



Evaluating Sustainable Entrepreneurship Practices and Their Contribution to Environmental Responsibility Among Lebanese Enterprises

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Abstract

It is necessary to highlight that sustainable entrepreneurship has become imperative for firms to attain economic development in light of environmental challenges. Nevertheless, there is little empirical research on the relationship between sustainable entrepreneurship practices and environmental responsibility among enterprises in the context of emerging economies like Lebanon. This study aims to address this gap by exploring the impact of sustainable entrepreneurship practices, namely green innovation, sustainable resource management, eco-friendly operations, and sustainability-oriented business strategies, on environmental responsibility among Lebanese firms. The uniqueness of the study is associated with the establishment of an integrated model that links sustainability-oriented entrepreneurship practices with the indicators of environmental responsibility, including waste minimization, energy efficiency, pollution prevention, environmental compliance, and conservation. A quantitative cross-sectional design was used to collect primary data from 300 Lebanese firms through a structured survey instrument. The results showed that sustainable entrepreneurship practices had a high mean score of 4.12, while environmental responsibility scored a mean value of 4.21, meaning that sustainability is highly adopted in the enterprises. Sustainability-oriented business strategies (Mean = 4.16) and sustainable resource management (Mean = 4.15) had a great impact on the sustainability performance. The reliability test showed that the Cronbach's alpha values were 0.91 for sustainable entrepreneurship practices and 0.92 for environmental responsibility, where AVE values were above 0.50, which meant the validity of the constructs. Correlation analysis indicated that there was a strong positive relationship between sustainable entrepreneurship practices and environmental responsibility ($r = 0.76, p < 0.01$), where sustainability-oriented business strategies ($r = 0.71$) and eco-friendly business practices ($r = 0.68$) were associated with both constructs. This means that the results have proved that sustainable entrepreneurship practices significantly increase environmental responsibility.

Keywords:

Sustainable entrepreneurship, environmental responsibility, green innovation, sustainable resource management, eco-friendly practices, environmental sustainability, lebanese enterprises.

Available Online: 01/09/2026

Introduction

A concept of sustainable entrepreneurship has become quite prominent within the last decades as a useful means of reconciling the two concepts of economic development and environmental protection through the promotion of eco-friendly strategies. As far as the Lebanese case is concerned, sustainable entrepreneurship is becoming increasingly dependent on such factors as environmental consciousness, social norms, resources, and entrepreneurial intentions which emphasizes the need for identifying the factors behind the development of environmentally responsible enterprise behavior (Freiha et al., 2026; Freiha & Mawad, 2025). SMEs are a rather integral part of the Lebanese economy; yet, to develop the strategy of sustainability need to effectively implement corporate social responsibility principles and environmental management approaches (Dubruc et al., 2018). At that, green entrepreneurship practices have proved to be positively correlated with innovation capacity and organizational sustainability performance and need further study of the factors behind environmentally responsible entrepreneurship (Wang et al., 2025).

Entrepreneurship oriented towards sustainable development necessitates that the enterprises transcend the conventional economic goals of profit making through the use of green innovation and efficient resource utilization and operational methods that are environmentally friendly. According to earlier literature, it is clear that there are several organizational and exogenous factors that have a significant impact on the success of entrepreneurship in projects geared towards sustainability; such factors include innovation ability, stakeholder involvement, and sustainable management methods (El-Chaarani et al., 2024). Despite resistance to socially responsible actions, scarce resources and operational limitations continue to affect the success of enterprises in implementing sustainable practices, especially those run in emerging economies (Elhajjar & Ouaida, 2020). Sustainable supply chain management and collaboration improve operational sustainability through responsible resource utilization and environmental efficiency (Abou El Naaj, 2026).

With the advent of circular economy approaches, the significance of sustainable entrepreneurship has been heightened as enterprises have been encouraged to embrace resource-efficient operations, waste reduction, and environmentally responsible practices. In Lebanon, sustainability-based entrepreneurship projects have shown how the provision of social support structures, collaboration of institutions, and ecosystem development can contribute to the implementation of environmentally responsible approaches (El Chaarani & Raimi, 2022). Moreover, studies related to the sustainability management in the Arab region have highlighted the increasing need for the consideration of environmental responsibility, sustainable governance, and enterprise sustainability approaches for generating ecological and economic results in the future (Ahmad et al., 2022). Sustainability approaches have emerged to be indispensable for enterprises in creating sustainable business models incorporating environmental responsibility with economic growth (Karunakaran et al., 2026). Sustainability transitions within such fields as renewable energy show that enterprises need supportive business contexts, innovative approaches, and resource-efficient strategies to implement environmentally responsible approaches (Elmustapha & Hoppe, 2020).

Even though more and more attention has been given to sustainable entrepreneurship practices in recent years, there has been insufficient research conducted to find out how these practices actually help businesses become environmentally responsible. It becomes crucial to analyze sustainable entrepreneurship practices such as green innovation, sustainable resource management, eco-friendliness operations and sustainability strategy to understand how help enterprises become environmentally responsible and sustainable.

Key Contribution

- Through this study, the application of sustainable entrepreneurship practices within Lebanese companies has been evaluated including green innovation, sustainable resource management, eco-friendliness, and sustainability strategies.
- Research conducted on the role of sustainable entrepreneurship in contributing to environmental accountability through waste minimization, energy efficiency, pollution prevention, and conservation.

- The research offers real-world implications that can be used by businesses and decision-makers in order to encourage environmental consciousness in Lebanon.

The structure of the paper is as follows: Part II consists of the Literature Review, which contains an overview of previous studies on the topic of sustainable entrepreneurship, environmental responsibility, and sustainability practices in enterprises. Part III introduces the methodology of the research, which includes the conceptual framework, research design, sampling, data collection method, measurement instrument, variables used, reliability and validity of data, and data analysis techniques. In Part IV, results and analysis are presented, covering demographic information, descriptive statistics, reliability and validity analysis, correlation analysis, and hypothesis testing. In Part V, the discussion of results is introduced, highlighting the implications of sustainable entrepreneurship practices for enhancing the environmental responsibility of Lebanese enterprises. Finally, conclusions for the paper are stated in section VI where the findings, contributions, limitations, and future research directions are discussed.

Literature Review

The significance of sustainable entrepreneurship has increased as companies look at ways of blending their economic activities with environmental and social considerations. There is a need for constant innovation in order to address the complexities of sustainable business models that blend economic success with environmental protection and social value. Innovation of business models helps firms overcome issues of sustainability through inclusion of environmental factors in value creation, use of resources, and operations (Matzembacher et al., 2020; Mendross & Valtieri, 2026). Consumer knowledge about sustainable business practices and the way consumers appreciate the same also contribute to the adoption of sustainable business models and practices by firms. This applies especially in emerging economies like Lebanon (Peterson et al., 2023).

Environmental responsibility in businesses is highly dependent on favorable institutions, sustainable policies, and effective governance systems. The incorporation of environmental aspects such as climate change, biodiversity conservation, and sustainable development in the regulations serves as vital assistance to businesses that practice environmental responsibility (Al-Jashaami et al., 2025). Sustainable entrepreneurship in developing countries and crisis areas involves adaptation techniques that help the business to be able to adjust to economic unpredictability and at the same time maintain its environmental responsibility. Multi-level sustainability framework stresses the significance of interaction between the entrepreneur, the organization, institutional support, and the environment in fostering sustainable enterprise development (Daou & Abdallah, 2026).

Values in society, cultural beliefs, and community-based perspectives are other factors that affect sustainability entrepreneurship through the motivation of entrepreneurs towards environmental conservation and corporate responsibility. Sustainability-driven entrepreneurial actions are usually affected by ethical values, societal pressures, and collective responsibility towards environmental conservation especially in developing countries (Sedkaoui, 2026). Additionally, institutional environment is another key factor in the process of determining the adoption of sustainable entrepreneurship strategies in periods of uncertainty due to the existence of institutional support, resources, and stakeholders' collaboration (Thoumy & Abou Hamad, 2026).

Sustainability ventures based on entrepreneurship also aid community development by bringing innovation, youth involvement, and sustainable business operations. Sustainability ventures help increase environmental awareness, sustainable resource management, and community resilience through entrepreneurship (Bouallegue et al., 2026). Strategic sustainability ventures are made even stronger by organizational behavior in a proactive manner, where organizations that recognize the environmental opportunities and adopt a strategy for sustainability gain better sustainability results (Al-Hakeem et al., 2026).

New research emphasizes the significance of combining environmental management activities in various areas of organizations in order to enhance sustainable business operations. Green HRM and environmentally responsible employee behavior help to achieve organizational sustainability through fostering innovation, environmental awareness, and responsibility in their operations (Saleh et al., 2026). In the same vein, the transition toward sustainability in industries shows that organizations need to have environmental strategies, innovations, and efficiency in resources use in order to attain sustainable objectives, especially in emerging countries like Lebanon (Khatib & Al Sayed, 2026; Arvinth & Sathish Kumar, 2026). Organizational environmental activities, such as green performance measurement, environmental knowledge acquisition, and

employee involvement, also enhance sustainability efforts through internal capabilities in environmental management (Sadek & Karkoulian, 2025; Geetha, 2026).

Generally, the available literature shows that sustainable entrepreneurship is affected by business model innovation, customer expectations, institutional context, societal values, organizational capabilities, and environmental management activities. Nevertheless, little empirical evidence has been found on how the various aspects of sustainable entrepreneurship help achieve environmental responsibility outcomes in Lebanese businesses. Thus, analyzing sustainable entrepreneurship practices and their impact on environmental responsibility would provide a deeper understanding of how businesses can increase efficiency and minimize the negative effects on the environment.

Research Gap

While sustainable entrepreneurship has received much attention due to its ability to facilitate the integration of economic growth with environmental protection, there is a dearth of empirical information on the role that entrepreneurial processes play in fostering environmental responsibility, especially in underdeveloped countries like Lebanon. Much of the previous research has emphasized theoretical models on green entrepreneurship, innovations, and sustainable business strategies. However, very little consideration has been accorded to assessing the adoption of environmentally responsible practices in organizations, including efficient resource use, waste minimization, renewable resource usage, and ecological management. In addition, the connection between sustainable entrepreneurial ventures and environmental responsibility outcomes is yet to be studied sufficiently with regard to organizations operating in economically unstable, regulated, and resource-constrained environments, such as Lebanese organizations. Consequently, a systematic assessment of sustainable entrepreneurship processes and their impact on environmental responsibility is necessary in order to provide practical ways of fostering environmentally sustainable enterprise growth, resource conservation, and ecological sustainability. This study fills the gap by exploring the impact that sustainable entrepreneurial processes have on environmental responsibility among Lebanese enterprises.

Research Objective

1. To assess the level of sustainable entrepreneurship practices that are being used by Lebanese businesses in terms of green innovations, sustainable resource management, green business operations, and sustainability-based business strategies.
2. To investigate the connection between sustainable entrepreneurship strategies and the results related to environmental responsibilities by analyzing their impact on waste minimization, energy efficiency, pollution prevention, environmental compliance, and conservation activities.
3. To identify the essential factors of sustainable entrepreneurship that help in increasing environmental responsibility and help in the promotion of environmentally responsible business activities in Lebanon.

Research Hypothesis

H1: Sustainable entrepreneurship practices have a significant positive influence on environmental responsibility among Lebanese enterprises.

H2: Green innovation and sustainable resource management practices significantly contribute to improved environmental performance and ecological sustainability outcomes among Lebanese enterprises.

H3: Eco-friendly operational practices and sustainability-oriented business strategies significantly enhance environmental responsibility through improved resource efficiency, waste reduction, and conservation practices among Lebanese enterprises.

Proposed Methodology

Conceptual Framework

The entire architecture figure1 shows the research framework used systematically for assessing sustainable entrepreneurship practices and their effect on environmental responsibility of Lebanese enterprises. Data collection from Lebanese enterprises takes place through purposive sampling approach. In this case, data are obtained from 300 respondents comprising owners, managers, and sustainability decision-makers through the use of questionnaires. The collected data are classified according to research constructs where sustainable entrepreneurship practices form the independent variables assessed using dimensions such as green innovation, sustainable resource management, eco-friendly operational practices, and sustainability business strategies.

Sustainable entrepreneurship practices are further analysed to see their effect on environmental responsibility depicted by waste reduction, energy efficiency, pollution prevention, environmental compliance and conservation practices. Statistical analysis procedures are employed in the framework in order to assess sustainable entrepreneurship practices and their effects on environmental responsibility.

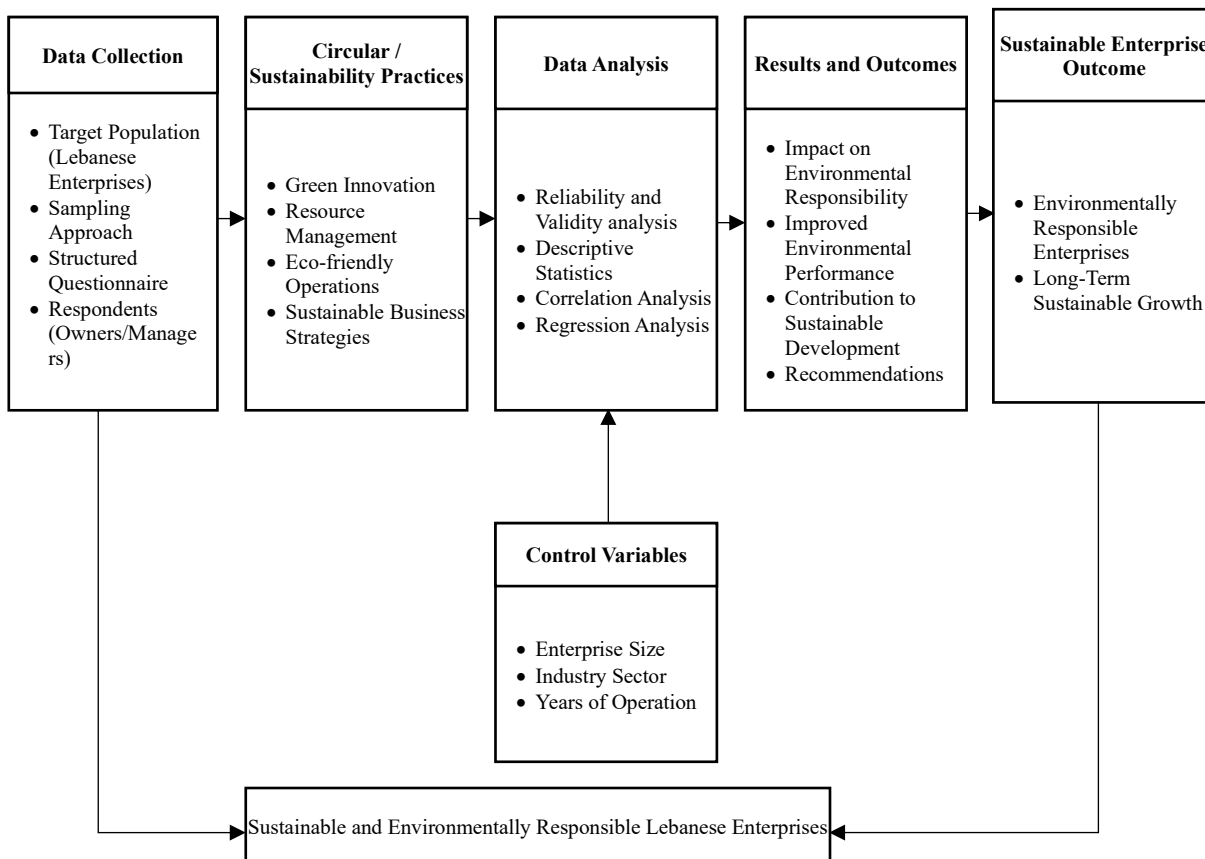


Figure1. Conceptual framework for proposed methodology

These procedures include data screening, reliability and validity, descriptive statistics, correlation analysis, and regression analysis for hypothesis testing. Enterprise size, industry sector, and years of operations be used as control variables. The ultimate output from the framework reveals the effect of sustainable entrepreneurship practices on environmental performance improvement and sustainable development.

Research Design

The research design of this study involves the use of quantitative cross-sectional research to assess the impact of sustainable entrepreneurship activities towards environmental responsibility of Lebanese enterprises. The research design mainly concentrates on measuring the degree of influence that sustainability-based entrepreneurial activities, such as green innovations, sustainable use of resources, environmental management techniques, and eco-friendly operations, have on organizational environmental outcomes. Quantitative research is chosen for statistical testing of relationships between various aspects of sustainable entrepreneurship and environmental responsibility. The research design assumes sustainable entrepreneurship practices to be an independent variable and environmental responsibility to be the dependent variable in order to identify important patterns and relationships in the Lebanese enterprise setting. The cross-sectional research design allows for gathering information from enterprises at a certain point in time.

Sampling Approach

The study utilizes a purposive sampling method to choose 300 enterprises from Lebanon with varied economic sectors such as manufacturing, agriculture, service, and SMEs. Respondents chosen for the research include

entrepreneurs, business leaders/managers, and those involved in making sustainability decisions within an enterprise and who have enough knowledge about the sustainability process within the business. Purposive sampling guarantees that the chosen participants have practical knowledge of business sustainability measures and therefore be able to respond effectively concerning sustainable entrepreneurship adoption. Choosing 300 enterprises for the research gives an adequate sample size that facilitates the assessment of differences in sustainability measures within varied organizations.

Data Collection

Primary data was obtained through the use of structured questionnaires distributed to 300 firms operating within Lebanon. The questionnaires were specifically designed to assess the sustainable entrepreneurial practice levels and environmental responsibility achievements in these firms. These questionnaires were created on the basis of sustainability models available and covered topics such as sustainable entrepreneurial orientation, green innovation practices, sustainable resource management, environmental awareness, and ecological responsibility. All measurement questions were tested against a 5-point Likert scale that ranged from 1 to 5 (from strongly disagree to strongly agree). The questionnaires were distributed electronically and directly among the firm representatives, including owners, managers, and decision-makers.

Measurement Instrument

This research employed the structured questionnaire method to investigate sustainable entrepreneurship practices and their role in environmental responsibility within Lebanese enterprises. The questions in the instrument have been taken from well-known sustainability and environmental management approaches and classified into two broad measures: sustainable entrepreneurship practices and environmental responsibility. The dimensions that have been considered under sustainable entrepreneurship practices included green innovation, sustainable use of resources, environmentally friendly practices, and sustainability-based business strategies. On the other hand, environmental responsibility has been examined based on dimensions such as waste reduction, energy efficiency, pollution prevention, environmental compliance, and conservation practices. These dimensions were rated using the Likert scale, which ranged from 1 (strongly disagree) to 5 (strongly agree). A preliminary review of the questionnaire tool and reliability analysis have been carried out using Cronbach's alpha before conducting the survey. The developed instrument was capable of providing a systematic assessment of the impact of sustainable entrepreneurship practices on environmental responsibility of Lebanese enterprises.

Variables and Measurement

The study includes two main variables, where sustainable entrepreneurship practices are considered as an independent variable and environmental responsibility is the dependent variable. Sustainable entrepreneurship practices are assessed on four dimensions that include green innovation, sustainable resource management, environmentally friendly operation practices, and sustainability-focused business strategies, which demonstrate the degree of integration of environmental concerns within the entrepreneurial endeavours by the enterprises. The environmental responsibility is evaluated through indicators such as waste reduction, energy savings, pollution control, environmental compliance, and sustainable resource usage, which show the extent of the organizational concern about its impact on the environment and promotion of ecological sustainability. All measurement questions are scored on a five-point Likert scale, starting from 1 (strongly disagree) to 5 (strongly agree).

Reliability and Validity

Reliability and validity of the measurement tool were conducted to assess whether the consistency and validity of the measurement constructs existed in the research. Reliability was measured through internal consistency reliability through Cronbach's alpha with an ideal value greater than 0.70, which signifies acceptable reliability of the measurement scales. Sustainable entrepreneurship practices and environmental responsibility constructs exhibited adequate reliability since the measurement constructs reflected the corresponding dimensions of the constructs effectively. Construct validity was measured through convergent and discriminant validity. Convergent validity was assessed through factor loading and Average Variance Extracted (AVE) and ensured that the indicators effectively reflected their respective constructs. On the other hand, discriminant validity was assessed through construct relationships to establish that each construct was unique. The reliability and validity test showed that the constructed tool is statistically sound for measuring the relationship between sustainable entrepreneurship practices and environmental responsibility in Lebanese businesses.

Data Analysis

Analysis of the collected data has been done using descriptive and inferential statistical methods to ascertain the effect of sustainable entrepreneurship practices on the environmental responsibility of Lebanese firms. Descriptive statistics have been employed for the purposes of analyzing the respondents' profile and the way answered the survey. Correlation analysis has been used to analyse the relationship between sustainability practices and the outcomes of environmental responsibility. Regression analysis was done to test for the predictability of the relationships proposed in the research model. Hypotheses were tested to check for significance.

Results and Analysis

Demographic Information based on Enterprise Profile

Table 1 describes the demographic description highlights the characteristics of the 300 enterprises from Lebanon, which participated in the research. In this section, it is possible to find information about diversity of firms, which took part in the evaluation of sustainability entrepreneurship practices. According to the distribution of the enterprises by their sectors, the largest group was represented by the service sector enterprises (32%), followed by manufacturing enterprises (26%) and agriculture and food processing enterprises (18%), which implies that participants of the research represent different economic sectors. In relation to the enterprises' sizes, it should be noted that the largest group of enterprises was small (36%), followed by micro enterprises (28%), medium enterprises (26%), and large enterprises (10%). As for the distribution of the years of operation, it is worth saying that the majority of the enterprises operated for 5–10 years (32%), while 28% of organizations operated for 11–20 years.

Regarding the distribution of ownership type, private businesses were the most common (44%), just after family businesses (42%), and cooperatives as well as others accounted for 14%. The participant demographics suggest that managers/executives constituted the largest group (42%), after business owners/entrepreneurs (32%), and sustainability/decision makers (26%). In sum, the demographic features of the respondents reflect the diversity of the study sample, as come from various types of Lebanese businesses from different fields, sizes, operating experience, and decision-making levels.

Table 1. Demographic information based on enterprise profile

Enterprise Characteristics	Category	Frequency (n)	Percentage (%)
Enterprise Sector	Manufacturing	78	26.0
	Agriculture and Food Processing	54	18.0
	Services	96	32.0
	Construction and Industry	36	12.0
	Other Sectors	36	12.0
Enterprise Size	Micro Enterprise (<10 employees)	84	28.0
	Small Enterprise (10–49 employees)	108	36.0
	Medium Enterprise (50–249 employees)	78	26.0
	Large Enterprise (≥250 employees)	30	10.0

Years of Operation	Less than 5 years	72	24.0
	5–10 years	96	32.0
	11–20 years	84	28.0
	More than 20 years	48	16.0
Enterprise Ownership Type	Family-owned enterprise	126	42.0
	Private enterprise	132	44.0
	Cooperative/Other ownership	42	14.0
Respondent Position	Business Owner/Entrepreneur	96	32.0
	Manager/Executive	126	42.0
	Sustainability/Operational Decision-maker	78	26.0

Descriptive Statistics

Table 2. Descriptive statistics of study variables (n = 300)

Variables	Minimum	Maximum	Mean	Standard Deviation
Sustainable Entrepreneurship Practices	1.80	5.00	4.12	0.56
Green Innovation Practices	1.60	5.00	4.08	0.61
Sustainable Resource Management	1.80	5.00	4.15	0.58
Eco-friendly Operational Practices	1.70	5.00	4.10	0.60
Sustainability-oriented Business Strategies	1.90	5.00	4.16	0.55
Environmental Responsibility	1.90	5.00	4.21	0.52
Waste Reduction Practices	2.00	5.00	4.18	0.57
Energy Efficiency Practices	1.80	5.00	4.22	0.54
Pollution Prevention Practices	1.70	5.00	4.15	0.59
Environmental Compliance	2.00	5.00	4.27	0.50
Conservation Practices	1.90	5.00	4.23	0.53

Table 2 describes the results of descriptive statistics, which show that Lebanese enterprises adopt sustainability entrepreneurship practices and environmental responsibility initiatives to a relatively great extent. On average, the sustainable entrepreneurship practices scored 4.12 on a scale from 0 to 5, which means that enterprises actively incorporate sustainability-related initiatives into their activities. Among all the dimensions, the sustainability-oriented business strategies had the highest average score (4.16), followed by sustainable resource management (4.15), showing that organizations take into account issues related to the efficient use of resources and sustainable development. In addition, environmental responsibility received an average score of 4.21, which proves that there is a good concern about the environment among enterprises. Among environmental responsibility dimensions, environmental compliance had the highest contribution (Mean = 4.27), followed by conservation practices (Mean = 4.23) and energy efficiency (Mean = 4.22).

Reliability and Validity

Table 3. Reliability and validity analysis of study constructs (n = 300)

Constructs	Measurement Dimensions	Cronbach's Alpha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Sustainable Entrepreneurship Practices	Overall Construct	0.91	0.93	0.68
	Green Innovation Practices	0.86	0.89	0.62
	Sustainable Resource Management	0.88	0.91	0.65

	Eco-friendly Operational Practices	0.87	0.90	0.63
	Sustainability-oriented Business Strategies	0.89	0.92	0.67
Environmental Responsibility	Overall Construct	0.92	0.94	0.70
	Waste Reduction Practices	0.86	0.90	0.64
	Energy Efficiency Practices	0.88	0.91	0.66
	Pollution Prevention Practices	0.87	0.90	0.63
	Environmental Compliance	0.90	0.93	0.69
	Conservation Practices	0.89	0.92	0.68

Table 3 describes the result of the reliability and validity test shows that the tool utilized in assessing sustainable entrepreneurship practices and environmental responsibility of the Lebanese firms possesses high internal consistency and construct validity. All constructs generated Cronbach's Alpha values above the suggested 0.70 level, implying that the questions were consistent in measuring their corresponding dimensions. Moreover, the Composite Reliability (CR) values of the constructs ranged from 0.89 to 0.94, once again confirming the reliability of the measurement model. In addition, the Average Variance Extracted (AVE) values were found to be greater than 0.50 for all constructs, which means that the measurement model has good convergent validity.

Correlation Analysis

Table 4. Correlation analysis between sustainable entrepreneurship practices and environmental responsibility (n = 300)

Variables	1	2	3	4	5	6
1. Sustainable Entrepreneurship Practices	1.00					
2. Green Innovation Practices	0.82**	1.00				
3. Sustainable Resource Management	0.79**	0.64**	1.00			
4. Eco-friendly Operational Practices	0.81**	0.61**	0.67**	1.00		
5. Sustainability-oriented Business Strategies	0.84**	0.66**	0.63**	0.69**	1.00	
6. Environmental Responsibility	0.76**	0.62**	0.65**	0.68**	0.71**	1.00

Note: $p < 0.01$ indicates statistically significant correlation.

Table 4 describes the correlation results reveal a substantial positive link between sustainable entrepreneurship activities and environmental responsibility among Lebanese organizations. The composite sustainable entrepreneurship activities construct was found to have a substantial positive correlation with environmental responsibility ($r = 0.76$, $p < 0.01$), since the organizations with high involvement in sustainability-based practices were found to be more environmentally responsible. As far as the individual dimensions are concerned, sustainability-focused business strategies were found to have a strong relationship with environmental responsibility ($r = 0.71$, $p < 0.01$) followed by eco-friendly business practices ($r = 0.68$, $p < 0.01$) and sustainable resource management ($r = 0.65$, $p < 0.01$). The green innovation practices have been observed to have a significant positive relationship with environmental responsibility ($r = 0.62$, $p < 0.01$).

Hypothesis Testing and Analysis

To evaluate the proposed hypotheses and determine the predictive impact of sustainable entrepreneurship practices on environmental responsibility, multiple linear regression analysis was performed. The control variables (enterprise size, industry sector, and years of operation) were included in the model to ensure statistical control.

H1: Sustainable Entrepreneurship Practices and Environmental Responsibility

Linear regression analysis was conducted to test *H1*, examining the overall effect of sustainable entrepreneurship practices on environmental responsibility. The regression model was statistically significant ($F(1,298) = 405.12, p < 0.001$), explaining approximately 57.6% of the variance in environmental responsibility ($R^2 = 0.576, \text{Adjusted } R^2 = 0.575$). Sustainable entrepreneurship practices showed a strong positive predictive impact ($\beta = 0.76, t = 20.13, p < 0.001$). Therefore, *H1* is fully supported.

H2(a,b): Green Innovation and Sustainable Resource Management Practices

Multiple regression analysis was conducted to test the individual contribution of green innovation and sustainable resource management to environmental responsibility outcomes. The results revealed that both green innovation ($\beta = 0.31, t = 6.42, p < 0.001$) and sustainable resource management ($\beta = 0.42, t = 8.75, p < 0.001$) significantly and positively influence environmental responsibility. The combined dimensions accounted for 51.2% of the variance ($R^2 = 0.512, p < 0.001$). Thus, *H2* is fully supported.

H3(a,b): Eco-friendly Operational Practices and Sustainability-oriented Business Strategies

The impact of eco-friendly operational practices and sustainability-oriented business strategies on environmental responsibility was evaluated using multiple regression. Both sustainability-oriented strategies ($\beta = 0.44, t = 9.81, p < 0.001$) and eco-friendly operations ($\beta = 0.38, t = 8.24, p < 0.001$) exhibited strong, statistically significant positive impacts on environmental performance outcomes. Together, these constructs explained 58.1% of the variance in environmental responsibility ($R^2 = 0.581, p < 0.001$). Consequently, *H3* is fully supported in table 5

Table 5. Regression analysis and hypothesis testing results ($n = 300$)

Hypothesis	Independent Variable	Dependent Variable	Standardized β	t-value	p-value	R ²	Adjusted R ²	Decision
H1	Sustainable Entrepreneurship Practices (Overall)	Environmental Responsibility	0.76	20.13	< 0.001	0.576	0.575	Supported
H2a	Green Innovation Practices	Environmental Responsibility	0.31	6.42	< 0.001	0.512	0.509	Supported
H2b	Sustainable Resource Management	Environmental Responsibility	0.42	8.75	< 0.001	--	--	Supported
H3a	Eco-friendly Operational Practices	Environmental Responsibility	0.38	8.24	< 0.001	0.581	0.578	Supported
H3b	Sustainability-oriented Strategies	Environmental Responsibility	0.44	9.81	< 0.001	--	--	Supported

Discussion

The findings from this study present significant information regarding the importance of sustainable entrepreneurship practices in ensuring environmental responsibility among Lebanese firms. The findings indicate that those firms using sustainability-based practices, including green innovation, sustainable resource management, eco-friendly operations, and sustainability-based business practices, have greater chances of realizing positive environmental performance. It has been proven that sustainable entrepreneurship is not only about generating economic value but also about ecological sustainability, which is ensured by practicing responsible use of resources and environmental management. The framework of the study focuses on the relationship between the independent variable of sustainable entrepreneurship practices and the dependent

variable of environmental responsibility in terms of waste reduction, energy efficiency, pollution prevention, and conservation.

The findings show that Lebanese firms are highly dedicated to adopting sustainability, as reflected in the high average score for sustainable entrepreneurship practices. Sustainability-focused business strategies and sustainability-focused resource management were strongly adopted, implying that the firms realize the need for incorporation of environmental issues in their strategic planning and resource management. These findings confirm previous studies' findings that the adoption of sustainability models requires innovative and efficient use of resources in an environmentally sound way.

This statistical linkage is further validated by the regression results. Overall, sustainable entrepreneurship practices accounted for 57.6% of the variance in environmental responsibility ($\beta = 0.76, p < 0.001$). Specifically, sustainability-oriented business strategies ($\beta = 0.44, p < 0.001$) and sustainable resource management ($\beta = 0.42, p < 0.001$) emerged as the strongest individual predictors, followed by eco-friendly operations ($\beta = 0.38, p < 0.001$) and green innovation ($\beta = 0.31, p < 0.001$). These statistical values confirm that adopting an integrated strategy directly improves environmental performance among Lebanese enterprises.

Such results highlight the need for an integrated approach involving strategy, efficiency measures, and innovations for achieving environmental responsibility. The findings also reinforce the value of green innovation and sustainable management of resources in improving the environmental performance of firms. Companies that utilize green technologies, efficient use of resources, and sustainable practices are more likely to reduce their environmental impact and ensure ecological sustainability. The results are consistent with the research objectives of exploring the role of green innovation, sustainable resource management, and other sustainability aspects in environmental responsibility of Lebanese companies.

Moreover, the research shows the significance of environmentally friendly operations and sustainability-related approaches as far as increasing environmental responsibility is concerned. Such approaches as minimizing waste, maximizing energy efficiency, avoiding pollution, and conserving resources show how businesses can achieve sustainability goals through concrete environmental results. The hypothesis framework developed during the research stresses the role of such approaches as those that increase environmental responsibility.

Generally, it is observed that sustainable entrepreneurship is an effective means for enterprises in Lebanon to solve environmental problems and ensure their business sustainability. The results help add to the body of literature in the field of sustainability by offering empirical evidence related to the impact of entrepreneurship on environmental responsibility in an emerging economy setting. By embracing green innovation, sustainable management of resources, and environment-responsible approaches, enterprises can enhance their ecological performance and facilitate sustainable development.

Conclusion

The purpose of this study was to investigate sustainable entrepreneurship practices and their effect on environmental responsibility within Lebanese firms through the use of green innovations, sustainable resource management, eco-friendly operations, and sustainability-oriented business strategies in influencing environmental outcomes. A quantitative cross-sectional research approach was used, and primary data were collected from 300 Lebanese firms through the use of a questionnaire using a five-point Likert Scale. Data collected was then analyzed through the use of descriptive statistics, reliability test, correlation analysis, and regression analysis in order to measure the relationship between sustainable entrepreneurship practices and environmental responsibility. Results obtained revealed that sustainability practices are well adopted by Lebanese firms, since sustainable entrepreneurship practices recorded a mean score of 4.12, while environmental responsibility recorded a mean score of 4.21. Sustainability-oriented business strategies (Mean = 4.16) and sustainable resource management (Mean = 4.15) were highly contributing to sustainability performance. Reliability tests showed strong reliability for both measures, since Cronbach's alpha coefficients were equal to 0.91 for sustainable entrepreneurship practices and 0.92 for environmental responsibility; AVE estimates higher than 0.50 provided evidence for validity. Correlation analysis revealed a significant positive relationship between sustainable entrepreneurship practices and environmental responsibility ($r = 0.76, p < 0.01$); this shows that sustainability-focused firms achieve better environmental results. Thus, this research demonstrates that incorporating the concept of sustainability in entrepreneurial activities helps to reduce waste,

conserve energy, prevent pollution, and engage in conservation. Further research may be conducted by increasing the sample size, conducting longitudinal analysis, comparing sectors, and considering more sustainability variables in order to examine the impact of sustainable entrepreneurship on environmental responsibility. Overall, this research is of great value for Lebanese firms and policymakers.

Declaration

Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this research work.

Funding Statement: This research received no external funding. The authors conducted the study without financial support from any public, commercial, or non-profit funding organizations.

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