

**MODELLING SUSTAINABLE ECO-TOURISM:
THE ROLE OF COMMUNITY AWARENESS, INFRASTRUCTURE,
AND STAKEHOLDER ENGAGEMENT IN INDORE, INDIA**

Surya Agrawal*

Deepali Pai**

Shilpa Katira**

Shefali Tiwari***

ABSTRACT

Eco-tourism has evolved into a strategic instrument for sustainable development, integrating ecological preservation, community empowerment, and inclusive economic growth. This study models the impact of three critical dimensions—Community Awareness (CA), Infrastructure (INF), and Stakeholder Engagement (SE)—on Eco-Tourism Outcomes (ETO) in the emerging eco-tourism region of Indore, India. Primary data was collected from 100 local stakeholders through a structured questionnaire, and analysed using multiple regression, correlation analysis, and ANOVA. The regression model explains 61% of the variance in eco-tourism outcomes ($R^2 = 0.61$), with Community Awareness ($\beta = 0.45$) and Stakeholder Engagement ($\beta = 0.38$) emerging as significant predictors, while Infrastructure ($\beta = 0.27$) showed a marginal impact. Correlation results supported these findings, with CA and SE strongly associated with ETO ($r = 0.71$ and $r = 0.69$, respectively). ANOVA results indicated no significant demographic bias in stakeholder perceptions, suggesting uniform engagement potential across gender, age, and education groups. Supported by recent empirical literature from India and abroad, the study validates a systems-thinking approach to eco-tourism planning—one that integrates education, inclusive governance, and sustainable infrastructure. The findings offer actionable insights for policy makers, tourism managers, and social entrepreneurs aiming to replicate holistic eco-tourism models in other urban-rural transitional zones.

Keywords: Sustainable Tourism, Stakeholder Engagement, Community Awareness, Infrastructure, Regression Analysis, Eco-Tourism.

* Assistant Professor, Amity, Indore
** Associate Professor, Amity, Indore
*** Deputy Dean, Amity, Indore

INTRODUCTION

Eco-tourism is no longer a fringe element of the global tourism industry; it is a vital strategic tool for promoting sustainability, fostering local entrepreneurship, and preserving natural heritage. In the face of intensifying challenges like climate change, loss of biodiversity, and degradation of local ecosystems, eco-tourism offers a pathway that balances conservation with livelihood generation. It re-explains tourism as a development that prioritizes cultural preservation, environmental care, and complete community involvement rather than only as an monetary effort.

The ecotourism industry is expanding rapidly worldwide and is expected to reach USD 340 billion by 2030, with a compound annual growth rate (CAGR) of 8.5%. This quick expansion is a result of travellers, governments, and international organizations realizing how important it is to find sustainable alternatives to mass tourism. India has much more potential because of its diverse cultural history, abundance of ecological hotspots, and sizable rural population, all of which stand to gain from distributed tourism strategies.

The Indian government has introduced flagship programs like the PRASHAD Scheme and the Swadesh Darshan Scheme, which emphasize integrated infrastructure, cultural protection, and subject-based tourist circuits, in an effort to realize this potential. One of the newest ecotourism locations is Indore, a growing Tier-2 city in Madhya Pradesh. Here, urban growth meets rural ecosystems, such as rivers, forests, and wildlife sanctuaries, all of which can be used to produce exciting ecotourism experiences. However, infrastructure spending alone will not be enough to drive Indore's ecotourism revolution. Its long-term success centres on the active participation of local communities, alignment of multi-sector stakeholders, and the spread of environmental awareness.

In order to assess how three key factors—community awareness (CA), infrastructure (INF), and stakeholder engagement (SE)—interact, this study takes a holistic approach. The impact of these factors, both individually and together, on Eco-Tourism Outcomes (ETO), such as the preservation of cultural heritage, the creation of jobs, and biodiversity conservation, is investigated. In order to contribute to the empirical literature and offer practical insights for tourism planners, policy makers, and social entrepreneurs in comparable urban-rural transitional zones in India, the research goes beyond descriptive analysis and uses regression techniques to create a predictive model.

REVIEW OF LITERATURE

Tourism accounts for a significant share of global economic output, contributing 9.1% to global GDP and employing over 330 million people worldwide (WTTC, 2024). In India, the sector contributes nearly 6.8% to the national GDP and provides employment to over 42 million people. Eco-tourism has become popular in this field as a means of promoting sustainable development. According to the United Nations World Tourism Organization (UNWTO, 2019), ecotourism is a crucial tactic for preserving culture and the environment. Eco-tourism strategic management entails striking a balance between socioeconomic results and environmental stewardship.

According to Birdie and Sanjeev (2019), ecotourism projects led by social entrepreneurs create long-term benefits by linking local livelihoods with conservation goals. They highlight that innovation in entrepreneurship helps in skill development, income generation, and promoting sustainability. Infrastructure also plays a key role in managing environmental impact and shaping tourists' experiences. Facilities like roads, eco-friendly accommodation, and internet connectivity are important for ecotourism (Hirotsune, 2011). But too much development can harm the environment. Infrastructure must therefore be planned to improve accessibility while reducing its negative effects on the environment. Stakeholder theory offers a further perspective on ecotourism. Kummitha (2020) highlights the importance of multi-stakeholder cooperation between community people, commercial investors, NGOs, and municipal governments. Participation from stakeholders guarantees that local communities' interests are taken into account and incorporated into the planning and decision-making procedures. Possibly the most important but least studied factor is community awareness. According to Lee (2013) and Daniele and Quezada (2017), community participation, perceptions, and knowledge have a big impact on how sustainable ecotourism projects are. Communities that are informed and involved are more likely to preserve natural resources, promote cross-cultural interactions, and serve as conservation stewards. Educated and engaged communities are more likely to protect natural resources, facilitate cultural exchanges, and act as stewards of conservation efforts. Awareness campaigns, school-based education, and participatory planning are thus essential tools in eco-tourism management. Taken together, these studies underscore the need for a multi-dimensional, integrated approach to eco-tourism. This paper builds on that foundation by empirically modelling the impact of awareness, infrastructure, and engagement on measurable eco-tourism outcomes.

RESEARCH GAP

While numerous studies acknowledge the role of eco-tourism in promoting sustainability, very few have empirically examined how specific community-level factors such as awareness, infrastructure availability, and stakeholder engagement interact to impact eco-tourism outcomes. Most existing research remains conceptual or focuses on isolated components without integrating them into a comprehensive impact model. There is a lack of region-specific quantitative models that capture these dynamics, particularly in emerging destinations like Indore. In the Tourism sector region specific models are of utter importance. Generalized models do not validate in case of tourism. This research fills the gap by developing a data-driven framework to measure how the three key variables—Community Awareness, Infrastructure, and Stakeholder Engagement—collectively influence sustainable eco-tourism outcomes.

OBJECTIVES OF THE STUDY

- To examine whether demographic variables (gender, age, education) significantly influence the level of community awareness regarding eco-tourism practices in Indore.
- To assess whether perceptions of eco-tourism infrastructure differ significantly across demographic segments (gender, age, and education levels) in Indore.
- To analyse whether perceptions of stakeholder engagement in eco-tourism vary significantly across different demographic groups (gender, age, and education) in Indore.
- To assess the impact of community awareness on eco-tourism outcomes.
- To evaluate the role of infrastructure in facilitating sustainable eco-tourism.
- To examine the effect of stakeholder engagement on eco-tourism outcomes.
- To develop a regression-based model for measuring the influence of community awareness, infrastructure and stakeholder engagement on eco-tourism outcomes.

HYPOTHESES

H₀₁: There is no significant difference in community awareness toward eco-tourism based on gender.

H₀₂: There is no significant difference in community awareness toward eco-tourism across different age groups.

H₀₃: There is no significant difference in community awareness toward eco-tourism based on education level.

H₀₄: There is no significant difference in perception of eco-tourism infrastructure between male and female respondents.

H₀₅: There is no significant difference in perception of eco-tourism infrastructure across different age groups.

H₀₆: There is no significant difference in perception of eco-tourism infrastructure across different education levels.

H₀₇: There is no significant difference in perception of stakeholder engagement between male and female respondents.

H₀₈: There is no significant difference in perception of stakeholder engagement across different age groups.

H₀₉: There is no significant difference in perception of stakeholder engagement based on education level.

H₀₁₀: Community awareness has no significant impact on eco-tourism outcomes.

H₀₁₁: Infrastructure availability has no significant impact on eco-tourism outcomes.

H₀₁₂: Stakeholder engagement has no significant impact on eco-tourism outcomes.

H₀₁₃: The combined effect of community awareness, infrastructure, and stakeholder engagement do not significantly predict eco-tourism success in Indore.

RESEARCH METHODOLOGY

Research Design: Quantitative, descriptive, and analytical design using a structured survey method.

Sample and Population: The study sampled 100 local residents from eco-tourism zones around Indore, selected through stratified simple random sampling. The population includes stakeholders such as local community members, guides, vendors, and small entrepreneurs.

Table 1: Sample Distribution

Variable	Category	Frequency	Percentage
Gender	Male	58	58%
	Female	42	42%
	Total	100	100%
Age Group	18–25 years	22	22%
	26–35 years	34	34%
	36–45 years	24	24%
	46 years and above	20	20%
	Total	100	100%
Educational Level	Higher Secondary	21	21%
	Undergraduate	39	39%
	Postgraduate	28	28%
	Others (Diploma/Vocational)	12	12%
Total		100	100%

Data Collection Tool: A structured questionnaire based on a 5-point Likert scale measuring agreement levels was administered. The questionnaire included items categorized under four constructs:

- Community Awareness (CA): 5 items
- Infrastructure (INF): 4 items
- Stakeholder Engagement (SE): 4 items
- Eco-Tourism Outcomes (ETO): 5 items

Statistical Tools:

- Reliability Test (Cronbach’s Alpha)
- Descriptive Statistics
- ANOVA for demographic comparisons
- Multiple Linear Regression
- Variance Inflation Factor (VIF) for multicollinearity

DATA ANALYSIS AND INTERPRETATION

A. Reliability Score

The internal consistency of the assessment scales for each of the study's constructs—Community Awareness (CA), Infrastructure (INF), Stakeholder Engagement (SE), and Eco-Tourism Outcomes (ETO)—was evaluated using reliability analysis using Cronbach's Alpha. All of the study's constructs had alpha values between 0.78 and 0.86, which is higher than the generally recognised cutoff point of 0.70 for reliability in social science research (Nunnally,1978). In particular, the following scores were obtained: Eco-Tourism Outcomes 0.86, Infrastructure 0.78, Stakeholder Engagement 0.83, and Community Awareness 0.81. These findings demonstrate that the measurement instrument used is reliable and appropriate for additional research by confirming the high reliability and good internal consistency of the questionnaire items used to evaluate each construct.

This suggests that the survey tool is statistically sound and that the answers accurately reflect the fundamental aspects under investigation. Additionally, it gives assurance when moving on with additional inferential analysis, including regression and correlation.

B. Characteristic Data

Descriptive statistics were computed for each of the four main constructs—Community Awareness (CA), Infrastructure (INF), Stakeholder Engagement (SE), and Eco-Tourism Outcomes (ETO)—in order to comprehend the general trend of participant responses.

Table 2: Mean scores of all variables under study

Variable	N	Mean	Standard Deviation (SD)	Minimum	Maximum
Community Awareness (CA)	100	4.18	0.54	3.00	5.00
Infrastructure (INF)	100	3.96	0.61	2.40	5.00
Stakeholder Engagement (SE)	100	4.06	0.57	2.60	5.00
Eco-Tourism Outcomes (ETO)	100	4.12	0.52	3.00	5.00

Interpretation: The descriptive statistics reveal that all four key variables—Community Awareness, Infrastructure, Stakeholder Engagement, and Eco-Tourism Outcomes—received

high mean scores (above 3.9), reflecting a generally favorable perception among respondents toward eco-tourism efforts in Indore. Community Awareness (mean = 4.18) and Eco-Tourism Outcomes (mean = 4.12) emerged as the highest-rated constructs, indicating that individuals feel well-informed and recognize the positive impacts of eco-tourism. Infrastructure, while still positively rated (mean = 3.96), showed the highest standard deviation (0.61), suggesting greater variability in respondents' views regarding infrastructure adequacy and accessibility. Despite this, the overall low standard deviations across all variables suggest that responses were relatively consistent and closely clustered around the mean.

C. To examine whether demographic variables (age, gender, education) significantly influenced perceptions of eco-tourism.

Table 3: Demographic variables -Community Awareness

Demographic Variable	Dependent Variable	F-Value	P-Value	Significance
Gender	Community Awareness	1.03	0.312	Not Significant
Age Group	Community Awareness	0.85	0.470	Not Significant
Education Level	Community Awareness	1.21	0.305	Not Significant

Interpretation: The results from the ANOVA analysis suggest that perceptions of eco-tourism and related awareness are consistent across gender, age, and education levels. This reinforces the regression findings that community awareness has a uniform influence on eco-tourism success regardless of demographic segmentation. These results align with findings by Lee (2013) who found no significant differences in environmental awareness across gender and age groups and Daniele and Quezada (2017) reported no statistically significant correlation between education level and awareness which emphasizes the importance of collective community perception in sustainable tourism.

D. To assess whether perceptions of eco-tourism infrastructure differ significantly across demographic segments, an ANOVA test was performed for gender, age group, and education level.

Table 4: Demographic variables -Infrastructure

Demographic Variable	F-Value	P-Value	Significance
Gender	1.45	0.231	Not Significant
Age Group	2.03	0.087	Not Significant
Education Level	2.66	0.047	Significant

Interpretation: The analysis indicates that respondents' education levels significantly influence their perceptions of eco-tourism infrastructure ($p = 0.047$), implying that individuals with higher education may possess greater awareness or expectations regarding infrastructure quality and sustainability. Age group shows a marginally significant effect ($p = 0.087$), suggesting some variation in how different age brackets perceive infrastructure, though the evidence is not strong enough to confirm a definitive difference. In contrast, gender does not significantly affect infrastructure perception ($p = 0.231$), indicating that views on infrastructure are generally consistent between male and female respondents. These studies align with the current study where Hirotsune (2011) and Rana et al. (2020) found that perceptions of eco-tourism infrastructure do not significantly vary across demographic lines such as age, gender. Hirotsune concluded that infrastructure improvements like roads and sanitation are universally valued, with minimal influence from demographic traits.

E. To assess whether perceptions of eco-tourism Stakeholder Engagement differ significantly across demographic segments, an ANOVA test was performed for gender, age group, and education level.

Table 5: Demographic variables -Stakeholder Engagement

Demographic Variable	Dependent Variable	F-Value	P-Value	Significance
Gender	Stakeholder Engagement	0.97	0.327	Not Significant
Age Group	Stakeholder Engagement	1.22	0.305	Not Significant
Education Level	Stakeholder Engagement	0.89	0.415	Not Significant

Interpretation: The ANOVA results show that people’s views on stakeholder engagement in eco-tourism are similar, no matter their gender, age, or education. This means engagement efforts are being experienced equally by everyone. Past research by Kummitha (2020) and Mehta and Pillai (2021) also found that these demographic factors don’t have much impact on engagement. Mehta and Pillai pointed out that when engagement processes are well-planned and inclusive, everyone gets involved equally, based on shared community interests, not personal differences. This finding can help create fair and inclusive strategies for community-based eco-tourism.

Predictor	Correlation with ETO		Beta Coefficient	t-Value	P-Value	Significance
	R	R ²				
Community Awareness	0.71	0.5	0.45	3.12	0.002	Significant
Infrastructure	0.55	0.30	0.27	1.97	0.052	Not Significant
Stakeholder Engagement	0.69	0.48	0.38	2.85	0.005	Significant
Model – Y=a+b1X1 +b2X2 +b3X3 ETO=a+0.45(CA)+0.27(INF)+0.38(SE)	R ² = 0.61			F = 21.3	0.001	Model Significant

Table 5: Regression Model Summary

Interpretation: Among the predictors of eco-tourism success, Community Awareness stands out as the most influential factor, with the highest standardized beta coefficient ($\beta = 0.45$, $p = 0.002$). This finding emphasizes the critical role of an informed and environmentally conscious local population in promoting sustainable tourism practices. Stakeholder Engagement also shows a statistically significant impact ($\beta = 0.38$, $p = 0.005$), highlighting the importance of collaborative governance, active community participation, and the involvement of NGOs and private sector entities in eco-tourism development. Meanwhile, Infrastructure exhibits a non- significant effect ($\beta = 0.27$, $p = 0.052$). Although improved

infrastructure enhances accessibility and safety, it alone cannot drive eco-tourism success without parallel efforts in community awareness and stakeholder collaboration.

The regression model explains 61% of the variance in eco-tourism outcomes ($R^2 = 0.61$). Community Awareness and Stakeholder Engagement have a statistically significant positive impact on eco-tourism performance. Infrastructure, though not highly significant, still plays a facilitative role. These findings validate the multi-variable approach and emphasize that a holistic strategy involving awareness, physical development, and social collaboration is essential for sustainable eco-tourism development.

FINDINGS

The study finds that Community awareness is the strongest predictor of eco-tourism outcomes. Educated and informed communities support biodiversity, respect cultural heritage, and contribute to sustainable practices. This is also supported by Khoshkam et al. (2023) and Sharma and Bansal (2022). Infrastructure aids accessibility and safety but requires integration with community and stakeholder mechanisms. Over-reliance on infrastructure without participation risks ecological degradation (Rana et al., 2020). Stakeholder engagement helps strengthen the impact of community awareness in eco-tourism. When planning is done together and decision-making is shared, it builds trust and encourages people to follow eco-tourism guidelines (Mehta and Pillai, 2021; World Bank, 2023). Together, awareness, infrastructure, and stakeholder involvement explain 61% of the eco-tourism success. This supports a model that includes education, good facilities, and teamwork, as suggested by the UNWTO and World Bank.

CONCLUSION

This study shows that eco-tourism success depends on more than just one factor. It comes from a mix of social efforts, good management, and proper infrastructure. Among these, community awareness and stakeholder involvement are the most important. When people are informed and aware of the environment, they take part more actively and help make eco-tourism sustainable in the long-term. Community awareness was found to be the biggest influence. This proves that educated and environmentally aware communities are key to making eco-tourism work. Stakeholder engagement—especially from NGOs, local governments, and private partners—is also very important. These groups help organize,

manage, and support eco-tourism efforts on the ground. However, infrastructure alone is not enough. Without strong community and institutional support, good facilities won't lead to sustainability. The study also found that gender, age, and education level do not affect how aware people are about eco-tourism in Indore. This means people from all backgrounds can be equally involved, creating opportunities for inclusive communication and participation.

In summary, eco-tourism needs a well-rounded approach that includes educating communities, working together with stakeholders, and planning in a way that benefits everyone. These findings are useful for tourism planners, entrepreneurs, and policymakers who want to grow eco-tourism in a way that is both environmentally friendly and fair to all. The results support using a complete strategy that combines awareness, infrastructure, teamwork, monitoring, and digital tools—matching both local needs and international best practices.

RECOMMENDATIONS

The suggested strategies match well with global best practices and recent research on sustainable eco-tourism. In India, Sharma and Bansal (2022) found that eco-awareness campaigns in Himachal Pradesh helped locals care more about the environment and made tourists happier. This supports the idea of running community awareness programs. Similarly, a study by Khoshkam et al. (2023) in Iran's national parks showed that hands-on learning activities helped people develop more eco-friendly behavior, highlighting the value of skill-based workshops.

When it comes to infrastructure, Rana et al. (2020) found in Uttarakhand that using local materials and eco-friendly designs not only reduced environmental harm but also improved tourist experiences. This supports the idea of using "green" infrastructure. However, Mehta and Pillai (2021), along with the World Bank (2023), stressed that good infrastructure alone isn't enough—it also needs proper governance and social inclusion to be effective.

For governance, Kummitha (2020) highlighted the importance of collaboration between local councils (panchayats), NGOs, and private players to ensure everyone is involved and responsible. In states like Kerala and Sikkim, eco-tourism run by local communities has been very successful because of such teamwork.

On technology, the UNWTO (2019) recommended using mobile apps for marketing eco-tourism and getting instant feedback from tourists. This approach has worked well in Costa Rica and Bhutan, helping make tourism more transparent, engaging, and personalized.

Finally, Birdie and Sanjeev (2019) stressed the need to measure performance using clear indicators—like job creation and waste reduction—to track whether eco-tourism is truly sustainable and responsible.

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