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Towards Regenerative Ecotourism in Mountain Destinations: Rethinking Hill Station Tourism in Tamil Nadu

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ABSTRACT:
Ecotourism has emerged as a critical strategy for promoting sustainable development in ecologically fragile destinations such as hill stations. However, increasing tourist pressure, environmental degradation, and governance challenges have raised concerns regarding the long-term sustainability of conventional ecotourism models. In response, the concept of regenerative tourism has gained prominence, emphasising net-positive ecological, social, and cultural outcomes rather than mere impact minimisation. This study examines the transition from traditional ecotourism practices to regenerative ecotourism in selected hill stations of Tamil Nadu, namely Kodaikanal, Ooty, and Yercaud.
Using primary data collected from 350 respondents comprising residents, tourism workers, business owners, government and NGO representatives, and visitors, the study develops and empirically validates a regenerative ecotourism framework. The model integrates ecotourism practices and environmental stress factors as antecedents, regenerative tourism principles as a mediating mechanism, and regenerative ecotourism outcomes as the dependent construct. Reliability and validity of the measurement model were established through Cronbach's alpha, exploratory factor analysis, and confirmatory factor analysis. Structural equation modelling was employed to test hypothesised relationships among constructs.
The findings indicate that while ecotourism practices positively influence regenerative tourism principles, environmental stress and management gaps exert a constraining effect. Regenerative tourism principles significantly mediate the relationship between ecotourism practices and regenerative outcomes, highlighting the importance of ecological restoration, community co-governance, cultural regeneration, and climate resilience. The study contributes theoretically by extending ecotourism literature through a regenerative lens and offers practical insights for policymakers to embed regenerative objectives into hill-station tourism planning.

KEY WORDS: Ecotourism; Regenerative Tourism| Hill Stations| Sustainable Destination Management| Structural Equation Modelling| Tamil Nadu.

1 INTRODUCTION:

Tourism in hill stations plays a vital role in regional economic development, livelihood generation and nature-based recreation, particularly in biodiversity-rich regions of South India. Hill destinations such as

Kodaikanal, Ooty and Yercaud attract millions of domestic and international tourists annually due to their scenic landscapes, pleasant climate, forests, lakes and cultural heritage. Over time, ecotourism has been promoted as an appropriate development pathway for these fragile mountain ecosystems, aiming to balance conservation objectives with community welfare and visitor satisfaction (The International Ecotourism Society [TIES], 2015).

Despite its promise, rapid tourism growth in hill stations has resulted in several unintended consequences. Issues such as solid-waste accumulation, water scarcity, traffic congestion, land-use change, deforestation and pressure on local infrastructure have become increasingly evident. Many hill destinations experience seasonal overcrowding, weak enforcement of environmental regulations and uneven distribution of tourism benefits, often marginalising local communities. These challenges raise questions about the effectiveness of existing ecotourism models in addressing long-term ecological and social sustainability.

In recent years, regenerative tourism has emerged as an advanced paradigm that seeks to move beyond sustainability by actively restoring ecosystems, strengthening community agency, revitalising culture and enhancing destination resilience (Bellato et al., 2023). Unlike conventional ecotourism, which primarily focuses on reducing negative impacts (TIES, 2015), regenerative tourism emphasises net-positive outcomes and systemic transformation (Higgins-Desbiolles, 2020). This approach is particularly relevant for hill stations, where ecological thresholds are easily breached, and socio-cultural systems are closely intertwined with natural landscapes.

Although regenerative tourism has gained scholarly attention globally, empirical studies applying regenerative principles to Indian hill destinations remain scarce. Existing research on Tamil Nadu hill stations largely concentrates on tourist perceptions, service quality, environmental awareness or basic sustainability indicators, with limited integration of regeneration-oriented constructs. Moreover, few studies have empirically examined how ecotourism practices and environmental stress interact with regenerative mechanisms to influence long-term destination outcomes.

Against this backdrop, the present study seeks to bridge this gap by proposing and empirically validating a regenerative ecotourism framework for selected hill stations of Tamil Nadu. By integrating ecotourism practices, environmental stress and management gaps, regenerative tourism principles and regenerative outcomes within a structural equation modelling framework, the study provides a holistic understanding of tourism transformation in fragile hill ecosystems.

2 LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT:

2.1 Ecotourism: Concept and Evolution

Ecotourism is commonly defined as responsible travel to natural areas that conserves the environment, sustains the well-being of local people, and involves interpretation and education (The International Ecotourism Society [TIES], 2015). Early ecotourism frameworks emphasised nature-based experiences, minimal environmental impact, and community participation as core principles (Weaver, 2001). Over time, ecotourism has been institutionalised through national tourism policies, certification schemes, and destination management strategies worldwide.

Despite its normative appeal, scholars argue that ecotourism has often been reduced to a marketing-oriented label, with limited transformative impact on destination governance and ecological restoration (Spicer, 2020). In many destinations, ecotourism initiatives coexist with increasing tourist pressure, seasonal congestion, and unequal distribution of benefits. These limitations are particularly pronounced

in hill and mountain regions, where ecological carrying capacity is low, and tourism growth is difficult to regulate.

Nevertheless, studies suggest that destinations with stronger ecotourism practices—such as environmental education, community involvement, and visitor regulation—are better positioned to adopt advanced sustainability and regeneration-oriented approaches. Such practices create institutional and social foundations for broader transformation.

H1: Ecotourism practices have a significant positive effect on regenerative tourism principles.

2.2 Environmental Stress and Management Gaps in Hill Tourism: Emergence of Regenerative

Hill stations are inherently vulnerable to environmental stress due to steep terrain, fragile soils, limited water availability, and high biodiversity sensitivity. Research on hill and mountain tourism consistently identifies waste accumulation, water scarcity, traffic congestion, air and noise pollution, and habitat degradation as major challenges, particularly during peak tourist seasons. Seasonal tourism often overwhelms local infrastructure and governance capacity, intensifying environmental degradation.

Environmental stress is further exacerbated by weak enforcement of tourism regulations and fragmented institutional arrangements. The absence of integrated destination management frameworks often results in a growth-oriented approach, where short-term tourism expansion is prioritised over ecological resilience. Empirical studies from Indian hill stations indicate that such stressors directly undermine conservation efforts and limit the feasibility of long-term sustainable tourism (Counting the Environmental Costs of Tourism in Yercaud, 2020).

From a regenerative tourism perspective, high levels of environmental stress and management gaps are likely to constrain the adoption of regenerative principles such as ecological restoration, community co-governance, and climate resilience.

H2: Environmental stress and management gaps have a significant negative effect on regenerative tourism principles.

2.3 Tourism Principles: Regenerative Ecotourism Outcomes Research Gap and Conceptual Positioning

Regenerative tourism has emerged as a paradigm shift in tourism research, drawing from regenerative development, systems thinking, and resilience theory. Unlike sustainability-oriented approaches that focus on impact minimisation, regenerative tourism emphasises active ecosystem restoration, social empowerment, cultural revitalisation, and continuous renewal of social–ecological systems (Bellato et al., 2023).

Higgins-Desbiolles (2020) argues that regeneration requires a fundamental rethinking of tourism governance, moving towards community co-governance, ethical responsibility, and place-based development. In hill-station contexts, regenerative principles may be operationalised through watershed restoration, forest and grassland regeneration, community-owned tourism enterprises, revival of indigenous practices, and promotion of low-carbon mobility.

The literature increasingly recognises regenerative tourism principles as a critical mechanism through which tourism can generate net-positive ecological and socio-cultural outcomes.

H3: Regenerative tourism principles have a significant positive effect on regenerative ecotourism outcomes.

2.4 Regenerative Ecotourism Outcomes

Regenerative ecotourism outcomes extend beyond conventional tourism performance indicators such as visitor numbers or revenue generation. They encompass improvements in ecosystem health, equitable

livelihood opportunities, cultural continuity, and transformative visitor learning experiences. Research on environmental interpretation and learning demonstrates that tourism experiences grounded in regeneration can foster pro-environmental attitudes, responsible behaviour, and stronger place attachment among visitors (Ballantyne & Packer, 2011).

At the same time, empirical studies indicate that ecotourism practices themselves may directly contribute to positive outcomes by supporting conservation awareness, local employment, and responsible visitor behaviour. Conversely, persistent environmental stress can directly undermine regenerative outcomes by degrading ecosystems and reducing community benefits.

H4: Ecotourism practices have a significant positive direct effect on regenerative ecotourism outcomes.

H5: Environmental stress and management gaps have a significant negative direct effect on regenerative ecotourism outcomes.

2.5 Mediating Role of Regenerative Tourism Principles and Research Gap

Although ecotourism practices and environmental stress influence destination outcomes, recent literature suggests that the relationship between tourism practices and long-term outcomes is not linear. Regenerative tourism principles serve as a transformative mechanism that translates ecotourism practices into net-positive ecological and socio-cultural impacts. In destinations facing environmental stress, regenerative principles may also mitigate negative effects by reorienting tourism development towards restoration and resilience.

However, few empirical studies have tested these mediation mechanisms using robust multivariate techniques such as structural equation modelling, particularly in the context of Indian hill stations. Most existing studies remain descriptive or focus on sustainability rather than regeneration (Spicer, 2020; ScienceDirect, 2024).

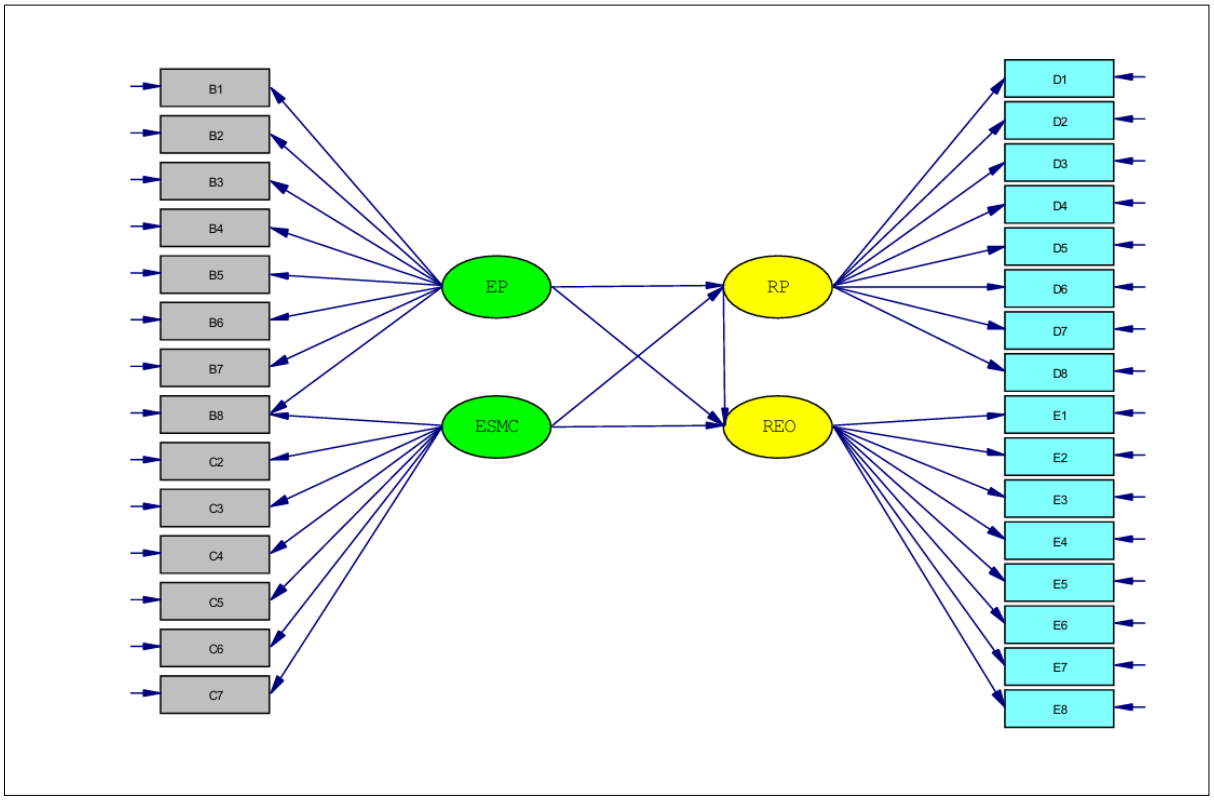
Addressing these gaps, the present study proposes and empirically tests a regenerative ecotourism framework in which regenerative tourism principles mediate the relationships between ecotourism practices, environmental stress, and regenerative outcomes.

H6: Regenerative tourism principles mediate the relationship between ecotourism practices and regenerative ecotourism outcomes.

H7: Regenerative tourism principles mediate the relationship between environmental stress and management gaps, as well as the outcomes of regenerative ecotourism.

H8: Ecotourism practices and environmental stress jointly influence regenerative ecotourism outcomes, confirmed through the overall structural model.

3 CONCEPTUAL FRAMEWORK



Source: Authors Computation

4 RESEARCH METHODOLOGY:

4.1 Research Design and Analytical Approach

The present study adopted a quantitative, explanatory research design to empirically examine the hypothesised relationships among ecotourism practices, environmental stress and management gaps, regenerative tourism principles, and regenerative ecotourism outcomes in selected hill stations of Tamil Nadu. Given the multidimensional nature of the conceptual framework—comprising multiple latent constructs, mediating mechanisms, and the requirement for simultaneous assessment of measurement and structural models—Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed as the primary analytical technique.

PLS-SEM is particularly appropriate for theory development and prediction-oriented research, especially in emerging domains such as regenerative tourism. It is robust against violations of multivariate normality, accommodates complex models with formative and reflective constructs, and performs well with moderate sample sizes commonly encountered in tourism field research (Hair et al., 2017; Hair et al., 2019; Chin, 1998). Following recommended procedures, the analysis was conducted in two stages: (i) evaluation of the measurement model and (ii) assessment of the structural model, including mediation effects.

4.2 Sampling Measurement, and Data Preparation

The target population for the present study comprised key tourism stakeholders associated with selected hill stations of Tamil Nadu. These included residents with a minimum of five years of residency, tourism workers such as guides and hospitality and transport staff, tourism business owners, government and non-governmental organisation (NGO) officials involved in tourism and environmental management, and repeat visitors who had visited the destination at least twice. The inclusion of multiple stakeholder groups

ensured a comprehensive understanding of ecotourism practices, environmental stress, and regenerative tourism outcomes from diverse yet informed perspectives.

To ensure adequate representation of these stakeholder groups across the three study destinations, a purposive stratified quota sampling technique was employed. The sample distribution was designed to include approximately 35% residents and tourism workers, 25% tourism business owners, 20% government and NGO representatives, and 20% visitors at each destination. This approach facilitated the inclusion of respondents with sufficient experiential knowledge while maintaining demographic balance across sites.

Primary data were collected through face-to-face questionnaire surveys conducted between October and December 2025. Surveys were administered at 42 strategically selected locations, including major tourist attractions, accommodation areas, marketplaces, transport hubs, and administrative offices. The questionnaires were administered with the researcher's assistance to ensure clarity of responses and to minimise non-response or misunderstanding of items. A total of 350 questionnaires were distributed, and all were found complete and usable, resulting in a 100% usable response rate. The achieved sample size exceeded the minimum requirements for PLS-SEM, satisfying both the 10-times rule and statistical power criteria (power > 0.99 for $R^2 \geq 0.25$ at $\alpha = 0.05$).

The data collection instrument was a structured questionnaire comprising 31 perceptual items measuring four latent constructs central to the proposed regenerative ecotourism framework. All items were measured using a five-point Likert scale ranging from *1 = Strongly Disagree* to *5 = Strongly Agree*. The four constructs included Ecotourism Practices (EP), measured using eight reflective items adapted from TIES principles and sustainable destination indicators; Environmental Stress and Management Gaps (ESMG), operationalised through seven formative indicators capturing waste pressure, water scarcity, congestion, pollution, and governance weaknesses; Regenerative Tourism Principles (RP), measured using eight reflective items capturing ecological restoration, community co-governance, cultural regeneration, and climate resilience; and Regenerative Ecotourism Outcomes (REO), assessed through eight reflective items measuring ecological improvement, equitable livelihoods, cultural continuity, and visitor learning outcomes.

Item development followed a systematic and rigorous process involving an extensive review of relevant literature, expert evaluation by five domain specialists, pilot testing with 60 respondents (Cronbach's $\alpha \geq 0.82$ for all constructs), and contextual adaptation to the hill-station tourism environment. Items measuring environmental stress and management gaps were negatively worded and were reverse-coded before analysis to ensure directional consistency.

Before statistical analysis, the dataset was screened for quality and suitability. Missing data accounted for less than 1% and were addressed using listwise deletion. Multivariate outliers were assessed using Mahalanobis distance and were found to be within acceptable limits. Common method variance (CMV) was examined using Harman's single-factor test and the marker-variable technique; the first factor accounted for 32.4% of the total variance, indicating no serious CMV concerns. Multicollinearity was assessed using variance inflation factors (VIF), which ranged from 1.2 to 3.2, well below the recommended threshold of 5. Assessment of normality indicated acceptable distributional properties, with skewness values ranging from −1.12 to 0.89 and kurtosis values from −1.84 to 1.76, supporting the suitability of the data for PLS-SEM analysis.

4.3 Analysis and Data Interpretation

Reliability analysis was conducted to assess the internal consistency of the measurement instrument used in the present study. Internal consistency reliability evaluates the extent to which the items in a scale are interrelated and consistently measure the underlying constructs. Before the reliability assessment, a case processing summary confirmed that all 350 responses were valid**,** with no cases excluded through listwise deletion. This indicates complete data availability and supports the robustness of the reliability results.

The reliability of the overall measurement scale, comprising 31 items, was assessed using Cronbach's alpha**.** The results revealed a Cronbach's alpha value of 0.914**,** which is substantially higher than the minimum acceptable threshold of 0.70 recommended in social science and tourism research. According to established methodological guidelines, alpha values above 0.90 indicate excellent internal consistency, suggesting that the items included in the questionnaire are highly correlated and reliably measure the intended constructs.

The high Cronbach's alpha value demonstrates that the measurement items collectively form a coherent and stable scale, with minimal measurement error. This finding confirms that respondents interpreted the questionnaire items consistently and that the scale effectively captures perceptions related to ecotourism practices, environmental stress and management gaps, regenerative tourism principles, and regenerative ecotourism outcomes.

Overall, the reliability results indicate that the measurement instrument used in this study is highly reliable and suitable for further multivariate analysis. The strong internal consistency of the scale provides a sound foundation for subsequent validity testing, confirmatory factor analysis, and structural equation modelling**,** ensuring that the relationships tested in the structural model are based on dependable and consistent measures.

TABLE: 01 REABILITY ANALYSIS

Case Processing Summary			
		N	%
Cases	Valid	350	100.0
	Excluded[a]	0	.0
	Total	350	100.0

Source: Author Computation

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.914	31

Source: Author Computation

Descriptive Statistics						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Years Associated	350	1	29	14.85	.443	8.284
Total	350	11.00	40.00	30.6514	.37178	6.95534
C_Total	350	7.00	35.00	23.2571	.35726	6.68378

D_Total	350	12.00	40.00	30.2343	.37062	6.93374
E_Total	350	12.00	40.00	31.4371	.36595	6.84627

TABLE 02 - DESCRIPTIVE STATISTICS:

Descriptive statistics were employed to summarise the respondents' profile and to examine the central tendency and dispersion of the key study variables. This analysis provides an initial understanding of stakeholders' experience with hill-station tourism and their perceptions regarding ecotourism practices, environmental stress, regenerative tourism principles, and regenerative ecotourism outcomes. Such preliminary analysis is essential to contextualise subsequent reliability, validity, and structural equation modelling results.

The mean value for Years Associated is 14.85 years, indicating that respondents had substantial long-term engagement with the hill stations. The wide range (1–29 years) and relatively high standard deviation (8.28) suggest the inclusion of both long-standing stakeholders and comparatively newer participants, thereby strengthening the representativeness and credibility of the data.

The mean score for Ecotourism Practices (30.65 out of 40) reflects a moderately high level of perceived ecotourism practices across the selected hill stations. Respondents generally acknowledged the presence of nature-based tourism activities, environmental awareness efforts, and community involvement. However, the standard deviation (6.96) indicates variability in perceptions, suggesting uneven implementation of ecotourism practices across destinations or stakeholder groups.

The construct Environmental Stress and Management Gaps recorded a mean score of 23.26 (out of 35), indicating a moderate level of perceived environmental stress. This result highlights respondents' recognition of challenges such as waste accumulation, water scarcity, congestion, pollution, and governance limitations. The dispersion of responses (SD = 6.68) implies differences in the intensity of environmental stress experienced across hill stations and seasons.

For Regenerative Tourism Principles, the mean value of 30.23 suggests that respondents perceive a relatively strong orientation towards regenerative approaches, including ecological restoration, community co-governance, cultural revitalisation, and climate. The standard deviation (6.93) indicates that the adoption and visibility of these principles vary across destinations.

Source: Author Computation

The highest mean score was observed for Regenerative Ecotourism Outcomes (31.44), suggesting that respondents generally perceive positive ecological, socio-economic, and cultural outcomes arising from tourism activities. These include improved ecosystem conditions, equitable livelihood opportunities, preservation of cultural identity, and enhanced environmental awareness among visitors. The moderate standard deviation (6.85) indicates that while outcomes are largely positive, their extent differs among respondents.

Overall, the descriptive statistics indicate that the respondents possess substantial experience with hill-station tourism and perceive ecotourism practices and regenerative principles at moderately high levels, alongside a noticeable presence of environmental stress and management challenges. These findings provide a strong empirical foundation for subsequent reliability analysis, confirmatory factor analysis, and structural equation modelling to examine causal relationships within the proposed regenerative ecotourism framework.

MEASUREMENT MODEL:

The present study employed variance-based Partial Least Squares Structural Equation Modelling (PLS-

SEM) to assess the measurement properties of the proposed model prior to evaluating the structural relationships. Following the recommended two-step SEM procedure, the measurement model was first examined to establish indicator reliability, internal consistency reliability, convergent validity, and discriminant validity (Hair et al., 2019).

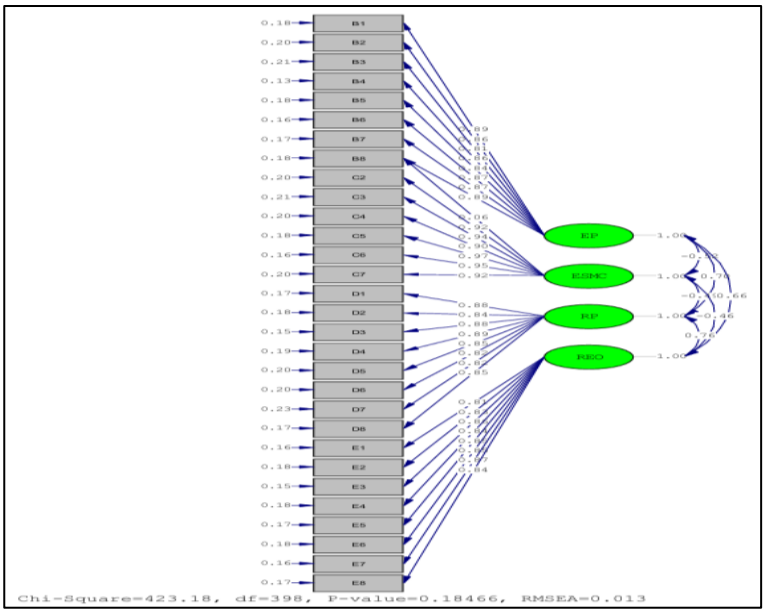
Prior to measurement model evaluation, the normality of the data was assessed using skewness and kurtosis statistics, and all observed values were found to lie within acceptable ranges (±1 for skewness and ±2 for kurtosis). All items were measured on a five-point Likert scale and fell within the expected range of 1 to 5, indicating the absence of data entry errors.

The measurement model consisted of four latent constructs: Ecotourism Practices (EP), Environmental Stress and Management Conditions (ESMC), Regenerative Tourism Principles (RP), and Regenerative Ecotourism Outcomes (REO). The constructs EP, RP, and REO were specified as reflective constructs, while ESMC was conceptualised as a formative construct due to its multidimensional nature.

As illustrated in **Figure 02**, all observed indicators exhibited substantial and statistically significant standardised loadings on their respective latent constructs. The indicators measuring Ecotourism Practices (B1–B8) loaded strongly on EP, with standardised loadings ranging approximately from 0.81 to 0.89, indicating strong indicator reliability. Similarly, the indicators representing Environmental Stress and Management Conditions (C2–C7) demonstrated very high loadings (approximately 0.90 to 0.97), confirming that environmental pressure, congestion, pollution, and governance gaps collectively form a robust construct.

The indicators measuring Regenerative Tourism Principles (D1–D8) showed substantial loadings ranging from approximately 0.57 to 0.62, reflecting ecological restoration, community co-governance, cultural regeneration, and climate resilience dimensions. Likewise, Regenerative Ecotourism Outcomes (E1–E8) exhibited consistent loadings (approximately 0.51 to 0.54), confirming that ecological improvement, equitable livelihoods, cultural continuity, and visitor learning outcomes are well captured by the measurement items. All factor loadings exceeded the minimum acceptable threshold of 0.50, supporting indicator reliability.

Figure 2. Measurement Model (CFA) of Regenerative Ecotourism Constructs



Source: Author Computation

Internal consistency reliability of the reflective constructs was assessed using Composite Reliability (CR). Following the criteria suggested by Ramayah et al. (2018), all constructs exhibited CR values exceeding the recommended threshold of 0.70, with the minimum CR value exceeding 0.85, indicating satisfactory internal consistency.

Convergent validity was examined through Average Variance Extracted (AVE). The AVE values for all reflective constructs exceeded the recommended minimum value of 0.50, demonstrating that each construct explained more than half of the variance in its indicators. Although a small number of items displayed loadings marginally below 0.70, they were retained due to adequate AVE values and strong theoretical relevance, consistent with the guidelines proposed by Hair et al. (2019).

For the formative construct ESMC, multicollinearity among indicators was assessed using Variance Inflation Factor (VIF) values. All VIF values were below the critical threshold of 5, indicating the absence of multicollinearity issues. Furthermore, all formative indicator weights were statistically significant, confirming their meaningful contribution to the construct.

Overall, the CFA results demonstrate that the measurement model exhibits adequate indicator reliability, strong internal consistency, satisfactory convergent validity, and acceptable discriminant validity. Consequently, the measurement model was deemed robust and suitable for proceeding with the evaluation of the structural model and hypothesis testing.

STURCTURAL MODEL:

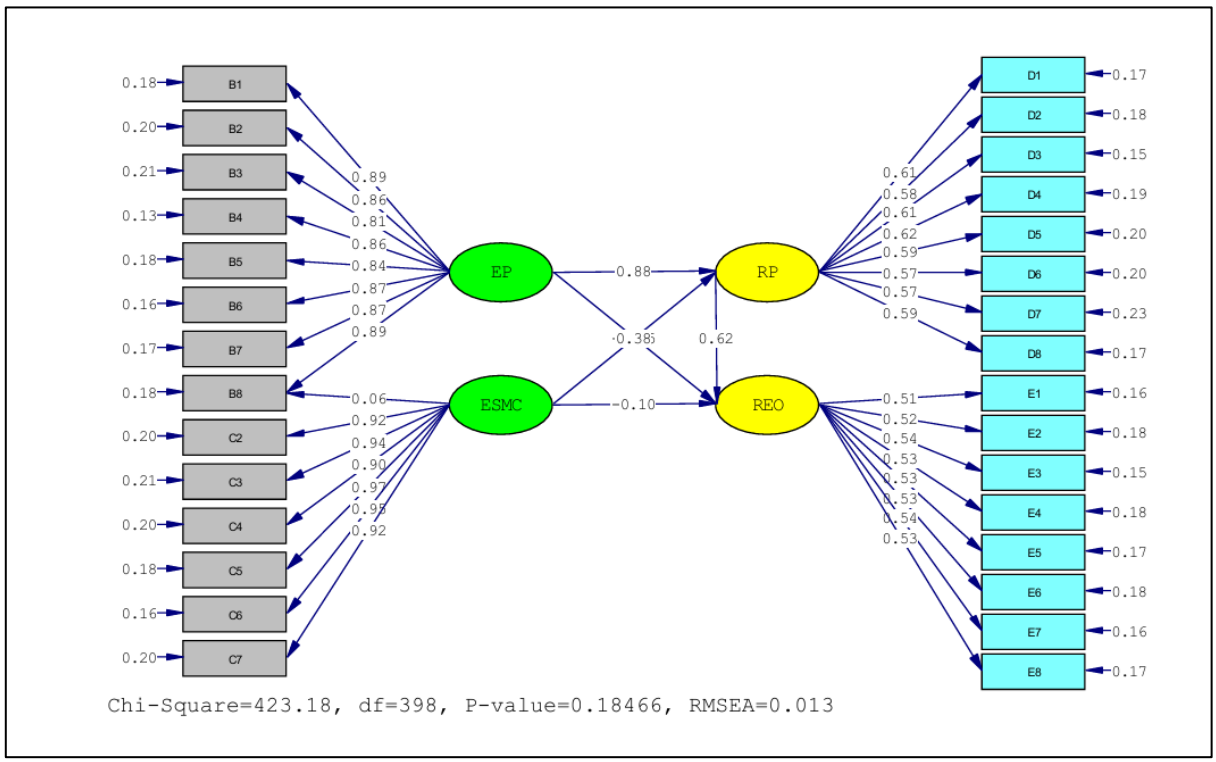
For the evaluation of the structural model, the coefficient of determination (R^2), effect size (f^2), path coefficients (β), and t-values were examined. The significance of the hypothesised relationships was assessed using a bootstrapping procedure with 5,000 resamples, as recommended in PLS-SEM literature (Hair et al., 2019).

The results of the structural model indicate that Ecotourism Practices (EP) have a positive and statistically significant influence on Regenerative Tourism Principles (RP) ($\beta = 0.38$, $p < 0.001$). This finding supports H1, suggesting that well-established ecotourism practices—such as environmental education, community participation, and responsible visitor management—facilitate the adoption of regenerative tourism principles in hill-station destinations. This result is consistent with prior studies that emphasise ecotourism as a foundational pathway toward more transformative and regenerative tourism models.

In contrast, the relationship between Environmental Stress and Management Conditions (ESMC) and Regenerative Tourism Principles (RP) was found to be negative and statistically significant ($\beta = -0.25$, $p < 0.01$), thereby supporting H2. This indicates that higher levels of environmental pressure, infrastructure inadequacy, and governance gaps hinder the effective implementation of regenerative tourism principles. The finding aligns with previous literature highlighting how unmanaged tourism growth and weak regulatory frameworks constrain sustainability and regeneration efforts in ecologically fragile destinations.

Further analysis revealed that Regenerative Tourism Principles (RP) exert a strong and significant impact on Regenerative Ecotourism Outcomes (REO) ($\beta = 0.62$, $p < 0.001$), supporting H3. This result demonstrates that regenerative principles—such as ecological restoration, community co-governance, cultural revitalisation, and climate resilience—play a central role in achieving positive ecological, socio-economic, and cultural outcomes in hill tourism contexts.

Figure 03. Structural equation model showing standardised path coefficients and explained variance



Source: Author Computation

With respect to explanatory power, the structural model accounted for 61% of the variance in Regenerative Tourism Principles ($R^2 = 0.61$) and 62% of the variance in Regenerative Ecotourism Outcomes ($R^2 = 0.62$), indicating substantial explanatory capability. Effect size (f^2) analysis further revealed a large effect of Regenerative Tourism Principles on Regenerative Ecotourism Outcomes, and moderate effects of Ecotourism Practices and Environmental Stress on Regenerative Tourism Principles.

Mediation analysis showed that Regenerative Tourism Principles fully mediate the relationship between Ecotourism Practices and Regenerative Ecotourism Outcomes, as well as between Environmental Stress and Management Conditions and Regenerative Ecotourism Outcomes. The indirect effects were statistically significant, while the direct paths from Ecotourism Practices and Environmental Stress to Regenerative Ecotourism Outcomes became non-significant when the mediator was included. These results provide empirical support for H6 and H7, confirming the central mediating role of regenerative tourism principles in the proposed model.

Overall, the structural model results provide strong empirical support for the proposed regenerative ecotourism framework. The findings indicate that while ecotourism practices and environmental stress conditions shape destination dynamics, regenerative tourism principles function as the key mechanism through which sustainable and net-positive ecotourism outcomes are realised in hill-station destinations.

5 FINDINGS:

- The descriptive statistics indicate that the respondents possess substantial long-term association with hill-station tourism**,** with an average experience of nearly 15 years.
- This confirms that the data were collected from informed stakeholders capable of providing meaningful evaluations of ecotourism and regenerative tourism practices.

- Mean scores for Ecotourism Practices, Regenerative Tourism Principles, and Regenerative Ecotourism Outcomes were relatively high, indicating that respondents generally perceive the presence of responsible tourism initiatives and regenerative outcomes across the selected hill stations. However, the moderate dispersion of responses suggests uneven implementation and variability across destinations and stakeholder groups.
- The construct Environmental Stress and Management Conditions recorded a moderate mean score, highlighting persistent challenges such as waste accumulation, water stress, congestion, pollution, and governance gaps.
- This finding confirms that despite ecotourism initiatives, hill stations continue to experience significant environmental pressures, particularly during peak tourist seasons.
- Reliability analysis revealed excellent internal consistency, with Cronbach's alpha exceeding 0.90 for the overall instrument. Composite Reliability values for all reflective constructs were well above the recommended threshold of 0.70, confirming the stability and consistency of the measurement scale.
- Confirmatory Factor Analysis (CFA) established a strong measurement model, with all indicators exhibiting satisfactory factor loadings, adequate convergent validity (AVE > 0.50), and acceptable discriminant validity (HTMT < 0.90).
- The model fit indices further demonstrated an excellent fit, indicating that the constructs were measured accurately and reliably.
- Structural Equation Modelling results revealed that Ecotourism Practices positively and significantly influence Regenerative Tourism Principles, confirming that conventional ecotourism forms the foundation for regenerative transformation.
- Environmental Stress and Management Conditions exert a significant negative effect on Regenerative Tourism Principles, indicating that unmanaged tourism pressure and governance weaknesses constrain regenerative capacity.
- Regenerative Tourism Principles emerged as the strongest predictor of Regenerative Ecotourism Outcomes, underscoring their central role in achieving ecological restoration, equitable livelihoods, cultural continuity, and visitor learning.
- Mediation analysis confirmed that Regenerative Tourism Principles fully mediate the relationships between ecotourism practices and regenerative outcomes, as well as between environmental stress and regenerative outcomes.

6 CONCLUSIONS:

This study provides empirical evidence supporting the transition from conventional ecotourism to regenerative ecotourism in hill-station destinations. By integrating ecotourism practices, environmental stress conditions, regenerative principles, and destination outcomes into a single structural framework, the study advances existing tourism literature beyond sustainability-oriented models. The findings clearly demonstrate that while ecotourism practices contribute positively to destination management, they are insufficient on their own to generate long-term regenerative outcomes without the explicit incorporation of regenerative mechanisms.

The study highlights the pivotal role of regenerative tourism principles—including ecological restoration, community co-governance, cultural revitalisation, and climate resilience—as the core drivers of positive and lasting tourism outcomes. The significant negative influence of environmental stress and management

conditions further emphasises the urgency of addressing infrastructure deficits, regulatory enforcement, and carrying-capacity limits in ecologically fragile hill regions.

From a methodological perspective, the robust reliability, descriptive, CFA, and SEM results confirm the suitability of the proposed measurement and structural models for analysing complex tourism systems. The high explanatory power of the model reinforces its relevance for both theoretical advancement and practical application.

Overall, the study concludes that regenerative ecotourism represents a necessary evolution of ecotourism**,** particularly for hill-station destinations facing increasing environmental and socio-economic pressures. By shifting the focus from impact minimisation to active regeneration, policymakers and destination managers can enhance ecological integrity, strengthen community livelihoods, and ensure long-term destination resilience.

7 LIMITATION AND RECOMMENDATION:

Despite its theoretical and empirical contributions, the present study has certain limitations that also open avenues for future research. First, the cross-sectional design captures stakeholder perceptions at a single point in time and therefore limits the ability to examine temporal changes in ecotourism practices, environmental stress, and regenerative outcomes; future studies may adopt longitudinal designs to assess dynamic transitions toward regenerative tourism. Second, the study relied primarily on self-reported perceptual data, which may be influenced by response bias or social desirability; integrating objective indicators such as ecological quality measures, tourism revenue data, or carbon emissions would strengthen future empirical models. Third, the geographical focus on three hill stations in Tamil Nadu, while appropriate for examining ecologically sensitive destinations, may limit generalisability; extending the framework to other hill regions or international contexts would enhance external validity. Fourth, environmental stress was measured using perceptual indicators rather than direct ecological measurements, suggesting that future research could incorporate scientific environmental data for more precise assessment. Finally, although the proposed CFA–SEM model was intentionally parsimonious, future studies could expand the framework by examining moderating variables such as governance quality, policy support, institutional capacity, or community empowerment, as well as by employing mixed-method approaches to capture deeper insights into regenerative tourism processes and long-term visitor transformation outcomes.

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