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# A STUDY ON AI-DRIVEN SUSTAINABLE TOURISM PATHWAYS FOR INDIAN YOUTH AND THE ROLE OF INTELLIGENT SYSTEMS IN PROMOTING ECO-FRIENDLY, RESPONSIBLE, AND LOW-CARBON TRAVEL

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## ABSTRACT:

Youth tourism has emerged as one of the fastest-growing segments of the Indian tourism industry, driven by increasing disposable incomes, digital connectivity, and a strong inclination toward experiential travel. However, the rapid growth of youth travel has raised serious concerns regarding environmental degradation, carbon emissions, over-tourism, and irresponsible tourist behavior in ecologically sensitive destinations. In this context, artificial intelligence (AI) has gained prominence as a transformative tool capable of influencing travel planning, decision-making, and behavioral outcomes.

This study examines the role of AI-driven intelligent systems, including itinerary planners, carbon footprint calculators, smart mobility applications, and AI-based recommendation engines, in promoting eco-friendly, responsible, and low-carbon tourism practices among Indian youth. Using a mixed-method research approach, primary data were collected through a structured questionnaire administered to Indian youth travelers aged 18–35 years. The study evaluates awareness, usage patterns, behavioral nudges, and sustainability outcomes associated with AI-enabled tourism platforms.

Findings reveal high levels of awareness and acceptance of AI-based travel tools among Indian youth, with significant influence on sustainable choices such as public transport usage, eco-accommodation selection, waste reduction practices, and support for local communities. The study contributes a conceptual framework linking AI adoption with sustainable youth tourism pathways and highlights AI's potential as a tool for social good in the Indian tourism ecosystem.

**Keywords:** Artificial Intelligence, Sustainable Tourism, Youth Tourism, Low-Carbon Travel, Responsible Tourism, India

## 1. INTRODUCTION

Tourism plays a vital role in India's economic development, contributing significantly to employment generation, foreign exchange earnings, and regional development. Within this

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sector, youth tourism has emerged as a dynamic and influential segment, characterized by higher mobility, digital dependence, and openness to innovation. Indian youth travelers increasingly rely on digital platforms for destination selection, itinerary planning, accommodation booking, and mobility decisions.

However, the growth of youth tourism has coincided with rising environmental concerns such as carbon emissions from transport, waste generation, overuse of natural resources, and degradation of cultural heritage sites. Popular destinations in India face challenges related to over-tourism, pollution, and unsustainable visitor behavior. This situation underscores the urgent need for sustainable tourism pathways that align youth travel aspirations with environmental responsibility.

Artificial intelligence has emerged as a powerful enabler in this transformation. AI-based systems can analyze vast datasets, personalize travel recommendations, and nudge users toward sustainable choices without restricting freedom of choice. Intelligent systems such as carbon footprint calculators, smart route planners, and eco-hotel recommendations have the potential to influence travel behavior at scale.

Despite growing interest in AI and smart tourism, empirical research focusing specifically on Indian youth and the behavioral impacts of AI-driven sustainable tourism tools remains limited. This study seeks to address this gap by examining how AI-enabled systems shape eco-friendly, responsible, and low-carbon travel decisions among Indian youth travelers.

## REVIEW OF LITERATURE

1. **Abu Bakkar Siddik et.al (2025),** In the research titled "Artificial intelligence as a catalyst for sustainable tourism growth and economic cycles" The study concludes that artificial intelligence acts as a critical catalyst in advancing sustainable tourism growth by aligning economic cycles with environmental responsibility. AI-driven systems enhance operational efficiency, optimize resource utilization, and influence tourist decision-making toward sustainability-oriented choices. The authors emphasize that AI not only supports economic resilience in tourism destinations but also contributes to long-term sustainability by enabling data-driven planning and responsible consumption patterns, thereby positioning AI as a key enabler of sustainable tourism ecosystems.
2. **Wang et.al (2025),** In the research titled "Artificial intelligence in tourism: A systematic literature review and future research agenda" This systematic literature review concludes that artificial intelligence has become a transformative force in the tourism industry, particularly in areas of personalization, destination management, and sustainability. The study identifies a significant shift toward AI-enabled smart tourism solutions while highlighting the lack of empirical research linking AI adoption to behavioral sustainability outcomes. The authors call for future research focusing on specific demographic groups, such as youth travelers, and on measurable environmental and social impacts of AI-driven tourism systems.
3. **Ni et.al (2025),** In the research titled "Digital nudging for sustainable tourist behavior in new media" The study concludes that digital nudging through AI-powered new media platforms significantly influences sustainable tourist behavior. AI-generated prompts, recommendations, and behavioral cues are found to effectively encourage environmentally responsible decisions without restricting traveler autonomy. The findings demonstrate that subtle AI-based nudges can enhance awareness, promote eco-friendly actions, and foster responsible tourism practices, making digital nudging a powerful tool for sustainability-oriented behavioral change.

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4. **Vijai (2025),** In the research titled "Artificial intelligence applications for reducing carbon footprint in tourism" This chapter concludes that artificial intelligence applications play a crucial role in reducing the carbon footprint of tourism activities. AI tools such as carbon emission calculators, smart mobility systems, and energy-efficient accommodation management solutions help tourists and service providers make informed, low-carbon decisions. The author emphasizes that integrating AI into tourism sustainability strategies can significantly contribute to climate action goals while supporting long-term environmental and economic viability of the tourism sector.
5. **Londhe et.al (2024),** In the research titled "Enhanced travel experience using artificial intelligence: A data-driven approach" The study concludes that AI-driven, data-centric approaches significantly enhance the overall travel experience through improved personalization, efficiency, and decision accuracy. While the primary focus is on experience enhancement, the findings indirectly highlight AI's potential to guide travelers toward optimized and resource-efficient choices. The authors suggest that AI-enabled travel systems can be strategically extended to promote sustainable and responsible tourism practices alongside improved customer satisfaction.
6. **Gretzel et.al (2015),** In the research titled "Smart tourism: Foundations and developments" This foundational study concludes that smart tourism represents a paradigm shift driven by advanced information technologies, including artificial intelligence and big data analytics. The authors establish that smart tourism systems enhance destination competitiveness, visitor experience, and managerial effectiveness. The study lays the theoretical groundwork for understanding how intelligent systems can support sustainable destination development through real-time data integration and informed decision-making.
7. **Buhalis & Amaranggana (2015),** In the research titled "Smart tourism destinations enhancing tourism experience through personalization" The study concludes that smart tourism destinations leverage intelligent technologies to deliver highly personalized and efficient tourist experiences. The authors highlight that personalization enabled through digital and AI-driven systems improves satisfaction while enabling better destination management. The study suggests that smart technologies can be strategically utilized to balance tourist demand, resource efficiency, and sustainability objectives, thereby enhancing both visitor experience and destination resilience.

## RESEARCH GAP

A critical review of the existing literature reveals that while prior studies extensively highlight the transformative role of artificial intelligence in sustainable tourism, smart destinations, digital nudging, and carbon footprint reduction, several significant gaps remain. Most existing research adopts a global or generalized perspective, with limited empirical focus on Indian youth travelers, despite youth being one of the most technology-driven and environmentally influential tourist segments. Additionally, although AI-enabled tools such as itinerary planners, carbon calculators, and sustainability nudges are conceptually acknowledged, there is a lack of quantitative evidence directly linking these intelligent systems to measurable eco-friendly, responsible, and low-carbon travel behaviours. Furthermore, earlier studies largely emphasize technological capabilities or experience enhancement, while insufficient attention is given to behavioral outcomes and decision-making mechanisms influenced by AI among youth. The absence of an integrated framework connecting AI-driven travel planning systems, sustainability nudges, and sustainable tourism

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behaviour, particularly within the Indian context, highlights the need for focused empirical investigation, which the present study seeks to address.

## RESEARCH METHODOLOGY

The present study adopts a descriptive and analytical research design to examine the influence of artificial intelligence–driven systems on sustainable tourism behaviour among Indian youth. Primary data were collected through a structured questionnaire administered to 80 Indian youth travelers aged 18–35 years, selected using convenience sampling. The questionnaire was designed using a 5-point Likert scale ranging from Strongly Disagree to Strongly Agree and covered variables related to AI-Driven Travel Planning Systems, AI-Enabled Sustainability Nudges, and Sustainable Tourism Behaviour of Indian Youth. Secondary data were sourced from scholarly journals, books, conference proceedings, and tourism reports. The collected data were coded and analyzed using SPSS software to achieve the objectives of the study.

## DATA ANALYSIS

Data analysis was carried out using descriptive and inferential statistical techniques to examine the relationships among the study variables. Pearson's correlation analysis was employed to assess the association between AI-Driven Travel Planning Systems, AI-Enabled Sustainability Nudges, and Sustainable Tourism Behaviour of Indian Youth. The results revealed strong and statistically significant positive correlations between AI-Driven Travel Planning Systems and Sustainable Tourism Behaviour ($r = 0.873$, $p < 0.01$), as well as between AI-Enabled Sustainability Nudges and Sustainable Tourism Behaviour ($r = 0.817$, $p < 0.01$). These findings indicate that increased use of AI-based travel tools and sustainability nudges significantly enhances eco-friendly, responsible, and low-carbon travel behaviour among Indian youth, leading to the rejection of the null hypotheses.

**Demographic Factor**

| Sr No. | Particular | Category | Frequency | Percent |
|---|---|---|---|---|
| 1 | Gender | Male | 45 | 56.3 |
| | | Female | 35 | 43.8 |
| 2 | Age | Below 25 Years | 30 | 37.5 |
| | | 26-35 Years | 32 | 40.0 |
| | | 36-45 Years | 10 | 12.5 |
| | | 46-60 Years | 8 | 10.0 |
| 3 | Qualification | Undergraduate | 14 | 17.5 |
| | | Graduate | 23 | 28.7 |
| | | Postgrad | 22 | 27.5 |
| | | Doctoral | 2 | 2.5 |
| | | Professional degree | 19 | 23.8 |
| 4 | Occupation | Homemaker | 6 | 7.5 |
| | | Professional | 13 | 16.3 |
| | | Salaried | 27 | 33.8 |
| | | Self-Emp | 10 | 12.5 |
| | | Student | 24 | 30.0 |

The demographic profile of the respondents indicates that out of 80 participants, 45 respondents (56.3%) were male and 35 respondents (43.8%) were female, showing a fairly balanced gender representation. With respect to age, the majority of respondents belonged to the 26–35 years age group (32 respondents, 40.0%), followed by those below 25 years (30

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respondents, 37.5%), indicating a strong representation of youth travelers. In terms of educational qualification, graduates constituted the largest group (23 respondents, 28.7%), closely followed by postgraduates (22 respondents, 27.5%) and professionally qualified respondents (19 respondents, 23.8%), while a small proportion were doctoral scholars (2 respondents, 2.5%). Regarding occupation, the sample was dominated by salaried employees (27 respondents, 33.8%) and students (24 respondents, 30.0%), followed by professionals (13 respondents, 16.3%), self-employed individuals (10 respondents, 12.5%), and homemakers (6 respondents, 7.5%), indicating a diverse occupational background among the respondents.

**Objective and Hypothesis**

**Objective 1 To examine the relationship between AI-Driven Travel Planning Systems and Sustainable Tourism Behaviour of Indian Youth.**

**Null Hypothesis $H_{01}$:** There is no relationship between AI-Driven Travel Planning Systems and Sustainable Tourism Behaviour of Indian Youth.

**Alternate Hypothesis $H_{11}$:** There is a relationship between AI-Driven Travel Planning Systems and Sustainable Tourism Behaviour of Indian Youth.

To study the above null hypothesis, Correlation T-test is applied and results are as follows:

| **Correlations** | | | |
|---|---|---|---|
| | | AI-Driven Travel Planning Systems | Sustainable Tourism Behaviour of Indian Youth |
| AI-Driven Travel Planning Systems | Pearson Correlation | 1 | .873** |
| | P-value | | .000 |
| | N | 80 | 80 |
| Sustainable Tourism Behaviour of Indian Youth | Pearson Correlation | .873** | 1 |
| | P-value | .000 | |
| | N | 80 | 80 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | |

**Interpretation:** The above results indicate that calculated p-value is 0.000. It is less than 0.05. Therefore, correlation test is rejected. Hence Null hypothesis is rejected and Alternate hypothesis is accepted.

**Conclusion:** There is a relationship between AI-Driven Travel Planning Systems and Sustainable Tourism Behaviour of Indian Youth.

**Findings:** The correlation analysis reveals a strong positive relationship between AI-Driven Travel Planning Systems and Sustainable Tourism Behaviour of Indian Youth, with a Pearson correlation coefficient of r = 0.873, which is statistically significant at the 0.01 level (p = 0.000). This result indicates that increased use of AI-based travel planning tools, such as intelligent itinerary planners, AI-driven destination recommendations, and smart mobility applications, is strongly associated with higher adoption of eco-friendly, responsible, and low-carbon travel practices among Indian youth. The strength and significance of the relationship suggest that AI-enabled travel planning plays a crucial role in shaping sustainable tourism behaviour, thereby leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis. This finding supports the view that intelligent travel systems act as effective enablers of sustainable tourism pathways for youth travelers.

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**Objective 2 To analyze the relationship between AI-Enabled Sustainability Nudges and Sustainable Tourism Behaviour of Indian Youth.**

**Null Hypothesis $H_{02}$:** There is no relationship between AI-Enabled Sustainability Nudges and Sustainable Tourism Behaviour of Indian Youth.

**Alternate Hypothesis $H_{12}$:** There is a relationship between AI-Enabled Sustainability Nudges and Sustainable Tourism Behaviour of Indian Youth.

To study the above null hypothesis, Correlation T-test is applied and results are as follows:

| Correlations | | | |
|---|---|---|---|
| | | AI-Enabled Sustainability Nudges | Sustainable Tourism Behaviour of Indian Youth |
| AI-Enabled Sustainability Nudges | Pearson Correlation | 1 | .817** |
| | P-value | | .000 |
| | N | 80 | 80 |
| Sustainable Tourism Behaviour of Indian Youth | Pearson Correlation | .817** | 1 |
| | P-value | .000 | |
| | N | 80 | 80 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | |

**Interpretation:** The above results indicate that calculated p-value is 0.000. It is less than 0.05. Therefore, correlation test is rejected. Hence Null hypothesis is rejected and Alternate hypothesis is accepted.

**Conclusion:** There is a relationship between AI-Enabled Sustainability Nudges and Sustainable Tourism Behaviour of Indian Youth.

**Findings:** The correlation analysis indicates a strong positive relationship between AI-Enabled Sustainability Nudges and Sustainable Tourism Behaviour of Indian Youth, with a Pearson correlation coefficient of r = 0.817, which is statistically significant at the 0.01 level (p = 0.000). This finding suggests that AI-based sustainability nudges, such as carbon footprint calculators, eco-friendly travel recommendations, responsible tourism alerts, and environmental impact notifications, have a substantial influence on promoting eco-friendly, responsible, and low-carbon travel practices among Indian youth. The strength of the correlation demonstrates that as exposure to and responsiveness toward AI-enabled sustainability nudges increase, youth travelers are more likely to adopt sustainable tourism behaviours. Consequently, the null hypothesis is rejected and the alternative hypothesis is accepted, confirming the positive role of intelligent systems in shaping sustainable tourism pathways for Indian youth.

## CONCLUSION

The present study highlights the significant role of artificial intelligence in shaping sustainable tourism pathways among Indian youth. The findings clearly demonstrate that AI-driven travel planning systems and AI-enabled sustainability nudges have a strong and positive influence on eco-friendly, responsible, and low-carbon travel behaviour. Indian youth show a high level of responsiveness to intelligent travel tools such as itinerary planners, carbon footprint calculators, and smart mobility applications, which guide them toward environmentally conscious decisions. The strong correlations observed in the study

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confirm that AI-based systems are not merely facilitators of convenience but also act as effective behavioral influencers that encourage responsible tourism practices.

Furthermore, the study underscores the potential of intelligent systems to support long-term sustainability goals in the tourism sector by promoting reduced carbon emissions, resource efficiency, and ethical engagement with destinations. By focusing on Indian youth, a key driver of future tourism demand, the research contributes valuable empirical evidence to the growing discourse on AI for social good in tourism. The study offers practical implications for policymakers, tourism planners, and technology developers to integrate AI-enabled sustainability features into travel platforms. Overall, the research reinforces the importance of leveraging artificial intelligence as a strategic tool to foster sustainable tourism development while aligning technological innovation with environmental and social responsibility.

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