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Sustainable Tourism in India: Assessing the Effectiveness of Carbon-Neutral Destination Policies

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Abstract

This research explores carbon-neutral tourism in India focusing on tourist awareness, perceptions, eco-friendly behaviour and constraints faced by tourism stakeholders (businesses and local communities) in practising sustainable tourism. Primary data were collected from 376 respondents, and factor analysis identified several dimensions of awareness, perceptions of sustainability policies, eco-friendly travel behavior, willingness to engage in carbon-neutral tourism, and perceived challenges. The study suggests that although tourists are aware of the need for sustainable tourism, participation is driven by government support, community participation, and factors such as cost and infrastructure. The research suggests the need for holistic measures from policymakers, businesses and communities to encourage eco-friendly tourism, improve stakeholder engagement and provide effective and accessible carbon-neutral initiatives. This includes implementing effective regulations, providing incentives for sustainable practices, and educating and engaging tourists to ensure sustainable tourism's long-term success in India.

Keywords: Carbon-Neutral Tourism, Sustainable Policies, Tourist Behaviour, Destination management

Introduction

Tourism is a cornerstone of economic growth, bringing in income, jobs and cultural benefits. In India, it is a significant economic driver, with millions of local and international tourists. Tourism is vital for the economy, but it also has a heavy environmental impact. It is linked with high carbon emissions, energy use and ecological disruption. Travel, accommodation and recreation activities all leave an environmental footprint, prompting questions about the sustainability of tourism growth.

Carbon-neutral tourism is a key solution to these issues, prioritising both economic and environmental sustainability. This involves minimising the environmental footprint of tourism through energy efficient practices, green buildings, and responsible tourism practices. At the destination level, carbon-neutral measures include measures to reduce greenhouse emissions, encourage renewable energy sources and support conservation efforts. In India, the government has implemented various policies and programs to support such initiatives. These range from energy efficiency codes for hotels to waste management protocols and incentives for tourism enterprises to adopt sustainable practices.

Carbon-neutral tourism is dependent on the active participation of various stakeholders, such as government, tourism businesses, local communities, and tourists. Government initiatives offer a foundation, but businesses need to adopt sustainable practices and tourists must be willing to make choices that might be more expensive or require more effort. So insights into tourists' awareness, attitudes and willingness to engage in sustainable practices are crucial for informing strategies. Tourist preferences, such as willingness to pay for eco-friendly stays or engage in sustainable activities, play a critical role in the success of carbon-neutral tourism.

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Challenges, Objectives, and Significance of the Study

Adopting carbon-neutral measures can be challenging for tourism businesses and communities. Tourism businesses such as hotels, resorts and tour operators may lack the financial and technical capacity, and policy implementation may be disjointed. Communities, while impacted by the tourism sector, may not be equipped to participate in sustainability efforts. Identifying and addressing these obstacles is crucial for designing effective policies and fostering collaboration across stakeholders.

A strategic analysis of carbon-neutral tourism in India can be enhanced through a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats). The industry's strengths are the country's cultural and natural heritage, but weaknesses lie in insufficient infrastructure and lack of consistent sustainable tourism practices. Opportunities lie in a global shift towards sustainable travel and government encouragement, while threats stem from environmental challenges and policy implementation gaps. Performing such an analysis provides a systematic view of the industry and a basis for strategies to improve sustainable tourism.

Increasing concern for environmental sustainability has not been matched by improvements in infrastructure, policy enforcement and industry engagement. Carbon-neutral programs require cooperation between government agencies, tourism operators, hotels and communities. By working together, key stakeholders can address practical challenges, encourage the adoption of sustainable practices, and achieve environmental goals while enhancing the tourist experience.

This research is driven by the need to encourage sustainable tourism in India, both in response to climate change and to safeguard cultural and natural assets. The study assesses tourist awareness, behavior and willingness to participate in carbon-neutral initiatives, as well as the challenges faced by tourism businesses and local communities, to inform policy development. The research also adds to the existing knowledge base on sustainable tourism, providing evidence-based insights to improve policy settings, collaboration among stakeholders and adoption of carbon-neutral practices.

The objectives of this research are twofold: first, to examine tourist awareness, attitudes, and willingness to support carbon-neutral tourism; and second, to identify the challenges encountered by tourism enterprises and local communities in implementing sustainable practices, along with proposing actionable policy recommendations. By addressing these objectives, the study aims to bridge knowledge gaps, assess the effectiveness of current policies, and support the development of a sustainable future for tourism in India.

Review of Literature

Awareness and Perception of Carbon-Neutral Tourism

Using the Environmental Kuznets Curve (EKC) framework Balsalobre-Lorente, Driha, Bekun, and Adedoyin (2022) study the relationship between India's economic growth, international tourism, renewable energy use and carbon dioxide emissions. They validate the inverted U-shaped environmental degradation in their study. The study recommends that India embraces a synergy between educational programs and renewable energy to facilitate carbon-neutral tourism growth. This therefore sees the potential gap between tourist awareness and tourist behavior, which leads to this hypothesis:

H01: *There is no significant relationship between tourists' awareness of carbon-neutral tourism and their willingness to support sustainable initiatives.*

Spicer (2020) gives a holistic appraisal of ecotourism in India from social, environmental, political, and economic dimensions. The study stresses that the existing national regulations require revision to effectively compel the eco-friendly travel practices. The gaps in this case have been identified through reviews of existing policies and literature that points to a lack of tourist awareness and perception of ecotourism practices, which is necessary for implementing the required regulations.

Sustainable Tourism Practices and Tourist Behavior

Tewari (2023) in his article presents sustainable tourism by dissecting it's social, environmental and economic facets. The research highlights the importance of sustainable practices as they are the key to the preservation of the competitiveness and the long-term survival of India's tourism destinations. Planning strategically executing climate policy integration and involving stakeholders are the main horns of the sustainable tourist development as per the policy themes. Sharma and Rajput (2023) conduct a study on environmentally friendly travel practices in the vast and unfathomable natural and cultural landscapes of India. Based on secondary data, their research indicates that ecosystem-oriented policy mappings do exist but they are hampered mainly by the lack of stakeholder coordination and the insufficient participation of the community. This point out that the tourists' opinions towards sustainability could impact their willingness to embrace eco-friendly behaviors, which brings us to the second hypothesis:

H02: *Tourist perception of sustainability does not significantly influence their adoption of eco-friendly travel behaviors.*

Challenges and Barriers for Tourism Businesses

Kumar and Singh (2023) evaluate strategic frameworks for sustainable tourism development in India, highlighting key differences between sustainable and non-sustainable practices at ten major tourist destinations. The study emphasizes the role of policy frameworks, skill development, and international partnerships in enhancing industry competitiveness. These findings indicate that financial constraints, technical limitations, and policy gaps may act as barriers for tourism businesses in implementing carbon-neutral practices, motivating the third hypothesis:

H03: *The financial burden of adopting carbon-neutral practices is not a significant barrier for tourism businesses.*

Gupta and Bhatt (2023) analyze how policy initiatives in Uttarakhand encourage self-employment and sustainable tourism through community-based programs such as homestays. The study stresses that proper policy promotion and active community engagement are essential for effective implementation. These insights highlight the importance of government incentives and local participation in facilitating sustainable practices:

H04: *Government incentives do not have a significant impact on the adoption of carbon-neutral tourism practices.*

Research Gap

While past studies have shed light on various aspects of sustainable tourism in India, they fall short in assessing how effective the sustainability initiatives at tourist destinations are in the real world. Most researches are centered around conceptual models or single case studies, and not much consideration is given to the dynamic between tourist behavior, business difficulties, and policy implementation. Besides, there are hardly any data-backed studies that combine SWOT analyses with statistical methods to gauge the effectiveness of carbon-neutral tourism initiatives. To fill these voids, our research looks into the levels of tourist knowledge, the ways in which tourists behave, the hindrances faced by the tourism industry, and the effectiveness of policies, thereby pointing towards a set of practical measures that can help turn sustainable tourism in India into a success story.

Research Questions

To guide the investigation, the study addresses the following questions:

1. What is the level of awareness among tourists regarding carbon-neutral tourism?
2. How does tourist behavior impact the adoption of carbon-neutral practices?
3. What are the key challenges tourism businesses and local communities face in implementing carbon-

neutral initiatives?

4. What policy measures can enhance the effectiveness of sustainability initiatives at the destination level?

Analysis and Interpretation

Table-1 Descriptive Statistics			
	Frequency	**Percentage**	**Cumulative Percentage**
Age			
Below 30	170	45.21	45.21
31-40	94	24.93	70.14
Above 40	112	29.86	100
	376	100	
Gender			
Male	218	58.02	58.02
Female	158	41.98	100
	376	100	
Marital Status			
Married	202	53.66	53.66
Unmarried	174	46.34	100
	203	100	

Source Primary Data

Descriptive statistics in Table 1 serve to outline the demographic factors of the participants in the research. With 376 individuals as the total number of participants, the majority of them (45.21%) were young people under 30, 24.93% aged 31-40 years, and 29.86% aged above 40 years, implying the sample of participants is mostly young. The proportion of males was 58.02%, and that of females 41.98%, implying that the number of male respondens is a bit bigger than that of females. Respondents who were married accounted for 53.66%, and those who were unmarried for 46.34% respectively. In general, the sample is a good representation of the various age groups and the marital statuses, with a slight Male predominance, which results in a representative basis for analyzing tourists' awareness, behaviors, and attitudes toward carbon-neutral tourism.

Table- 2 **KMO and Bartlett's Test**		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.802
Bartlett's Test of Sphericity	Approx. Chi-Square	9886.598
	df	595
	Sig.	.000

Source: Primary data

Table 2 display the results of Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity which are used for testing the appropriateness of data for factor analysis. The KMO value of 0.802 indicates a meritorious level of sampling adequacy; this means that the correlations between the variables are high enough for factor extraction to be reliable. Bartlett's Test of Sphericity is significant (Approx. Chi-Square = 9886.598, df

= 595, $p < 0.001$), showing that the correlation matrix is not an identity matrix and the variables are sufficiently correlated for factor analysis. These findings indicate that the data are suitable for factor analysis in order to identify latent factors in the areas of tourist awareness perception behavior, and attitudes toward carbon-neutral tourism.

Table - 3

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	umulative %
1	4.419	12.625	12.625	4.419	12.625	12.625	3.903	11.151	11.151
2	4.111	11.746	24.371	4.111	11.746	24.371	3.882	11.091	22.242
3	3.931	11.231	35.602	3.931	11.231	35.602	3.871	11.061	33.303
4	3.698	10.565	46.167	3.698	10.565	46.167	3.700	10.573	43.876
5	3.633	10.381	56.549	3.633	10.381	56.549	3.621	10.346	54.223
6	3.201	9.146	65.695	3.201	9.146	65.695	3.599	10.282	64.505
7	3.055	8.729	74.424	3.055	8.729	74.424	3.472	9.919	74.424
8	.795	2.271	76.695						
9	.745	2.129	78.825						
10	.674	1.926	80.750						
11	.658	1.879	82.629						
12	.575	1.644	84.273						
13	.561	1.604	85.877						
14	.440	1.258	87.136						
15	.320	.915	88.050						
16	.296	.847	88.897						
17	.286	.817	89.714						
18	.273	.781	90.495						
19	.268	.765	91.260						
20	.261	.746	92.006						
21	.246	.703	92.709						
22	.238	.681	93.389						
23	.232	.661	94.051						
24	.219	.626	94.677						

25	.217	.621	95.299						
26	.209	.598	95.897						
27	.199	.570	96.467						
28	.190	.544	97.011						
29	.180	.514	97.525						
30	.176	.502	98.028						
31	.158	.451	98.479						
32	.150	.429	98.908						
33	.143	.409	99.317						
34	.127	.363	99.680						
35	.112	.320	100.000						
Extraction Method: Principal Component Analysis.									

Source Primary Data

The Principal Component Analysis (PCA) results presented in Table 3 illustrate the overall amount of variance accounted for by the extracted components. Seven components with eigenvalues exceeding 1 have been identified through the analysis, which implies that these factors hold considerable weight in unraveling the latent structure of the dataset. Component 1 alone explains 12.63% of the variance, Component 2 accounts for 11.75%, and Component 3 makes up 11.23%. Components 4 to 7 each explain between 8.73% and 10.57% of the variance, thereby indicating that every component plays a significant role in not only describing the exclusive facets of tourist awareness perceptions behavior, and attitudes but also their interaction with carbon-neutral tourism.

The combined variance explained by these seven components amounts to 74.42%, which shows that a major fraction of the total dynamism in the dataset is being clearly represented by these factors. Such a high cumulative percentage figure suggests the components chosen here can very well stand in for the hidden dimensions, and they are the right candidates to be undergoing further exploration. Moreover, the findings imply that the dataset is aptly organized for shedding light on the various facets of carbon-neutral tourism like tourists' propensities for supporting sustainable tourism initiatives, their biospheric behaviors, and the role of destination-level policies and communal participation..

The rotation of the component loadings changes the way variance is shared among the factors so that each factor's unique contribution becomes clearer, thus helping with interpretation. Even after the rotation, the seven components explain 74.42% of the cumulative variance, which reassures us that the factor solution is stable and reliable. This not only sets a firm basis for the hypothesis testing, but it also confirms the factor structure so that the next analysis will truly represent the interrelations between awareness perception behavior, business challenges, and policy influences in encouraging carbon-neutral tourism.

Table 4 - Rotated Component Matrix[a]

	Component						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Var1_Q1	.902						
Var1_Q5	.895						
Var1_Q4	.888						
Var1_Q3	.888						
Var1_Q2	.815						

Var5_Q2		.898					
Var5_Q1		.896					
Var5_Q3		.895					
Var5_Q5		.887					
Var5_Q4		.798					
Var6_Q1			.912				
Var6_Q2			.910				
Var6_Q3			.890				
Var6_Q5			.883				
Var6_Q4			.783				
Var7_Q2				.902			
Var7_Q5				.893			
Var7_Q1				.874			
Var7_Q3				.817			
Var7_Q4				.788			
Var4_Q4					.902		
Var4_Q3					.877		
Var4_Q5					.821		
Var4_Q2					.815		
Var4_Q1					.808		
Var2_Q2						.869	
Var2_Q4						.864	
Var2_Q1						.835	
Var2_Q3						.818	
Var2_Q5						.815	
Var3_Q1							.875
Var3_Q4							.875
Var3_Q2							.796
Var3_Q5							.796
Var3_Q3							.784
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 5 iterations.							

Source: Primary data

Table 4 reports the outcomes of the rotated component matrix resulting from Principal Component Analysis (PCA) with Varimax rotation. The rotation converged after five iterations, which implies that the factor solution is firm. Besides, each variable has a high loading on only one component, which confirms that the components reflect separate constructs that the study investigates. Component loadings greater than 0.7 are deemed significant, and the figures listed here show that all variables have very strong correlations with the factors to which they belong. Thus, the factor structure can be considered reliable.

The seven extracted components correspond to distinct dimensions of carbon-neutral tourism behavior and perception. For instance, Component 1 represents tourists' awareness of carbon-neutral tourism (Var1_Q1 to Var1_Q5), while Component 2 reflects the influence of destination-level sustainability policies (Var5_Q1 to

Var5_Q5). Component 3 captures perceptions of barriers to carbon-neutral tourism (Var6_Q1 to Var6_Q5), Component 4 relates to tourists' willingness to participate in eco-friendly initiatives (Var4_Q1 to Var4_Q5), Component 5 represents the perceived importance of sustainable tourism (Var2_Q1 to Var2_Q5), Component 6 corresponds to tourist behavior towards sustainability (Var3_Q1 to Var3_Q5), and Component 7 highlights the role of local communities (Var7_Q1 to Var7_Q5). This clear loading pattern confirms that the questionnaire items effectively measure the intended constructs.

The rotated component matrix not only supports the factor structure but also facilitates the understanding of factors for further analysis. The high association of variables with their respective components enables proper identification of factors which is very important for testing research hypotheses. For instance, the distinct separation of awareness (Component 1) and willingness to participate (Component 4) gives the grounds for investigating the hypothesized relationship between awareness and support for sustainable initiatives (H01). Along the same lines, the factor structure is in line with the path of analysis of influence of perceptions, barriers, and policy incentives on tourist behavior and business adoption of carbon-neutral practices (H02-H04). In summary, Table 4 affirms that the data is appropriate for detailed statistical examination and hypothesis testing.

Result and Discussion

The factor analysis results showed that tourists' awareness perceptions behavior, and attitudes towards carbon-neutral tourism could be clearly characterized. The rotated component matrix showed that the survey items fell into distinct factors that meaningfully corresponded to different facets of sustainable tourism involvement. The awareness related items strongly loaded on the first component, which means that tourists are on the whole aware of carbon-neutral tourism and its environmental benefits. By the same token, the perception of sustainability policies at the destination level, tourist behavior, willingness to engage in eco-friendly initiatives, and perceived barriers each made up separate components, which means that these factors are different but related in their influence on sustainable tourism practices.

Discussing these results, it is well exemplified why the awareness and perceptions of tourists have a major role in determining environmentally friendly behavior. Those who are better informed about what carbon-neutral tourism consists of, are more inclined to favor green accommodation, minimalist activities, and travel decisions that cause the least harm. Besides, the level at which governments are active in policymaking, involvement of the community, and the presence of sustainable tourism options are factors that determine how willing tourists are to go for carbon-neutral ways. The findings reveal that although there is a widespread awareness, respondents have mentioned the following barriers: which can prevent the complete adoption of sustainable tourism practices. Taking all that into account that such findings point to the necessity for multi-level approaches that blend educating people, using policy measures as a motive and keeping environmentally friendly options handy to promote responsible travel behavior.

Besides, the results also highlight the role of businesses and local communities in supporting carbon-neutral tourism. The grouping of items about business constraints and community involvement indicates that structural factors, such as financial capacity, technical know-how, and community engagement, are a major influence on the effectiveness of sustainability initiatives. In fact, it supports a line of research that has found government support and stakeholder collaboration to be crucial for producing real environmental results in tourism. In general, the findings point to the need for a multifaceted approach that attempts to modify tourist behavior, create the right policy environment, and overcome tourism-related operational difficulties as the way of promoting carbon-neutral tourism in India.

Conclusion and Suggestion

The research identifies that a combination of connected factors determines carbon-neutral tourism in India such as tourist awareness, perception, and behavior, besides government policies and local community involvement. The research results indicate that although tourist, in general, acknowledge the significance of going

green, their actual commitment to eco-friendly measures relies on the availability of such options, the existence of relevant regulations, and collaboration among different stakeholders. Being aware of environmental issues is not enough; people's perception of sustainability, their willingness to engage in it, and the existence of practical obstacles such as the cost and lack of green facilities, strongly influence people's decisions to travel ecologically. These findings demonstrate that in order to develop carbon-neutral tourism, it is necessary to adopt a comprehensive strategy which combines providing information, offering motivation and considering the practical aspects of green tourism.

From the discussed understandings, one can outline quite a few strategies to elevate the carbon-neutral tourism concept. First of all, the governmental officials are called upon to build up the legal base of the matter, issue welL-defined instructions, and create monetary or technical support, which is especially important to those tourism businesses that are going green. The local tour operators and the hosts of the accommodations need to focus mainly on offering eco-friendly options and get their sustainability story out there in an attractive way for the traveler who takes his/her environment seriously. In order to ensure that local residents benefit economically while at the same time be actively involved in the protection of the environment, community engagement must be backed up with training programs and participation in local conservation activities. Last but not least, the information raising interventions directed at tourists will work in two ways - encouraging them to behave responsibly and at the same time creating the market for the so-called green alternatives. After all, by doing so, India will be able to move forward the tour sector in the direction of sustainability where the economic growth is balanced with environmental conservation.

Factors	
Items	**Components**
Components 1 - Awareness of Carbon-Neutral Tourism	
1.	The concept of carbon-neutral tourism is well-known.
2.	The environmental impact of tourism-related carbon emissions is understood.
3.	Information about carbon-neutral tourism initiatives in India has been encountered.
4.	Carbon-neutral tourism is believed to help preserve natural destinations.
5.	Seeking information about eco-friendly tourism practices is a priority.
Component 2 - Perceived Importance of Sustainable Tourism	
6.	Carbon-neutral tourism is considered essential for the sustainability of tourist destinations
7.	Reducing carbon emissions is a priority in the tourism sector.
8.	Tourists have a responsibility to minimize their environmental footprint.
9.	Government policies play a crucial role in promoting carbon-neutral tourism
10.	Tourism businesses should prioritize sustainability in their operations.
Component 3 - Tourist Behaviour Towards Sustainability	
11.	Preference is given to eco-friendly accommodations when traveling.
12.	Efforts are made to reduce waste while traveling.
13.	Public transport or non-motorized transport is used when exploring a destination.
14.	Tourism activities with minimal environmental impact are chosen.
15.	Support is given to businesses that follow sustainable tourism practices
Component 4 - Willingness to Participate in Carbon-Neutral Initiatives	
16.	Paying extra for eco-friendly accommodation is acceptable.
17.	Carbon offset programs are supported while traveling
18.	Participation in volunteer programs for environmental conservation is considered.
19.	Travel frequency is reduced to minimize carbon footprint.
20.	Support is given to the introduction of carbon taxes for tourism-related activities
Component 5 - Influence of Destination-Level Sustainability Policies	
21.	Destination-level policies influence the choice of travel destination.
22.	Strict regulations for carbon emissions in tourism are supported.
23.	Government incentives for green tourism encourage sustainable travel.

24.	Sustainability certifications for hotels and tour operators are considered beneficial.
25.	Enforcement of penalties for tourism businesses that do not follow sustainability guidelines is supported.
Component 6 - Perception of Barriers to Carbon-Neutral Tourism	
26.	Eco-friendly travel options are perceived as expensive
27.	Lack of awareness prevents the adoption of sustainable practices
28.	Limited availability of eco-friendly accommodations affects travel choices.
29.	The convenience of traditional travel options makes sustainable practices difficult to adopt
30.	Insufficient government support hinders the promotion of carbon-neutral tourism
Component 7 - Role of Local Communities in Carbon-Neutral Tourism	

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