sectional design limits causal inference because the relationships among the variables were examined at a single point in time. In addition, the focus on formally registered MSMEs in Aceh Province may limit the generalizability of the findings to MSMEs operating in other regions or institutional contexts. The use of self-reported questionnaire data may also introduce response and common-method biases. Future research could address these limitations through longitudinal or multi-wave designs, cross-regional comparisons, and multi-source measures. Future studies could also examine additional factors, such as digital capability, green innovation, environmental orientation, organizational resilience, and institutional quality, to provide a broader understanding of sustainable entrepreneurship across different economic and institutional settings.

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