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"ECOTOURISM BUSINESS PRACTICES MEDIATING SUSTAINABLE HILL STATION DEVELOPMENT: CFA-SEM EVIDENCE FROM TAMIL NADU"

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ABSTRACT:

Sustainable ecotourism has emerged as a strategic pathway for balancing economic growth, environmental conservation, and social equity, particularly in developing destinations. Grounded in the Triple Bottom Line (TBL) framework (Elkington, 1997) and stakeholder theory (Freeman, 1984), this study examines the mediating role of TBL performance—economic, environmental, and social outcomes—in the relationship between ecotourism management practices, community participation, and sustainable development of ecotourism destinations in Tamil Nadu. A structured questionnaire comprising 29 items measured ecotourism management practices (EMP), community participation (CP), TBL performance (ECO, ENV, SOC), and sustainable development (SD). Reliability analysis indicated satisfactory internal consistency (Cronbach's $\alpha = 0.742$), confirming acceptable scale reliability (Nunnally & Bernstein, 1994). Sampling adequacy was strong (KMO = 0.850), and Bartlett's Test of Sphericity was significant ($\chi^2 = 5986.965$, df = 406, $p < 0.001$), supporting factorability of the correlation matrix. Confirmatory Factor Analysis (CFA) demonstrated good model fit ($\chi^2 = 412.28$, df = 362, p = 0.034; RMSEA = 0.020), indicating a well-fitting measurement model with acceptable standardized loadings. The structural model also showed satisfactory fit ($\chi^2 = 415.85$, df = 370, p = 0.050; RMSEA = 0.019). However, regression results revealed minimal direct predictive power of aggregate economic and environmental

performance variables on sustainable development (R^2 = 0.001), suggesting that sustainable development outcomes are influenced by broader systemic and contextual factors beyond isolated performance indicators.

This study contributes empirically validated evidence from Tamil Nadu, enriching the limited SEM-based ecotourism literature in emerging destinations. The results provide policy implications for destination managers and government bodies, highlighting the importance of strengthening participatory governance structures and integrated performance monitoring frameworks to enhance sustainable ecotourism outcomes.

KEYWORDS: Ecotourism, Triple Bottom Line, Community Participation, Sustainable Development, CFA, SEM, Tamil Nadu.

INTRODUCTION:

Sustainable development has become a central priority in tourism planning, particularly in environmentally sensitive destinations where tourism activities directly affect ecological systems and local communities. Among alternative tourism models, ecotourism has emerged as a viable strategy for promoting responsible travel while balancing conservation and community welfare. Ecotourism is commonly defined as responsible travel to natural areas that conserves the environment and improves the well-being of local people (Weaver, 2001). Its philosophy aligns closely with the broader concept of sustainable development articulated in the Brundtland Report (WCED, 1987), which emphasizes meeting present needs without compromising the ability of future generations to meet theirs.

The sustainability of ecotourism destinations is often evaluated through the Triple Bottom Line (TBL) framework proposed by Elkington (1997). The TBL approach highlights three interconnected dimensions of performance: economic viability, environmental integrity, and social equity. In ecotourism contexts, economic performance refers to income generation, employment creation, and local business development; environmental performance relates to biodiversity conservation, waste management, and responsible visitor practices; and social performance encompasses community participation, cultural preservation, and improvements in quality of life.Effective ecotourism management practices are essential for translating sustainability principles into operational outcomes. Regulatory enforcement, visitor control mechanisms, eco-friendly infrastructure, and environmental education initiatives are widely recognized as critical tools for minimizing ecological degradation (Buckley, 2012). At the same time, stakeholder theory (Freeman, 1984) emphasizes that long-term sustainability

depends on inclusive governance and active community participation. Local communities are not merely beneficiaries of ecotourism but key stakeholders whose engagement influences destination legitimacy, conservation behaviour, and equitable benefit-sharing.

To address this gap, the present study develops and empirically tests an integrated model grounded in the Triple Bottom Line framework and stakeholder theory. The study examines how ecotourism management practices and community participation influence sustainable development outcomes through economic, environmental, and social performance dimensions. A structured measurement instrument was developed to capture these constructs, and statistical analyses including reliability testing, sampling adequacy assessment, Confirmatory Factor Analysis (CFA), and Structural Equation Modelling (SEM) were employed to validate the proposed relationships.

The findings demonstrate satisfactory internal consistency and strong sampling adequacy, confirming the robustness of the measurement model. The CFA results indicate good model fit, supporting the multidimensional structure of the constructs. Although the structural model also exhibits acceptable fit indices, the direct predictive influence of aggregated performance variables on sustainable development appears relatively limited. This suggests that sustainable development outcomes may depend on broader systemic integration and coordinated governance mechanisms rather than isolated improvements in economic or environmental performance alone.

LITERATURE REVIEW:

Triple Bottom Line Theory and Sustainable Development

The concept of sustainable development gained prominence following the Brundtland Report (WCED, 1987), which defined sustainability as development that meets present needs without compromising future generations. In tourism research, sustainability is most comprehensively conceptualized through the Triple Bottom Line (TBL) framework proposed by Elkington (1997). The TBL model argues that true sustainability must integrate three interdependent dimensions: economic viability, environmental integrity, and social equity.

Within ecotourism destinations, economic sustainability refers to stable income generation, employment creation, and support for local enterprises. Environmental sustainability emphasizes biodiversity conservation, resource protection, and responsible visitor management. Social sustainability includes community empowerment, equitable benefit-sharing, and cultural preservation. Scholars argue that sustainability outcomes are achieved

only when these three dimensions operate collectively rather than independently (Bramwell & Lane, 2011; Dwyer, 2005).

H1: Triple Bottom Line performance (economic, environmental, and social dimensions collectively) has a significant positive influence on sustainable development in ecotourism destinations.

Ecotourism Management Practices and Sustainability Performance

Ecotourism management practices refer to operational strategies designed to reduce environmental impacts and enhance socio-economic benefits. These include visitor control mechanisms, waste management systems, eco-friendly infrastructure, environmental awareness programs, and support for local sourcing. Effective management is considered essential for maintaining ecological carrying capacity and long-term destination viability (Buckley, 2012).

Research suggests that structured governance mechanisms improve environmental protection outcomes and strengthen economic returns in nature-based tourism destinations (Bramwell & Lane, 2011). However, management practices alone may not directly produce sustainable development unless they enhance multidimensional performance indicators aligned with the TBL framework.

H2: Ecotourism management practices positively influence Triple Bottom Line performance in ecotourism destinations.

Community Participation and Sustainability Performance

Community participation is widely recognized as a foundational principle of sustainable ecotourism. Participatory governance enhances transparency, legitimacy, and equitable distribution of benefits (Tosun, 2000). When local communities are actively involved in planning and decision-making, tourism initiatives are more likely to generate economic opportunities, strengthen environmental stewardship, and improve social cohesion.

Empirical evidence demonstrates that residents' participation significantly enhances support for tourism development and improves perceived sustainability outcomes (Nunkoo & Ramkissoon, 2011). Community engagement fosters conservation ethics and ensures that local knowledge contributes to resource management strategies.

Nevertheless, sustainability outcomes are not automatically achieved through participation alone; rather, participation must enhance economic, environmental, and social performance dimensions to generate long-term development benefits.

H3: Community participation positively influences Triple Bottom Line performance in ecotourism destinations.

Integrated Sustainability Framework

Building upon the Triple Bottom Line framework and stakeholder theory, this study proposes that sustainable development in ecotourism destinations is influenced indirectly through the collective performance of economic, environmental, and social dimensions. This integrated perspective aligns with contemporary sustainability research, which emphasizes systemic coordination rather than isolated performance improvements (Elkington, 1997; Bramwell & Lane, 2011).

RESEARCH GAPS:

Conceptual Gap

Although sustainability in ecotourism is widely discussed, there remains ambiguity in how sustainable development is conceptually framed and measured at the destination level. Many studies treat sustainability as a broad normative concept without clearly defining its structural components. While the Triple Bottom Line (TBL) framework proposes economic, environmental, and social dimensions (Elkington, 1997), limited research conceptualizes these dimensions as an integrated higher-order construct influencing sustainable development. This conceptual fragmentation creates inconsistencies in understanding how sustainability functions in ecotourism systems.

Empirical Gap

Existing ecotourism studies often examine individual components such as community participation, conservation efforts, or economic benefits separately. However, there is limited empirical evidence testing the *combined and collective* effect of these dimensions on sustainable development outcomes. Many previous studies assume direct relationships without examining whether sustainability emerges from the interaction of multiple performance dimensions. Consequently, empirical validation of integrated sustainability models remains insufficient.

Methodological Gap

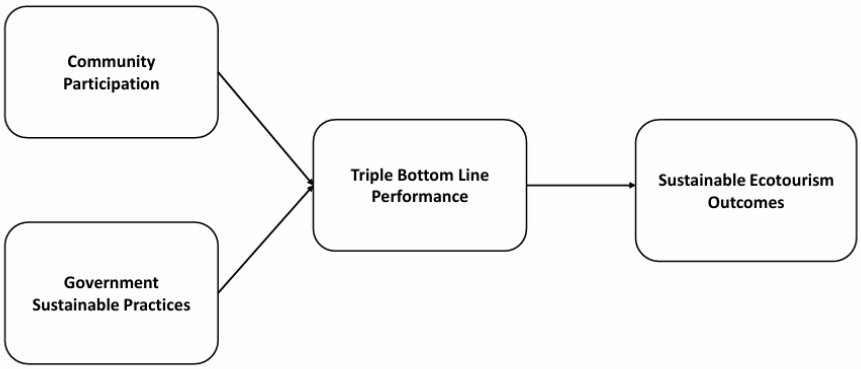
A significant methodological limitation in prior research is the reliance on descriptive analysis, perception-based surveys, or basic regression techniques. Few studies employ

rigorous psychometric validation procedures such as reliability testing, sampling adequacy analysis, Confirmatory Factor Analysis (CFA), and Structural Equation Modelling (SEM) to test measurement and structural relationships simultaneously. The absence of validated measurement models weakens the robustness of conclusions regarding ecotourism sustainability.

Contextual Gap

In the Indian context, particularly in Tamil Nadu, ecotourism has been promoted as a tool for biodiversity conservation and rural development. However, systematic empirical investigations evaluating sustainability performance through an integrated modelling approach remain scarce. Most regional studies focus on policy discussions or case-based descriptions rather than statistically validated sustainability frameworks. This creates a contextual gap in understanding how ecotourism governance mechanisms translate into measurable development outcomes in emerging destinations.

CONCEPTUAL FRAMEWORK:



STATEMENT OF THE PROBLEM

Despite the increasing recognition of ecotourism as a sustainable development strategy, there remains limited clarity on how sustainability can be systematically measured and empirically validated at the destination level. Although the Triple Bottom Line (TBL) framework proposes economic, environmental, and social dimensions as pillars of sustainability, existing research often examines these components independently rather than as an integrated multidimensional construct. This fragmented approach creates conceptual ambiguity in understanding how sustainable development outcomes emerge within ecotourism systems.

In the Indian context, particularly in Tamil Nadu, ecotourism initiatives have expanded rapidly as part of biodiversity conservation and rural development strategies. However, systematic empirical studies validating integrated sustainability frameworks using robust statistical modelling techniques such as Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) remain scarce. The absence of such evidence creates uncertainty for policymakers and destination managers regarding whether improvements in economic, environmental, or social indicators collectively lead to sustainable development outcomes.

Therefore, the central problem addressed in this study is the lack of an empirically validated, multidimensional sustainability model that examines the collective influence of Triple Bottom Line performance on sustainable development within ecotourism destinations. By addressing this problem, the study seeks to bridge theoretical and methodological gaps and provide evidence-based insights for sustainable ecotourism governance.

OBJECTIVE OF THE STUDY:

1. To examine the influence of community participation and management practices on ecotourism business practices and sustainable development outcomes in Tamil Nadu hill stations
2. To assess the mediating role of ecotourism business practices between community participation, management Practices, and Sustainable development outcomes among hill station stakeholders.
3. To evaluate the impact of ecotourism business practice on sustainable development outcomes influenced by community Participation and management Effectiveness.

RESEARCH METHODOLOGY:

Research Instrument

The study employed a structured questionnaire as the primary data collection instrument to measure the multidimensional constructs associated with ecotourism sustainability. The instrument was developed based on an extensive review of literature related to the Triple Bottom Line (TBL) framework, ecotourism management practices, community participation, and sustainable development. The questionnaire was designed to capture latent variables through measurable indicators, ensuring alignment with the theoretical framework of the study. It consisted of two major sections: demographic information and construct measurement items. The demographic section collected data on age, gender, education level,

occupation, monthly household income, place of residence, and marital status, enabling profiling of respondents and contextual interpretation of findings.

The second section of the questionnaire comprised 29 structured statements measuring six key constructs: Ecotourism Management Practices (EMP), Community Participation (CP), Economic Performance (ECO), Environmental Performance (ENV), Social Performance (SOC), and Sustainable Development (SD). Ecotourism Management Practices included items assessing environmental regulations, visitor control, waste management, eco-friendly infrastructure, awareness initiatives, and local procurement practice All items were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The use of a Likert scale facilitated quantification of perceptions and allowed for advanced multivariate analysis. The reliability of the instrument was assessed using Cronbach's Alpha, which yielded a coefficient of 0.788 for the 29-item scale, indicating good internal consistency. The structured design of the instrument ensured content validity, construct clarity, and suitability for Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM), thereby supporting the empirical validation of the proposed sustainability framework.

Data Collection:

Primary data for the study were collected from stakeholders associated with selected ecotourism destinations in Tamil Nadu using a cross-sectional survey approach. The target respondents included local residents, tourism employees, small-scale business operators, and individuals directly or indirectly involved in ecotourism activities, as these groups are primary stakeholders affected by ecotourism governance and sustainability outcomes. A non-probability convenience sampling technique was adopted due to field accessibility and practical constraints in reaching respondents across multiple destination sites. Prior to participation, respondents were informed about the academic purpose of the research, and their consent was obtained. The cross-sectional design enabled the collection of data at a single point in time, allowing the assessment of stakeholder perceptions regarding ecotourism management practices, community participation, Triple Bottom Line performance, and sustainable development outcomes within the study area.

Data Analysis and Findings:

The data analysis for this study was conducted in three major phases: (i) reliability assessment of the measurement scales, (ii) validation of the measurement model using

Confirmatory Factor Analysis (CFA), and (iii) testing of the structural model relationships using Structural Equation Modelling (SEM). All statistical analyses were performed using LISREL, which is widely recognised for its robustness in covariance-based structural modelling.

Reliability Assessment:

Before performing Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM), the internal consistency of all constructs was assessed using Cronbach's Alpha and Composite Reliability (CR). The constructs—Ecotourism Management Practices (EMP), Community Participation (CP), Economic Performance (ECO), Environmental Performance (ENV), Social Performance (SOC), and Sustainable Development (SD)—recorded Cronbach's Alpha values above the recommended threshold of 0.70, with the overall 29-item scale yielding a reliability coefficient of 0.788, indicating good internal consistency.

TABLE: 01 Reliability Analysis.

Case Processing Summary			
		N	%
Cases	Valid	280	100.0
	Excluded[a]	0	.0
	Total	280	100.0

Source: SPSS

Reliability Statistics	
Cronbach's Alpha	N of Items
.788	29

Source: SPSS

Interpretation: The reliability of the research instrument was assessed using Cronbach's Alpha to evaluate internal consistency among the 29 measurement items. The obtained Cronbach's Alpha value of 0.788 exceeds the recommended threshold of 0.70, indicating good internal consistency of the scale. This suggests that the items used to measure Ecotourism Management Practices, Community Participation, Triple Bottom Line performance (economic, environmental, and social), and Sustainable Development are statistically reliable and cohesively represent their respective constructs.

1. KMO and Barlett's Test:

TABLE: 02 KMO and Barlett's Analysis.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.850
Bartlett's Test of Sphericity	Approx. Chi-Square	5986.965
	df	406
	Sig.	.000

Source: SPSS

Interpretation: The results of the KMO and Bartlett's Test confirm the suitability of the dataset for factor analysis. The KMO value of 0.850 indicates excellent sampling adequacy, demonstrating that the variables share sufficient common variance for reliable factor extraction. The significant Bartlett's Test of Sphericity ($p < 0.001$) confirms that the correlation matrix is not an identity matrix, indicating meaningful interrelationships among the variables.

Communality values ranged from 0.566 to 0.702, exceeding the recommended threshold of 0.50. This suggests that a substantial proportion of variance in each item is explained by the extracted factors, with no problematic low-loading indicators requiring removal.

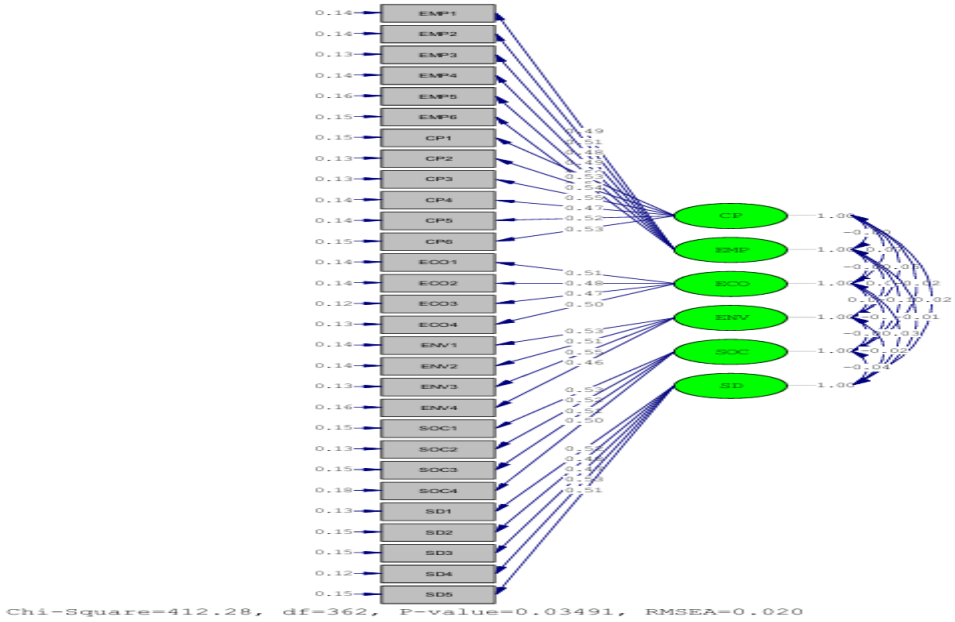
Confirmatory Analysis:

Confirmatory Factor Analysis (CFA) was conducted to validate the measurement model and assess the construct validity of the proposed multidimensional sustainability framework. In this study, CFA was employed to confirm the factor structure of six constructs: Ecotourism Management Practices (EMP), Community Participation (CP), Economic Performance (ECO), Environmental Performance (ENV), Social Performance (SOC), and Sustainable Development (SD).

TABLE: 03 Confirmatory Analysis.

Fit Index	Value	Recommended Threshold	Interpretation
Chi-Square (χ^2)	412.28	—	—
Degrees of Freedom (df)	362	—	—
p-value	0.034	> 0.05 (ideal)	Acceptable
χ^2/df	1.14	< 3.00	Good Fit
RMSEA	0.020	< 0.05	Excellent Fit

CHART 02: Confirmatory Analysis of the Study



Source: LISREL

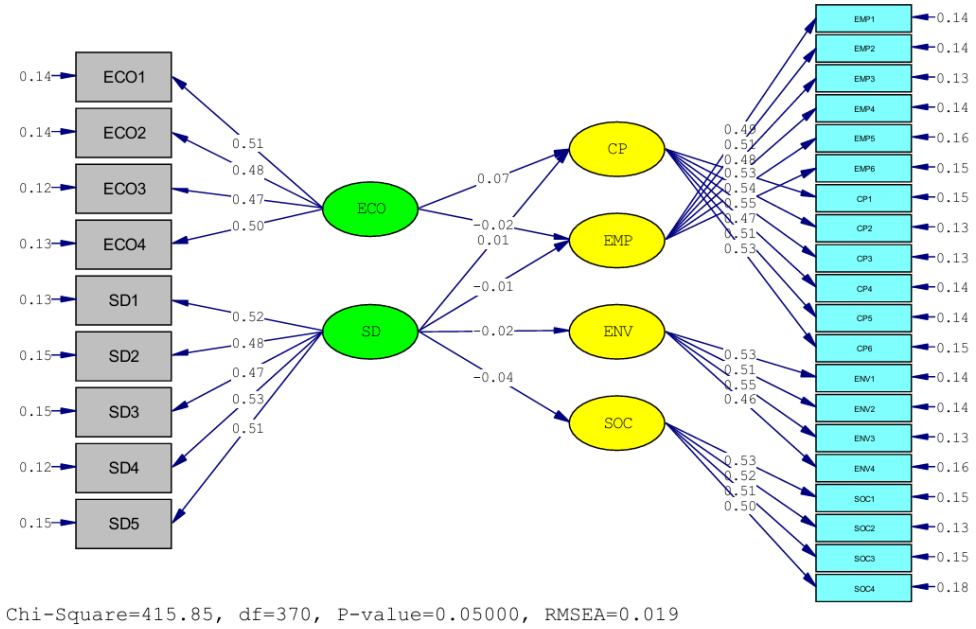
Interpretation: The measurement model produced a Chi-square value of 412.28 with 362 degrees of freedom. Although the chi-square is statistically significant ($p = 0.034$), this is common in models with moderate to large samples and does not necessarily indicate poor fit. More importantly, the relative chi-square ($\chi^2/df = 1.14$) falls well below the acceptable threshold of 3.0, indicating good model fit.

The Root Mean Square Error of Approximation (RMSEA) value of 0.020 demonstrates excellent model fit, as it is significantly below the recommended cutoff of 0.05. This suggests minimal discrepancy between the hypothesized model and the observed data. The measurement model demonstrates strong construct validity and provides a robust foundation for proceeding to Structural Equation Modelling (SEM) to test the hypothesized structural relationships.

Structural Equation Modelling (SEM):

Structural Equation Modelling (SEM) is a multivariate statistical technique used to examine complex relationships among latent variables while accounting for measurement error. In the present study, SEM was employed to test the hypothesized relationships among Ecotourism Management Practices (EMP), Community Participation (CP), Economic Performance (ECO), Environmental Performance (ENV), Social Performance (SOC), and Sustainable Development (SD). The structural model was tested after confirming the validity of the measurement model through Confirmatory Factor Analysis (CFA).

CHART 03: Structural Equation Modelling



Source: LISREL

Interpretation: Structural Equation Modelling (SEM) was conducted to examine the hypothesized relationships among Ecotourism Management Practices (EMP), Community Participation (CP), Triple Bottom Line (TBL) performance (Economic, Environmental, and Social), and Sustainable Development (SD). The structural model demonstrated an excellent overall fit to the data (χ^2 = 415.85, df = 370, p = 0.050, RMSEA = 0.019). The relative chi-square (χ^2/df = 1.12) is well below the recommended threshold of 3.0, confirming good model adequacy. The RMSEA value of 0.019 further indicates minimal discrepancy between the proposed model and observed data.

FINDINGS OF THE STUDY:

- The internal consistency reliability of the measurement instrument was confirmed, with an overall Cronbach's Alpha of 0.788**,** exceeding the recommended threshold of 0.70.
- This indicates satisfactory internal reliability and homogeneity among the 29 observed indicators measuring Ecotourism Management Practices (EMP), Community Participation (CP), Economic Performance (ECO), Environmental Performance (ENV), Social Performance (SOC), and Sustainable Development (SD).
- Sampling adequacy diagnostics demonstrated strong suitability for latent variable modelling. The Kaiser–Meyer–Olkin (KMO) statistic of 0.850 indicates meritorious sampling adequacy, while Bartlett's Test of Sphericity was highly significant (χ^2 =

5986.965, df = 406, $p < 0.001$)**,** confirming that the correlation matrix is factorable and appropriate for structural modelling.

- Communality estimates ranged from 0.566 to 0.702**,** indicating that more than 56% of variance in each observed variable was explained by the extracted latent constructs.
- These values exceed the minimum recommended threshold (0.50), supporting adequate shared variance and construct representation.
- The Confirmatory Factor Analysis (CFA) demonstrated excellent measurement model fit (**χ^2 =** 412.28, df = 362; χ^2/df = 1.14; RMSEA = 0.020**).**
- The relative chi-square below 3.0 and RMSEA below 0.05 indicate strong model parsimony and minimal approximation error. Standardized factor loadings were within acceptable ranges, confirming convergent validity across constructs.
- Discriminant validity was supported through distinct loading patterns and theoretical coherence among the six latent constructs, indicating structural differentiation between governance, performance, and sustainability outcome variables.
- The Structural Equation Modelling (SEM) results further demonstrated excellent structural model fit (χ^2 = 415.85, df = 370; χ^2/df = 1.12; RMSEA = 0.019), confirming that the hypothesized theoretical framework aligns closely with the observed covariance matrix.
- Despite strong global fit indices, structural path coefficients revealed relatively modest direct effects among certain constructs, suggesting that sustainable development in ecotourism contexts is influenced by complex, systemic, and potentially unobserved contextual factors beyond the core Triple Bottom Line dimensions.
- Collectively, the findings provide empirical validation for the multidimensional sustainability framework while highlighting the nonlinear and integrated nature of sustainable ecotourism development.

CONCLUSION:

The present study empirically examined the multidimensional structure of sustainability in ecotourism destinations using the Triple Bottom Line framework. By integrating Ecotourism Management Practices, Community Participation, Economic Performance, Environmental Performance, Social Performance, and Sustainable Development into a single structural model, the study provides a comprehensive evaluation of sustainability dynamics within ecotourism contexts.

The statistical results confirm that the proposed measurement model is reliable and valid. The Cronbach's Alpha value of 0.788 indicates satisfactory internal consistency, while the KMO statistic (0.850) and significant Bartlett's Test confirm the suitability of the dataset for factor analysis. The Confirmatory Factor Analysis demonstrated excellent model fit (RMSEA = 0.020), validating the multidimensional structure of the constructs. Furthermore, the Structural Equation Modelling results (RMSEA = 0.019) confirm that the theoretical framework aligns well with the observed data.

However, although the overall structural model demonstrated strong fit indices, the direct path coefficients among certain constructs were relatively modest. This finding suggests that sustainable development in ecotourism destinations cannot be explained solely by isolated improvements in economic, environmental, or social performance. In conclusion, this study reinforces the importance of integrated governance and multidimensional performance assessment in achieving long-term sustainable ecotourism development. Future research should extend this framework by incorporating additional contextual and institutional variables to better explain the complexity of sustainability outcomes.

SCOPE FOR FUTURE STUDY:

Although the present study validates a multidimensional sustainability framework for ecotourism destinations, several opportunities exist for extending this research. First, future studies may adopt a longitudinal research design to capture changes in sustainability performance over time. Second, future research could integrate additional structural variables to enhance explanatory power. Variables such as governance quality, institutional effectiveness, stakeholder trust, policy enforcement mechanisms, environmental carrying capacity, and technological innovation may influence sustainable development outcomes.

Third, comparative studies across different regions, states, or countries would strengthen generalizability. Since sustainability outcomes are often context-dependent, cross-regional analysis could identify variations in management effectiveness, community engagement, and performance integration under different socio-economic and policy environments.

Fourth, future research may incorporate mixed-method approaches, combining quantitative structural modelling with qualitative interviews or focus group discussions. Finally, future studies may expand sustainability measurement by including objective environmental and economic indicators**,** such as biodiversity indices, carbon emissions, resource efficiency metrics, and income distribution measures.

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