Multidisciplinary Reviews

QUESTIONNAIRES APPLICATION
Published Online: October 22, 2025
https://doi.org/10.31893/multirev.2026236

Moderating role of dynamic capabilities on environmental forces influencing the sustainability of eco-tourism destinations in developing countries

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Abstract Eco-tourism destinations in developing countries operate in volatile environments where economic, legal, social, and technological factors can significantly influence their sustainability. The purpose of the study was to examine the moderating role of dynamic capabilities in the relationship between environmental forces and the sustainability of eco-tourism destinations in a developing country like Nigeria. Theoretically, this study was anchored on dynamic capability theory, and a quantitative approach was employed, using a structured survey to gather data from a sample of 285 staff across 50 Nigerian eco-tourism destinations. The data analysis utilised Partial Least Squares Structural Equation Modelling (PLS-SEM). The output of the robustness test carried out in the study indicates that both structural and measurement models are valid; hence, the study is reliable and generalisable. Results showed that economic, legal, and technological forces significantly affect the sustainability of eco-tourism destinations. Further analysis of the moderating effects indicated that dynamic capabilities such as sensing, seizing, learning, and configuration positively moderate this relationship, enabling eco-tourism destinations to better adapt to external pressures and uncertainty. Practically, the study highlights that the growth of eco-tourism destinations depends on whether environmental forces exert a positive or negative influence. It also demonstrates that eco-tourism destinations can utilise their dynamic capabilities, such as market intelligence, developing an innovative culture, and forming strategic partnerships, to respond effectively to these environmental forces. Notably, market intelligence can enhance the capacity to identify market opportunities, seize emerging trends, and reconfigure resources to capitalise on growth potential through an innovative culture. The primary theoretical contribution of this research is explaining how environmental forces impact eco-tourism competitiveness and ecosystem development. The originality of this study lies in its empirical validation of the moderating role of dynamic capabilities in the influence of environmental forces on the sustainability of eco-tourism destinations within a developing country context.

Keywords: sensing, seizing, learning, economic factor, legal factor, technological factor

1. Introduction

In recent decades, eco-tourism has become a crucial driver of sustainable economic development, environmental protection, and socio-cultural preservation, especially in developing countries like Nigeria (Nguyen et al., 2022). Eco-tourism sites significantly boost local economies by creating jobs, supporting community development, and encouraging biodiversity conservation. Despite its promise, the sustainability of eco-tourism destinations in Nigeria faces major challenges due to changing environmental factors, including economic instability, regulatory constraints, technological changes, and ecological decline (Dayioglu et al., 2024). While government and non-governmental organisations such as the Nigerian Tourism Development Authority (NTDA), the National Park Service of Nigeria, the Federal Ministry of Environment, the Ministry of Art, Culture, Tourism and the Creative Economy (FMACTCE), and various eco-tourism programmes are in place to support this sector, many eco-tourism businesses struggle to stay viable beyond their early years.

Environmental forces are external factors that influence business operations, performance, and the sustainability of eco-tourism destinations. These forces are usually beyond the organisation's control and originate from various sources such as economic, political, social, technological, legal, and ecological aspects of the broader environment in which businesses operate (Suryana, 2016). Forés et al. (2023) emphasised that the business environment plays a critical role in shaping and determining the performance and sustainability of tourism enterprises. Adeoye (2013) further stresses that the continuous interaction between businesses and their environment influences their resilience and ability to leverage available resources effectively. According to Baloch et al. (2022), the business environment for eco-tourism is shaped by multiple factors, including government

policies, impacts of climate change, technological advancements, and evolving tourist preferences. These forces can either restrict or support sustainability, depending on how well eco-tourism destinations adapt to them (Adeoye, 2013). To succeed in such a volatile environment, eco-tourism enterprises must develop dynamic capabilities and strategic competencies that enable them to sense, seize, and adapt to emerging opportunities and threats (Teece et al., 1997). The concept of dynamic capabilities is defined as an organisation's ability to integrate, reconfigure, and realign its resources and strategies in response to environmental changes (Teece, 2018; Al-Hawary & Alanazi, 2023). These capabilities are vital for eco-tourism destinations in managing risks, boosting competitiveness, and ensuring long-term sustainability (Leonidou et al., 2015).

For eco-tourism destinations, sustainability involves maintaining ecological integrity, economic viability, and socio-cultural relevance while minimising negative environmental impacts (Alshanty & Emeagwali, 2019; Wided, 2022). Sensing capabilities enable eco-tourism operators to detect shifts in market demand, regulatory policies, and ecological conditions, while seizing capabilities allow them to capitalise on emerging opportunities (Simo-Kengne, 2021). Additionally, learning and reconfiguration capabilities empower these enterprises to innovate, adopt sustainable practices, and adjust their business models in response to changing environmental dynamics (Wided, 2022). The effectiveness of dynamic capabilities in ensuring sustainability largely depends on their ability to mitigate adverse environmental forces (Leonidou et al., 2015). Economic factors such as inflation, exchange rate volatility, and limited access to funding pose significant threats to the sustainability of eco-tourism (Suryana, 2016). Legal and regulatory frameworks, including environmental compliance requirements and land-use policies, introduce operational complexities that eco-tourism businesses must navigate (Nyarku & Oduro, 2017). Furthermore, technological advancements like digital marketing, sustainable infrastructure, and eco-friendly innovations present both opportunities and challenges, requiring continuous adaptation (Suryana, 2016).

While existing literature recognises the importance of dynamic capabilities in organisational performance (Forés et al., 2023; Wided, 2022), there remains a gap in understanding how these capabilities moderate the impact of environmental forces on the sustainability of eco-tourism destinations, especially in developing economies such as Nigeria. Given Nigeria's exposure to economic instability, regulatory inefficiencies, and ecological vulnerabilities, investigating the moderating role of dynamic capabilities is vital for strengthening the resilience of eco-tourism enterprises. Despite increasing scholarly interest, limited empirical research examines how Nigerian eco-tourism destinations utilise dynamic capabilities to reduce environmental pressures. This study aims to fill this gap by exploring how dynamic capabilities influence the relationship between environmental forces and the long-term sustainability of eco-tourism destinations in Nigeria.

2. Literature Review and Theoretical Background

This study is grounded in the dynamic capability theory, developed by Teece et al. (1997). The theory states that organisations must have the "ability to integrate, build, and reconfigure internal and external competencies to respond effectively to rapidly changing environments" (Teece et al., 1997). It highlights the importance of organisational processes and the capacity to sense, seize, learn, and reconfigure resources to adapt to environmental changes (Teece, 2018). Sensing and seizing involve an organisation's ability to detect and interpret opportunities and threats in the external environment and to quickly act on them (Teece, 2018; Valdez-Juárez et al., 2023). In eco-tourism destinations, these capabilities include monitoring environmental regulations, shifting tourist preferences, impacts of climate change, and emerging trends in sustainable tourism (Del Rosario Reyes-Santiago et al., 2019). Additionally, sensing and seizing enable eco-tourism destinations to foresee changes in tourism and environmental policy and to proactively adjust their sustainability strategies (Engelmann, 2023). Similarly, learning and reconfiguration capabilities refer to a destination's capacity to acquire new knowledge, skills, and competencies, and to adapt and reorganise resources in response to changing environmental conditions (Teece et al., 1997). For eco-tourism destinations, this involves fostering a culture of sustainable innovation, adaptable governance structures, and flexible operational models that promote ecological preservation and meet tourism demands (Rehman & Saeed, 2015). Therefore, the dynamic capability theory offers a valuable framework for understanding how eco-tourism destinations can effectively mitigate the impact of environmental forces on their long-term sustainability (Wu et al., 2024).

Eco-tourism destinations, like other businesses, operate within a broader macro-environment and are influenced by various external forces (Dayioglu et al., 2024). These environmental forces—economic, legal, political, social, technological, and ecological—shape the competitiveness, regulatory compliance, and sustainability of eco-tourism destinations (Gini & Agala, 2023; Luong, 2023). A study by Amoako and Boateng (2022) indicates that a PESTEL (Political, Economic, Social, Technological, Environmental, and Legal) analysis is crucial for assessing the sustainability of eco-tourism destinations. This framework helps identify external influences that affect operations and long-term viability (Luong, 2023). According to Amoako and Boateng (2022), when evaluating factors influencing tourism sustainability, PESTLE analysis is very robust when carefully applied, while Simo-Kengne (2021) emphasised the need for eco-tourism destinations to analyse environmental forces to mitigate risks and enhance sustainability.

2.1. Economic factor

Economic factors, such as inflation rates, exchange rates, GDP fluctuations, and tourism revenue streams, significantly influence the performance of eco-tourism destinations (Simo-Kengne, 2021). Wang (2024) highlights that economic forces directly affect sustainability, as fluctuations in tourist spending, government funding for conservation, and global travel trends impact revenue and operational stability. During economic downturns, eco-tourism destinations may face reduced visitor numbers and funding constraints, whereas periods of growth present opportunities for sustainable infrastructure development and eco-friendly tourism expansion (Forés et al., 2023). The relationship between environmental forces and eco-tourism sustainability has been explored in empirical literature. Asumah et al. (2024) argue that dynamic capabilities help eco-tourism destinations adapt to economic and ecological fluctuations, fostering long-term resilience. Baloch et al. (2022) highlight that environmental sustainability trends in tourism are often driven by regulatory pressures and shifting tourist expectations, pushing destinations toward greener practices. Hernita et al. (2021) emphasise the role of local community engagement and adaptive resource management in sustaining eco-tourism, particularly in developing regions like Nigeria. Hernita et al. (2021) further suggest that economic and ecological stability significantly influence the strategic sustainability planning of eco-tourism destinations. Teece (2018) emphasises the importance of dynamic capabilities in enabling firms to sense and seize opportunities during economic uncertainties to enhance their survival and sustainability.

H1: Economic environment influences the sustainability of eco-tourism destinations.

2.2. Legal factor

Legal environmental forces comprise the laws, regulations, and legal frameworks that govern eco-tourism destinations and their operations within a specific region (Nyarku & Oduro, 2017). These forces include environmental protection laws, tourism licensing requirements, waste management regulations, compliance standards, land-use policies, and intellectual property rights related to eco-tourism branding. Such factors influence the operational environment for eco-tourism destinations in Nigeria, affecting their sustainability and long-term viability (Müller et al., 2021). Adherence to legal requirements is essential for eco-tourism operators to avoid penalties, reputational damage, and operational disruptions (Radičić & Petković, 2023). Furthermore, regulatory changes can present both opportunities and challenges; strict environmental laws may raise operational costs, while supportive policies like tax incentives or conservation grants can promote sustainable growth (Siyanbola, 2020). Research by Wang (2024) highlights the importance of strategic agility in navigating legal complexities, allowing eco-tourism destinations to adapt to regulatory shifts and seize emerging opportunities. Likewise, Tyler et al. (2023) stress that regulatory pressures significantly influence sustainability practices, especially among proactive eco-tourism firms. Policy interventions, as noted by Nyarku and Oduro (2017), play a vital role in fostering environmental responsibility, with well-structured legal frameworks encouraging compliance and innovation. In Nigeria, government policies and multi-stakeholder regulations are crucial in shaping eco-tourism sustainability. A study by Nyarku and Oduro (2017) underscores the role of supportive legal frameworks in enhancing environmental stewardship and competitive resilience. Hence, the legal environment not only establishes operational boundaries but also motivates eco-tourism destinations to adopt sustainable business models through regulatory incentives and enforcement mechanisms.

H2: Legal environment influences the sustainability of eco-tourism destinations.

2.3. Technological factor

Technological environmental forces refer to the influence of innovations and disruptions in information technology on various sectors, including eco-tourism destinations (Alraja et al., 2022). These forces encompass technological developments such as automation, digitalisation, artificial intelligence, robotics, communication technologies, and sustainable infrastructure (Chen et al., 2011). In Nigeria's eco-tourism sector, rapid technological progress is transforming visitor experiences, operational efficiency, and environmental conservation efforts (Ebabu, 2012). Eco-tourism destinations that do not adopt these innovations risk losing their competitiveness, whereas those that leverage them can improve sustainability and attract eco-conscious travellers. However, resource constraints, high implementation costs, and limited technical expertise may impede the adoption of advanced technologies in Nigeria's eco-tourism sector (Ebabu, 2012). Despite these challenges, technological innovations enable eco-tourism destinations to enhance resource management, reduce ecological footprints, and deliver immersive, sustainable experiences (Alraja et al., 2022). Müller et al. (2021) emphasise that absorptive capacity—the ability to integrate and utilise new technologies—is vital for eco-tourism sustainability. Studies by Radičić and Petković (2023) demonstrate that eco-tourism destinations embracing digitalisation achieve higher operational efficiency and environmental resilience. Furthermore, Alraja et al. (2022) underscore the role of green technologies in promoting sustainable performance, especially in mitigating climate-related risks. Chege and Wang (2020) suggest that eco-innovation bolsters environmental sustainability, while Ozturk et al. (2024) show how digital tools support long-term eco-tourism growth. Vrontis et al. (2022) further examine how adopting digital technologies fosters value creation and sustainability, with entrepreneurial orientation serving as a moderating factor. Their research indicates that technological advancements and digital transformation significantly influence firms' sustainable performance, particularly when aligned with environmental and entrepreneurial strategies.

H3: Technological environment influences the sustainability of eco-tourism destinations

2.4. Sensing and seizing capabilities

In the rapidly evolving and competitive eco-tourism sector, dynamic capabilities are vital for ensuring destination sustainability, especially in developing nations like Nigeria. According to Hadi (2023), to effectively mitigate the impact of environmental forces on eco-tourism destinations' sustainability, capabilities such as sensing and seizing are highly important. These capabilities enable eco-tourism destinations to anticipate, identify, and adapt to external changes, thereby increasing their resilience and long-term viability (Leonidou et al., 2015). Sensing capability refers to the ability of eco-tourism destinations to detect, interpret, and respond to signals from their external environment, including shifts in tourist preferences, regulatory policies, climate change effects, and competitive pressures (Teece et al., 2016). Effective sensing allows destinations to collect vital market and environmental data, assess emerging trends, and proactively adjust strategies to meet sustainability objectives.

Seizing capability involves the capacity of eco-tourism destinations to leverage identified opportunities by mobilising resources, implementing sustainable practices, and enhancing visitor experiences (Teece et al., 2016). This includes making strategic decisions, investing in eco-friendly infrastructure, and collaborating with stakeholders to reduce risks and exploit favourable conditions. Strong sensing capabilities enable eco-tourism destinations in Nigeria to anticipate regulatory changes, shifting tourist demands, and ecological threats, facilitating proactive adaptation (Nguyen et al., 2022). Research by Alshanty and Emeagwali (2019) underscores the importance of sensing and seizing capabilities for tourism destinations and highlights the positive link between proactive environmental scanning and innovation outcomes. Similarly, research by Teece (2018) stresses the significance of seizing capabilities in driving strategic renewal and value creation in dynamic environments. Collectively, these capabilities strengthen the resilience of eco-tourism destinations against environmental forces, securing long-term sustainability.

H4: Sensing and seizing capabilities moderate the influence of environmental forces on the sustainability of eco-tourism destinations.

2.5. Learning and reconfiguration capabilities

Learning and reconfiguration capabilities are essential components of a firm's dynamic capabilities, essential for maintaining eco-tourism destinations amidst environmental changes (Haputhanthri et al., 2024). Learning capability refers to the ability of eco-tourism destinations to acquire, assimilate, and utilise knowledge from both internal and external sources (Al-Hawary & Alanazi, 2023). This encompasses continuous environmental scanning, stakeholder collaboration, and adaptive management to adjust to shifting ecological, regulatory, and tourist preferences (Kareem & Alameer, 2019; Bassey, 2023). Destinations with strong learning capabilities can predict changes in sustainability standards, visitor expectations, and conservation policies, enabling them to modify their offerings and operational strategies accordingly (Pervan et al., 2018; Al-Hawary & Alanazi, 2023). Research by Luong (2023) demonstrates that destinations with structured learning mechanisms adapt more effectively to sustainability challenges, thereby boosting their long-term viability.

Reconfiguration capability refers to eco-tourism destinations' ability to reorganise resources, partnerships, and operational models in response to environmental disturbances (Belitski & Khalil, 2020). This involves altering infrastructure, expanding eco-friendly activities, and adopting green technologies to reduce ecological threats and adapt to regulatory changes (Wided, 2022; Ayang, 2022). For example, destinations with agile reconfiguration abilities can adjust during climate-related risks or policy shifts, ensuring resilience and ongoing appeal (Haputhanthri et al., 2024). Research shows that eco-tourism sites that utilise reconfiguration strategies demonstrate greater adaptability to environmental pressures, supporting both ecological and economic sustainability (Wu et al., 2024). These capabilities collectively help mitigate the effects of environmental forces, allowing eco-tourism destinations to maintain competitiveness whilst conserving natural and cultural assets (Eldin et al., 2025). Figure 1 illustrates the conceptual framework for the study.

H5: Learning and reconfiguration capabilities moderate the influence of environmental factors on the sustainability of eco-tourism destinations

3. Materials and Methods

The quantitative research approach using a survey design was employed in this research. The target population comprised 1,010 staff members from 50 eco-tourism destinations across Nigeria. A simple random sampling technique was employed to obtain a representative sample size, and Krejcie and Morgan's (1970) sample size determination table was used to derive a sample of 285. To effectively collect quality data that expresses unbiased views of respondents, a structured questionnaire was designed and distributed with the consent of the management and staff of the selected eco-tourism destinations. Six research assistants, each representing one of Nigeria's six geopolitical zones, were involved in the data collection process, which took place between June 15, 2024, and December 10, 2024. Of the questionnaires administered, 270 copies (94.74%) were completed and deemed usable for analysis, while 15 copies (5.26%) were not retrieved. The data

collection instrument was reviewed prior to administration by three academics from the Departments of Business Management and Tourism Management at the University of Calabar, Nigeria, who are experts in the relevant fields. A pilot study was also conducted with 20 staff members at Cross River National Park. Feedback from both the expert reviews and the pilot study was used to revise and refine the questionnaire. The final instrument used a 5-point Likert scale, with measurement items adapted from validated scales in previous studies and adjusted to suit the specific objectives of this research. Table 1 provides a summary of the measurement instrument. Initial analysis of respondent demographics revealed that 73.4% were male, while 26.6% were female. In terms of age, 70% of respondents were between 35 and 50 years old, while 30% were above 50. Regarding educational qualifications, 75.7% held a bachelor's degree or higher, while 24.3% had a Higher National Diploma (HND) or lower. Descriptive statistics presented in Table 1 show that the mean and standard deviation values for all constructs were within acceptable ranges.

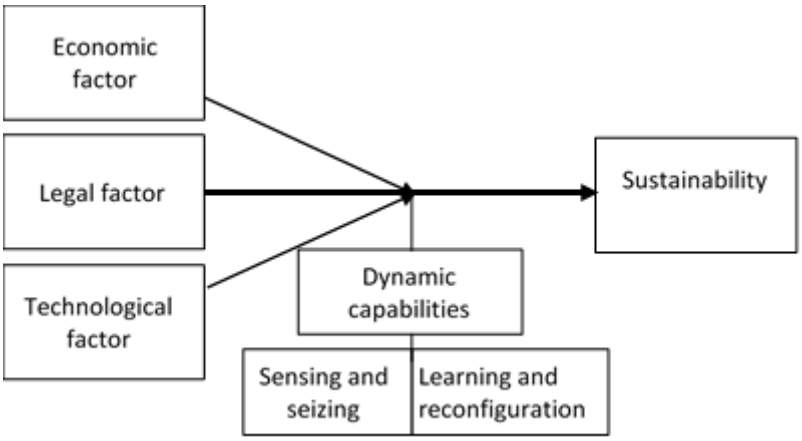

Figure 1 Conceptual framework. *Source:* Scopus Database.

Table 1 Measurement instrument showing descriptive statistics.

Constructs	Items Codes	ITEMS	Sources	Mean	SD
Economic Factor (EF)	EF1	To what extent do economic fluctuations (such as inflation, interest rates, and GDP growth) influence the sustainability of eco-tourism destinations	Bassey (2023), Ayang (2022)	4.231	0.056
	EF2	To what extent do access to financial resources and funding options significantly affect the sustainability of eco-tourism destinations against economic shocks		4.143	0.087
	EF4	To what extent do the availability of skilled labour and its cost influence the sustainable growth of eco-tourism destinations		4.321	0.084
	EF6	How do changes in exchange rates and international trade policies impact the competitiveness and sustainability of eco-tourism destinations		4.153	0.087
	EF7	Do economic uncertainties and market volatilities necessitate dynamic adaptation strategies by eco-tourism destinations to maintain sustainability		4.012	0.453
Legal Factor (LF)	LF1	To what extent do environmental protection laws (waste management regulations) influence the sustainability of eco-tourism destinations	Ebabu (2012) Bassey (2023), Ayang (2022), Siyanbola (2020)	4.532	0.054
	LF3	How do changes in government policies regarding business registration requirements and renewal of licenses impact the ability of eco-tourism destinations to sustain themselves in dynamic economic environments		4.432	0.063
	LF4	How do employment laws impact the ability of eco-tourism destinations to recruit a skilled workforce to sustain their operations		4.112	0.073

	LF5	To what extent do taxation laws affect the sustainability of eco-tourism destinations		4.101	0.088
	LF7	To what extent do health and safety regulations impact the sustainability of eco-tourism destinations		4.161	0.075
	TF1	To what extent do technological innovations influence the sustainability of eco-tourism destinations	Chen et al. (2011) Bassey (2023)	4.521	0.074
Technological Factor (TF)	TF3	How does the level of automation and digitalisation impact the ability of eco-tourism destinations to sustain their operations amidst environmental challenges		5.011	0.084
	TF4	To what extent do the quality of information technology infrastructure and e-commerce platforms contribute to enhancing the sustainability of eco-tourism destinations		4.221	0.213
	TF5	To what extent do the adoption of mobile technology and Internet of Things (IoT) solutions empower eco-tourism destinations to respond effectively to environmental changes		4.001	0.064
	TF6	How do biotechnological advancements and the adoption of renewable energy technologies impact the sustainability of eco-tourism destinations		4.351	0.053
	SUS1	To what extent do eco-tourism destinations prioritise energy efficiency improvements in their operational strategies to enhance sustainability	Ayang (2022), Siyanbola (2020)	4.342	0.083
Sustainability (SUS)	SUS3	Do eco-tourism destinations actively engage in waste reduction and recycling practices within their operations to enhance sustainability		4.732	0.089
	SUS5	To what extent does regulatory compliance enhance the sustainability of eco-tourism destinations		4.544	0.093
	SUS7	To what extent does technology adoption enhance the sustainability of eco-tourism destinations		4.543	0.091
	SUS8	To what extent do eco-tourism destinations prioritise green product development and water conservation as part of their sustainability strategy		4.435	0.089
	S&S1	To what extent do eco-tourism destinations perceive changes in their external environment that could impact their sustainability	Teece (2007), Belitski and Khalil (2020), Kareem and Alameer (2019), Pervan et al. (2018)	4.331	0.084
Sensing and Seizing (S&S)	S&S2	How effective are eco-tourism destinations in identifying opportunities, emerging market trends, and competitive threats through environmental scanning		4.632	0.078
	S&S5	To what extent do eco-tourism destinations possess the ability to quickly capitalise on identified opportunities to enhance sustainability		4.125	0.081
	S&S6	To what extent do eco-tourism destinations allocate resources and adjust their design and strategies to seize opportunities and mitigate threats to sustainability		5.124	0.073
	L&R1	To what extent do eco-tourism destinations reconfigure and transform existing resources and strategies to address the prevailing changes in market conditions	Teece (2007), Rehman and Saeed (2015), Hawass(2010)	4.653	0.086
Learning and Reconfiguration (L&R)	L&R3	To what extent do eco-tourism destinations prioritise organisational learning processes to adapt to changing environmental forces		4.531	0.093

L&R4	To what extent does the continuous acquisition of new knowledge through training influence the sustainability of eco-tourism destinations	4.453	0.073
L&R6	Does the capacity to reallocate resources in response to changes in the external environment affect the sustainability of eco-tourism destinations	4.216	0.071

Source: Scopus Database.

4. Results

Structural equation modelling (SEM) using Smart PLS 3 software was utilised to analyse and test hypotheses in the study. A measurement model assessment was performed to ensure content, discriminant, and convergent validity. The items were evaluated to confirm they accurately measured the constructs. The results of the convergent validity of the questionnaire instrument are shown in Table 2. Hair et al. (2019) recommendations were followed when evaluating the factor structure indices of the questionnaire instrument. Standardised Factor Loadings (SFL > 0.70), Composite Reliability (CR > 0.50), Average Variance Extracted (AVE > 0.50), and Cronbach's alpha (α > 0.70) were all retained in the model. Additionally, collinearity statistics showed no concerns regarding multicollinearity, as the tolerance values were above 0.1, and VIF did not exceed 10, as recommended by Hair et al. (2010).

Table 2 Results of convergent validity for the measurement instrument.

Constructs	Items Codes	SFL	AVE	CR	Cronbach Alpha A	Collinearity Statistics	
						Tolerance	VIF
Economic Factor (EF)	EF1	0.812	0.591	0.890	0.887	.421	1.451
	EF2	0.793					
	EF4	0.864					
	EF6	0.792					
	EF7	0.718					
Legal Factor (LF)	LF1	0.721	0.632	0.853	0.953	.443	1.432
	LF3	0.849					
	LF4	0.764					
	LF5	0.875					
	LF7	0.865					
Technological Factor (TF)	TF1	0.878	0.588	0.854	0.935	.431	1.432
	TF3	0.985					
	TF4	0.875					
	TF5	0.892					
	TF6	0.878					
Sustainability (SUS)	SUS1	0.877	0.587	0.894	0.885	.401	1.421
	SUS3	0.898					
	SUS5	0.784					
	SUS7	0.933					
	SUS8	0.905					
Sensing and Seizing (S&S)	S&S1	0.894	0.591	0.874	0.861	.413	1.432
	S&S2	0.787					
	S&S5	0.877					
	S&S6	0.854					
Learning and Reconfiguration (L&R)	L&R1	0.895	0.681	0.852	0.919	.443	1.442
	L&R3	0.865					
	L&R4	0.843					
	L&R6	0.912					
		Summary of model fit indexes					
		CMIN/DF	RMSEA	CFI	GFI		
		2.973	0.058	0.972	0.954		

Source: Researchers compilation (2025).

The Hetero-Trait Mono-Trait Ratio (HTMT) was employed to evaluate the Discriminant validity of the measurement instrument, with Table 3 presenting the summary of the HTMT ratio results. Indicatively, all obtained values were below the threshold of 0.90 (Henseler et al., 2014), indicating satisfactory results with no concerns about discriminant validity.

Table 3 HTMT Ratio.

Constructs	SUS	EF	LF	TF	S&S	L&R
SUS						
EF	0.752					
LF	0.523	0.742				
TF	0.665	0.683	0.761			
S&S	0.757	0.578	0.652	0.772		
L&R	0.613	0.686	0.594	0.674	0.765	

Source: Researchers compilation (2025).

4.1. Assessment of the structural equation model (SEM)

In conducting the analysis, path coefficients (β) and t-statistics were used to assess the SEM model, as shown in Figure 2. However, the analysis employed the bootstrapping method. The research hypotheses are two-tailed, with a t-value above 1.96 at a 5% significance level deemed acceptable. Concerning the path coefficient (β-value), a higher value signifies a greater impact on the dependent constructs (sustainability). The bootstrapping results are displayed in Table 4.

Table 4 Summary of hypotheses testing and moderating results.

Hypotheses	Relationships	β	t-value	p-value	LL	UL	Decision
H1	EF- -> SUS	0.667	5.342	0.0003	0.082	0.621	Supported
H2	LF - -> SUS	0.734	6.983	0.0002	0.811	0.912	Supported
H3	TF - -> SUS	0.512	7.453	0.0002	0.087	0.723	Supported
H4	S&S - -> ENVF- -> SUS	0.423	4.546	0.0000	0.045	0.523	Supported
H5	L&R - -> ENVF- -> SUS	0.301	4.432	0.0001	0.043	0.532	Supported

Source: Researchers compilation (2025).

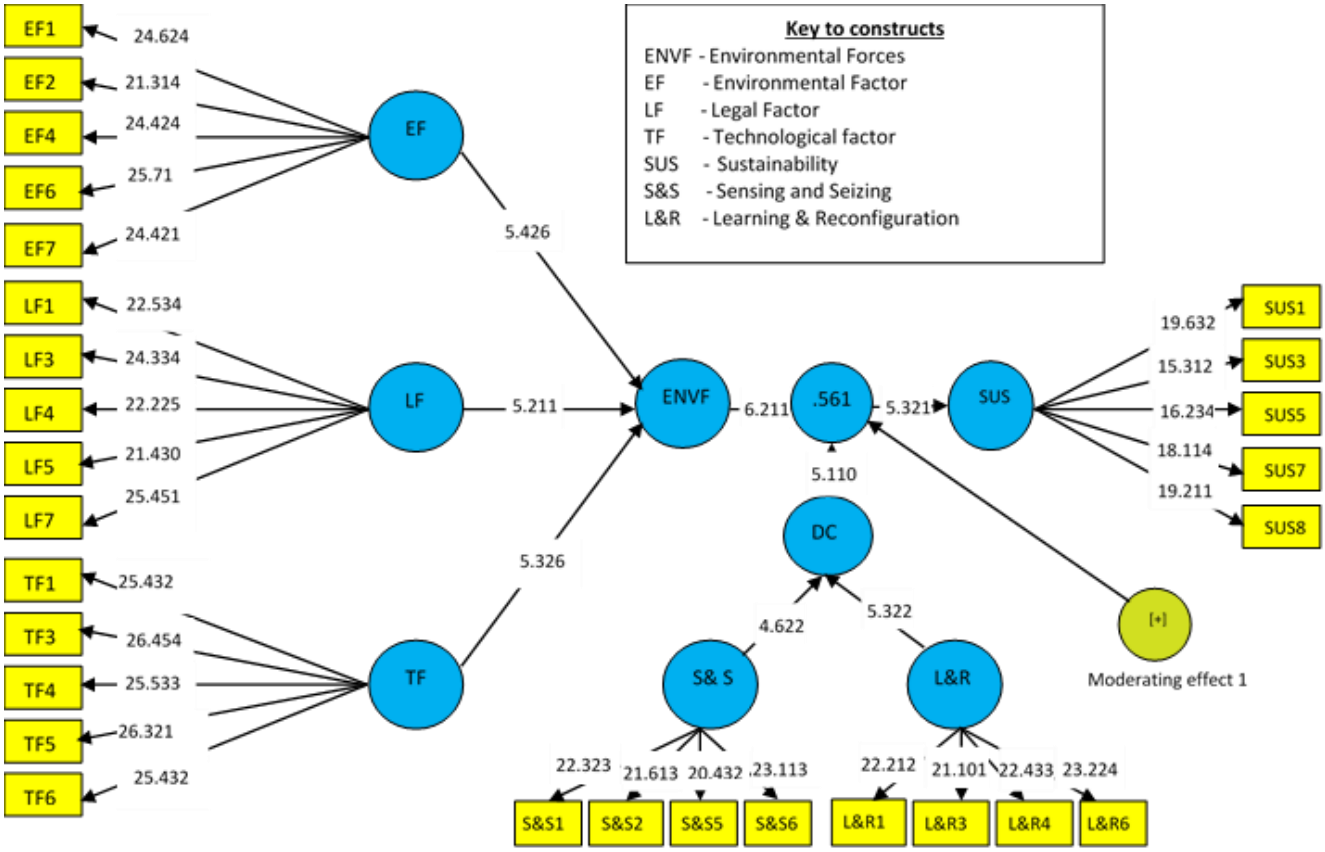

Figure 2 Assessment of the structural equation model (SEM). *Source:* Scopus Database.

Hypothesis one (H1) assessed the influence of the economic environment on the sustainability of eco-tourism destinations. The summary results presented in Table 4 show that H1 was supported (β = 0.667, t = 5.342, p = 0.0003; 95% CI: LL = 0.082, UL = 0.621). This indicates that the economic environment significantly influences the sustainability of eco-tourism destinations. Hypothesis 2 (H2) assessed the influence of the legal environment on the sustainability of eco-tourism destinations. The analysis showed strong support for H2 (β = 0.734, t = 6.983, p = 0.0002; 95% CI: LL = 0.811, UL = 0.912), indicating that the legal environment significantly impacts the sustainability of eco-tourism destinations. Hypothesis three (H3) focused on the influence of the technological environment. The analysis yielded: β = 0.512, t = 7.453, p = 0.0002; 95% CI: LL = 0.087, UL = 0.723. These results support H3, suggesting that the technological environment significantly impacts the sustainability of eco-tourism destinations. To assess moderation, hypothesis four (H4) tested whether sensing and seizing capabilities moderate the relationship between environmental forces and sustainability. The results were: β = 0.423, t = 4.546, p < 0.0001; 95% CI: LL = 0.045, UL = 0.523. This supports H4, indicating that sensing and seizing capabilities significantly moderate the influence of environmental forces on the sustainability of eco-tourism destinations. Finally, hypothesis five (H5) examined the moderating role of learning and reconfiguration capabilities. The findings were: β = 0.301, t = 4.432, p = 0.0001; 95% CI: LL = 0.043, UL = 0.532. This result supports H5, suggesting that learning and reconfiguration capabilities significantly moderate the effect of environmental factors on the sustainability of eco-tourism destinations.

5. Discussion

The study examined how dynamic capabilities (sensing and seizing, and learning and reconfiguration) influence the way environmental forces (economic, legal, and technological) affect the sustainability of eco-tourism destinations. The results confirmed the impact of environmental forces on the sustainability of these destinations. H1 affirms that the economic environment significantly affects the sustainability of eco-tourism destinations. This finding is especially important for a developing country like Nigeria, considering its volatile and often unpredictable economic landscape. Nigeria's eco-tourism destinations operate within an economic context characterised by persistent inflation, fluctuating interest rates, limited access to affordable finance, and unstable GDP growth—all of which directly affect their sustainability and long-term viability. Research such as Wang (2024) and Del Rosario Reyes-Santiago et al. (2019) stresses that economic factors are not merely external influences but fundamental determinants of whether eco-tourism destinations thrive, expand, or fail. In Nigeria, high inflation and interest rates diminish purchasing power and raise the cost of borrowing, while restricted access to credit remains a substantial barrier for eco-tourism ventures due to strict lending conditions and limited financial infrastructure. Additionally, the country's macroeconomic instability, driven by reliance on oil revenues and susceptibility to global shocks, creates a highly volatile operational environment. Likewise, the findings of H2 show that the legal framework significantly impacts the sustainability of eco-tourism destinations. The importance of this is that clear and enforceable legal structures are crucial for Nigerian eco-tourism destinations to gain stakeholder trust, attract investments, and develop strategic plans. As Ufua et al. (2020) and Nyarku and Oduro (2017) suggest, well-designed legal frameworks improve decision-making and establish a stable basis for long-term sustainability. Furthermore, Nigeria's struggle with regulatory overlaps heightens the legal challenges faced by eco-tourism destinations. Managing these issues often requires substantial legal and administrative capacity, which many eco-tourism operators lack. In such an environment, compliance with ethical standards and legal regulations becomes a vital, though challenging, requirement for survival and growth.

Furthermore, the study demonstrated a significant influence of the technological environment on the sustainability of eco-tourism destinations (H3). This finding aligns with studies by Valdez-Juárez et al. (2023), which emphasised the transformative role of technology in boosting eco-tourism competitiveness and innovation capabilities. Technological advancements, including digitalisation, automation, and access to advanced tools and platforms, allow eco-tourism destinations to enhance efficiency, respond to changing market demands, and explore new growth opportunities (Vrontis et al., 2022; Chege & Wang, 2020). The results of H4 indicate that sensing and seizing capabilities moderate the impact of environmental forces on the sustainability of eco-tourism destinations. This is supported by Engelmann (2023), who stressed the importance of dynamic capabilities, such as sensing market opportunities and rapidly seizing them, in improving eco-tourism destinations' adaptive capacity and sustainability. Detecting changes in the external environment and quickly seizing emerging opportunities can help eco-tourism destinations better manage uncertainties and maintain their operations, thereby enhancing business sustainability (Teece, 2007; Kurtz & Varvákis, 2016). In a volatile environment like Nigeria, eco-tourism destinations that can sense market shifts, policy changes, or customer needs, and act swiftly to seize new opportunities, are better equipped to adapt and flourish.

Lastly, the confirmation of H5, highlighting the moderating role of learning and reconfiguration capabilities on the sustainability of eco-tourism destinations, is highly relevant in a developing country like Nigeria. These capabilities involve continuous learning and the adaptive reconfiguration of resources and processes in response to environmental changes (Eisenhardt & Martin, 2000). As Forés et al. (2023) suggest, eco-tourism destinations that learn continuously and adaptively reconfigure resources are more likely to withstand such instability. In Nigeria, many eco-tourism destinations operate in unpredictable environments, where rigid business models often fail. Therefore, firms need to pivot in response to shocks such as inflation or shifts in consumer demand. However, most Nigerian eco-tourism destinations lack formal structures for

organisational learning or resource realignment, limiting their adaptability. Consequently, this finding underscores the need for innovation-driven training to strengthen eco-tourism destinations' learning and reconfiguration capacities.

6. Conclusion

The findings of this study revealed the moderating role of dynamic capabilities in reducing the impact of environmental forces on the sustainability of eco-tourism destinations. The economic, legal, and technological environments affect the long-term viability and sustainability of these destinations. However, based on dynamic capability theory, the results highlighted the importance of sensing, seizing, learning, and reconfiguration capabilities in moderating how the economic, legal, and technological factors influence eco-tourism sustainability. The connection between dynamic capabilities as a moderating factor in lessening environmental forces' effects on eco-tourism sustainability is crucial for understanding how destinations can manage and succeed in complex business environments. Dynamic capabilities improve an eco-tourism destination's ability to adapt, innovate, and respond effectively to external changes. These capabilities are particularly important for eco-tourism destinations operating in highly dynamic markets where environmental forces such as economic shifts, regulatory updates, and technological progress can significantly affect their sustainability.

7. Practical Implications

This study's findings offer practical applications for eco-tourism destinations seeking to improve their sustainability amidst challenging business environments. Firstly, these eco-tourism destinations can utilise their dynamic capabilities, including sensing, seizing, learning, and reconfiguration, to adapt and respond effectively to changing market conditions. Through investment in market intelligence, nurturing an innovation-driven culture, and building strategic partnerships, eco-tourism destinations can strengthen their ability to identify market opportunities, grab emerging trends, and reconfigure their resources to capitalise on growth potentials. Moreover, they should focus on complying with legal frameworks and regulations, safeguarding intellectual property rights, and fostering an innovative atmosphere by adopting new technologies that can enhance competitiveness to stay sustainable in today's digital economy. Lastly, eco-tourism destinations can invest in organisational learning initiatives, promote experimentation, and facilitate knowledge sharing to improve their adaptive capacity and sustainability amid environmental uncertainties.

8. Theoretical Implications

The study contributes theoretically by expanding the understanding of dynamic capabilities in the context of eco-tourism destinations' sustainability. Based on dynamic capability theory, the findings highlight the important roles of sensing, seizing, learning, and reconfiguration capabilities in moderating how environmental forces affect the sustainability of eco-tourism destinations. By examining how these dynamic capabilities influence environmental forces, the study advances theoretical knowledge about eco-tourism destinations' adaptive capacity and sustainability in changing business environments. Furthermore, by grounding the research in dynamic capability theory, it offers a solid framework for exploring how eco-tourism destinations can maintain competitiveness in a challenging business setting.

Acknowledgment

The authors thank the anonymous reviewers, the journal editor, all the scholars whose work was cited in this study, and the respondents who contributed essential data to this study.

Ethical Considerations

This study adhered to ethical guidelines established by the University of Calabar and complied with national and international research standards. The University's Ethical Review Board approved the research protocol, and informed consent was obtained from the management of eco-tourism destinations and all participating individuals before the study commenced.

Conflict of Interest

All authors declare no conflicts of interest.

Funding

This research did not receive any financial support.

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