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Sustainable Tourism Dynamics at Kakrebihar: A Comprehensive Evaluation of Visitor Satisfaction and Loyalty within Archaeological and Forest Preserves

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Abstract

This research explores the dynamics of sustainable tourism at Kakrebihar, an archaeological site and forest preserve in Nepal, by examining the connections between sustainable tourism practices (STP), destination attributes (DA), visitor experience quality (VEQ), visitor satisfaction (VS), and visitor loyalty (VL). A quantitative approach rooted in the positivist paradigm was employed, with data collected through a survey of 407 visitors. Structural equation modeling (SEM), along with confirmatory factor analysis (CFA) and exploratory factor analysis (EFA), was used for data analysis. The results show significant positive correlations between STP, VEQ, and DA with VS, yielding path coefficients of 0.103, 0.382, and 0.283, respectively. VEQ emerged as the most influential factor in enhancing visitor satisfaction, highlighting the critical role of enriching visitor experiences. Furthermore, VS was identified as a key driver of VL, with a path coefficient of 1.362, suggesting that satisfied visitors are more inclined to return and recommend the site. These outcomes emphasize the role of sustainable tourism practices, destination appeal, and visitor experience in cultivating both satisfaction and loyalty. The study offers valuable insights for stakeholders, underlining the importance of effective tourism management to protect Kakrebihar's archaeological and ecological resources while promoting sustainable growth.

Keywords: Tourism. Evaluation. Sustainable. Archaeological. Forest preserves. Kakrebihar.

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1 Introduction

Sustainable tourism has become as a significant paradigm in the international tourism industry, highlighting the need to balance economic development with the preservation of the environment and cultural heritage, particularly concerning archaeological sites and forest preserves (Weaver, 2007). As tourism continues to grow globally, there is a persistent need to ensure that tourism development not only meets current visitor demands but also preserves the integrity of natural, cultural, and historical resources for future generations (Edgell, 2019). The primary objectives of

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sustainable tourism are to minimize tourism's environmental footprint, encourage the preservation of natural and cultural resources and generate economic opportunities for local communities (Bentley & Halim, 2024; Novita, Ngindana, & Putra, 2024) . Kakrebihar, an archeological site and forest preserves, offers a unique opportunity for examining sustainable tourism practices due to its rich historical, archeological, cultural and ecological diversity.

Situated in Birendranagar, the capital of Karnali Province in Nepal, Kakrebihar often considered second only to Lumbini (Birth place of Buddha) in archaeological and historical importance, covers about 180 hectares of forest preserves . Artifacts discovered at Kakrebihar provide detailed representations of Buddha's life and include statues of Hindu deities such as Shiva, Parvati, Saraswati, and Vishnu, as well as symbols like lotus flowers, conch shells, and chariot wheels. Kakrebihar traces its origins to the 11th or 12th century, under the rule of King Ashoka Challa of the Khasa Malla dynasty. The Tibetan manuscript "Abhisamayalankara" further confirms the site's significance, dating it to the 12th century . Although historical accounts of its destruction vary, the site's importance was rediscovered in 1950 by Guru Yogi Narharinath Preservation efforts, including reforestation led by King Birendra in the 1970s, have been crucial in safeguarding this culturally rich site .

Renowned as one of Nepal's oldest and largest Shikhara-style temples, Kakrebihar's intricate architecture, featuring both Buddhist and Hindu motifs, highlights the region's rich historical, cultural, archaeological, and ecological heritage. This unique blend of heritage draws tourists from both within Nepal and internationally during certain periods of the year. However, with increasing tourism comes the risk of over-exploitation and degradation of its natural and cultural assets (Gössling, 2003). Sustainable tourism practices, including proper management of environmental impacts, maintaining biodiversity, and promoting responsible visitor behavior, have become essential for protecting the site (Bushell & Bricker, 2017). These practices aim to preserve the destination's resources while enhancing visitor experiences and satisfaction.

Visitor satisfaction plays a critical role in managing tourism destination, as pleased visitors are more likely to develop loyalty to the location, return for future visits, and recommend it to others (Chi & Qu, 2008). In sustainable tourism, visitor satisfaction is determined by the tourists' overall experience, influenced by factors such as the site's aesthetic appeal, accessibility, quality of interpretation services and the preservation of its natural and historical elements (Gao2020 ; Kempiak et al., 2017; Olya et al., 2019). Meanwhile, visitor loyalty is characterized by a willingness to revisit the site and endorse it to others, indicating sustained interest and support for the destination (HEIDARI2024 ; Wang & Li, 2023). The relationship between visitor satisfaction and loyalty is critical for ensuring the long-term success and sustainability of tourism destinations (Ryglová et al., 2018) .

Previous studies have investigated various factors contributing to visitor satisfaction, including service quality and destination attractiveness Chakrabarti and Mittal, 2023; Jain et al., 2023. However, there has been limited focus on how sustainability practices are integrated within archaeological and forest preserves sites like Kakrebihar. To address this gap, the present study aims to investigate the relationships between sustainable tourism practices, destination attributes, visitor experience quality, visitor satisfaction and visitor loyalty at Kakrebihar's archaeological and forest preserves.

2 Literature Review

The theoretical foundation of this study combines concepts from various prominent theories in tourism and environmental psychology. Central to the framework is Service-Dominant (S-D) logic, which emphasizes that service, rather than products forms the foundation of economic exchange, with value being co-created by both businesses and consumers (Vargo & Lusch, 2014).

This is especially relevant in tourism, where visitor experiences are influenced by services, environmental context, cultural heritage, and community interactions. Kaplan's Attention Restoration Theory (ART) also plays a significant role, explaining how natural environments like Kakrebihar can restore attention and enhance emotional well-being, thereby affecting visitor satisfaction (Kaplan & Kaplan, 1989). Additionally, Expectancy-Disconfirmation Theory (EDT) proposes that satisfaction is shaped by the gap between anticipated outcomes and actual experiences (L., 1977). This framework thus integrates S-D logic, ART, and EDT to examine how sustainable tourism practices, destination attributes and visitors experience quality impact visitor satisfaction and loyalty at archeological and forest preserves sites like Kakrebihar.

Sustainable Tourism Practices (STP)

STP focuses on minimizing the adverse effects of tourism on the environment and local communities while enhancing positive outcomes, such as socio-economic growth and the conservation of cultural and natural resources (Neto, 2003). Research by Solís-Radilla et al.'s (2019) highlights the importance of STP in improving tourist satisfaction and sustaining the long-term attractiveness of tourism destinations. Similarly, Jasrotia, Kamila, and Patel's (2023) assert that environmental, sociocultural, and institutional sustainability are crucial factors for enhancing tourist satisfaction. Juandi, Andari, and Setiyorini's (2018) emphasize that the integrated development of STP, which includes economic and sociocultural aspects, has a significant positive effect on visitor satisfaction. Additionally, STP positively affects the satisfaction of both residents and visitors, underscoring the necessity of local engagement in tourism development (Trišić et al., 2024). Mathew, Cabral, and Mohandas's (2024) further contend that responsible tourism practices enhance visitor satisfaction, leading to greater intentions to return and favorable word-of-mouth. In light of this evidence, the following hypothesis is proposed:

H1: STP positively influence visitor satisfaction.

Destination Attributes (DA)

DA include the cultural significance, archaeology, biodiversity, accessibility, and overall condition of the destination (Eusébio & Vieira, 2013; Fallon & Schofield, 2006; Kozak, 2003) . The association between the DA and visitor satisfaction has been studied by several authors (Albayrak & Caber, 2013; Auliya & Prianti, 2022; Garrod & Fyall, 2000; Žabkar, Brenčič, & Dmitrović, 2010; Zhou et al., 2024). Garrod and Fyall's (2000) highlighted that a site's conservation status, coupled with the availability of amenities and the quality of interpretive materials, aesthetic and educational value of the environment contributes to higher satisfaction levels. Further, Albayrak and Caber's (2013) verified the significant impact of DA on visitor satisfaction. Similarly, research by Auliya and Prianti's (2022) confirmed that positive DA contribute to tourist satisfaction. Additionally, Žabkar, Brenčič, and Dmitrović's (2010) found that DA influence the perceived quality of tourist offerings, which in turn positively affects satisfaction and visitor behavior. Moreover, cultural attributes are essential in forming a destination's image and satisfaction, with a strong cultural reputation being closely linked to visitor loyalty (Zhou et al., 2024). Thus, the following hypothesis is put forward:

H2: DA positively influence visitor satisfaction.

Visitor Experience Quality (VEQ)

VEQ includes various aspects such as emotional engagement, educational value, and overall enjoyment (Calver & Page, 2013). Visitor satisfaction refers to the benefits or psychological outcomes that individuals gain from visiting a tourist attraction or taking a trip (Baker & Crompton, 2000). Tung and Ritchie's (2011) suggest that striking tourism experiences driven by personal fulfillment, emotional or intellectual connections with the site, and satisfaction with provided services is strongly correlated with increased satisfaction. Cole and Scott's (2004) further affirm that the cumulative nature of tourist experiences—where performance quality enhances experi-

ence quality—contributes to satisfaction. Additionally, C. F. Chen and Chen's (2010) demonstrated that the VEQ directly impacts apparent value and satisfaction. Carlianti, Syahyunan, and Fauzan Azhmy's (2024) also emphasize that the VEQ significantly influences both satisfaction and loyalty. Drawing on these insights, the following hypothesis is suggested:

H3: VEQ positively influences visitor satisfaction.

Visitor Satisfaction (VS) and Visitor Loyalty (VL)

The relationship between VS and VL has been widely examined, with numerous studies indicating that satisfied visitors are more likely to exhibit loyalty behaviors, such as intentions to revisit and positive word-of-mouth recommendations (C. F. Chen & Phou, 2013; C. F. Chen & Tsai, 2007) . Kozak and Rimmington's (2000) emphasize that VS serves as a fundamental element in cultivating VL, which is crucial for the sustainable success of tourism destinations. In a similar vein, L.'s (1977) posits that VS is a critical precursor to the development of VL. S. Lee, Jeon, and Kim's (2011) further affirm that VL and VS are closely linked. Additionally, Chiu, Zeng, and Cheng's (2016) found that VS is a strong predictor of tourist loyalty. Tran et al.'s (2023) also observed that VS can lead to loyalty behaviors, even in cultural destinations. Based on this, the following hypothesis is proposed:

H4: VS positively influences VL.

The reviewed literature highlights the interconnectedness of STP, DA, and VEQ in influencing VS and VL. These relationships underpin the proposed hypotheses and guide the subsequent empirical investigation into sustainable tourism at Kakrebihar.

3 Research Methodology

3.1 Data

In this study, the researcher utilizes a quantitative methodology to establish the relationships between STP, DA, VEQ, VS and VL, at Kakrebihar a unique blend of archeological site and forest preserve. Quantitative methodology aims to identify causal relationships among variables by employing mathematical, computational, and statistical techniques (SekaranU.&Bougie2016). The research operates within the positivist paradigm, employing mathematical, computational, and statistical methods, following explanatory research design, in the context of sustainable tourism.

The research utilized a survey questionnaire to collect primary data for subsequent analysis. The questionnaire is divided into two sections: the first part consists of 7 questions focused on demographic information, while the second part includes 26 questions pertaining to the study variables. This involved 7 items for STP, 4 items for DA, 5 items for VEQ, 5 items for VS and 5 items for VL. This questionnaire design draws upon reviews of past seminal studies Chen2010 ; Agyeman, Aboagye, and Ashie's (2019), Asmelash and Kumar's (2019), C. F. Chen and Phou's (2013), H. Chen and Rahman's (2018), Chiu, Zeng, and Cheng's (2016), Jasrotia, Kamila, and Patel's (2023), S. W. Lee and Xue's (2020), Mohammed et al.'s (2020), Moore, Rodger, and Taplin's (2017), Raimkulov, Juraturgunov, and Ahn's (2021), Salim and Zhang's (2024), and Trišić et al.'s (2024) related to the relevant themes of this research. All items for each construct were assessed using a Likert scale, which ranges from 1 (strongly disagree) to 5 (strongly agree). The target population includes all visitors to Kakrebihar, with a focus on understanding their experiences and perceptions. A purposive sampling technique was used, and the sample size was estimated using the model or formula prescribed by Taherdoost's (2018), i.e., 384 samples. However, 407 visitors to Kakrebihar were taken as the sample size to gather relevant data. Researcher had also adhered to ethical research standards, ensuring informed consent, confidentiality, and the voluntary nature of participation. Participants were provided with information about the

study's objectives, how their data would be utilized, and assured that their identities would remain confidential.

To investigate the sustainable tourism in Kakrebihar: analyzing visitor satisfaction and loyalty at archeological site and forest preserve, researcher had developed structural equation models (SEM) to test hypotheses. SEM utilizes a multivariate approach that combines multiple regression and factor analysis to simultaneously estimate a set of interrelated dependence relationships (Hair et al., 2021). The SEM framework comprises two components: the measurement model and the structural model. The measurement model, often referred to as "Confirmatory Factor Analysis" (CFA), assesses how well the observed indicators represent the unobserved (latent) variables (Brown, 2015). Meanwhile, the structural model also known as path analysis, identifies the causal relationships among these latent variables (Hair et al., 2021).

To estimate how well a hypothesized model fits the data, several goodness-of-fit measures are used. Key relative fit indices include the "goodness-of-fit index" (GFI), the "adjusted goodness-of-fit index" (AGFI), the "comparative fit index" (CFI) and the "non-normed fit index" (NNFI). When these indices reach or exceed a value of 0.9, it specifies that the model fits the data (Hu Li-tze & Bentler Peter M, 1999). Conversely, the chi-square statistic serves as a goodness-of-fit measure, where a smaller value signifies a better fit (Kline, 2023). The "root-mean-square error of approximation" (RMSEA) is another crucial fit measure, with an acceptable range being 0.08 or less, complementing other fit indices (Hu Li-tze & Bentler Peter M, 1999). Additionally, "root-mean-square residual" (RMR) and "standardized root-mean-square residual" (SRMR) are also commonly measured to provide a comprehensive assessment of model fit, ensuring that the model accurately reflects the data (Bentler & Bonett, 1980). This methodology not only adds depth to the analysis but also ensures accuracy and reliability in the findings, contributing valuable insights to the field of sustainable tourism study.

During the analysis, it was found that including all items related to construct in the measurement model did not produce a good fit. To address this issue, "exploratory factor analysis" (EFA) was also used to reduce the items to a more manageable set of factors and to determine the appropriate item-factor assignments prior to CFA (Taherdoost, Sahibuddin, & Jalaliyoon, 2014). Parallel analysis with oblimin rotation was utilized as the extraction method, with factors being retained based on an eigenvalue of 1.0 or higher. Items with a factor loading greater than 0.5 were included in the final model, and coefficient alpha was computed to assess the reliability of these factors (Crawford et al., 2010).

4 Results

The research followed a thorough three-stage analytical process. The first stage involved collecting background data on respondents, with frequency tables and percentages used to provide a clear summary of the demographic profile. In the second stage, a descriptive analysis of the independent and dependent variables was performed, utilizing metrics such as mean and standard deviation to understand the central tendencies and variability in the data. Finally, the third stage employed SEM to explore the relationships among the variables, enabling the identification of complex links between the independent variables and the dependent variable, yielding insightful findings.

Characteristics of the Respondents

Structured questionnaires were utilized to gather demographic information from respondents, including gender, marital status, education, occupation, annual income, information sources, visit motivations, and visit frequency. This approach offered a detailed overview of their demographic profiles in terms of frequency and percentage.

Table 1. Demographic Statistics

Description	Fre.	Description	Fre.
Gender		Education	
Male	189 (46.44%)	School Level	178 (43.73%)
Female	218 (53.56%)	University Level	133 (32.68%)
Others	0 (0.00%)	Illiterate	96 (23.59%)
Marital Status		Annual Income	
Married	242 (59.46%)	Less than Rs 100000	33 (8.11%)
Single	129 (31.70%)	Rs 100001 - Rs 250000	67 (16.46%)
Divorce	36 (8.85%)	Rs 250001 - Rs 500000	109 (26.78%)
Occupation		Annual Income	
Employee	145 (35.63%)	Rs 500001 - Rs 750000	177 (43.49%)
Private workers	136 (33.42%)	Above Rs 750001	21 (5.16%)
Students	107 (26.29%)		
Other	19 (4.67%)		
Source of Information		Visit Motivation	
Internet	266 (65.36%)	Vacation	213 (52.33%)
Print Media	15 (3.69%)	Religious	156 (38.33%)
Friends and Relatives	126 (30.96%)	Research	38 (9.34%)
Total	407 (100.00%)	Total	407 (100.00%)

Source: Authors' compilation

The table1 provides respondents' demographic characteristics and other relevant factors. In terms of gender, 46.44 percent of respondents were male, while 53.56 percent were female. Regarding marital status, 59.46 percent of respondents were married, 31.70 percent were single, and 8.85 percent were divorced. In terms of education, 43.73 percent had completed school-level education, 32.68 percent had a university-level education, and 23.59 percent were illiterate. For annual income, 8.11 percent of respondents earned less than Rs 100,000 annually, 16.46 percent earned between Rs 100,001 and Rs 250,000, 26.78 percent earned between Rs 250,001 and Rs 500,000, 43.49 percent earned between Rs 500,001 and Rs 750,000, and 5.16 percent earned above Rs 750,001. Regarding occupation, 35.63 percent were employed, 33.42 percent worked in the private sector, 26.29 percent were students, and 4.67 percent had other occupations. In terms of visit motivation, 52.33 percent of respondents visited for vacation purposes, 38.33 percent for religious purposes, and 9.34 percent for research. For sources of information, 65.36 percent of respondents obtained information from the internet, 30.96 percent from friends and relatives, and 3.69 percent from print media. Lastly, in terms of visit occurrences, 54.55 percent of respondents were first-time visitors, while 45.45 percent were repeat visitors.

Descriptive Analysis and Reliability

This section presented how sustainable tourism practices, destination attributes and visitor experiences contribute to visitor satisfaction and loyalty at archeological site and forest preserve like Kakrebihar, based on participant rated level of agreement or disagreement with each statement on a 5-point Likert scale, using measures like, Mean, Standard Deviation, Skewness, Kurtosis and Cronbach Alpha.

Table 2. Descriptive Statistics and Reliability

Item	Description	Mean	SD	Skewness	Kurtosis	α
DA	Destination Attributes	4.3179	0.7893	-1.2322	1.5062	0.87
DA1	The natural landscapes and cultural landmarks at Kakrebihar are well-preserved and accessible.	4.4152	0.6637	-1.1003	1.6267	
DA2	Information plaques and guides at the site provide valuable insights into both history and ecology.	4.2875	0.7774	-1.0160	0.7534	
DA3	The site features impressive wildlife diversity and archeology and maintains effective protection.	4.2875	0.8354	-1.2854	1.5823	
DA4	Walkways, trails, and viewing areas are well-maintained and enhance the visitor experience.	4.1646	0.9442	-1.0845	0.4698	
DA5	Facilities and cleanliness at Kakrebihar meet visitor needs and contribute to a tranquil experience.	4.4349	0.6622	-1.1063	1.4708	
STP	Sustainable Tourism Practice	4.5184	0.7318	-1.9471	4.5115	0.75
STP1	The site practices responsible waste management and recycling measures.	4.4717	0.7113	-1.6620	3.3816	
STP2	Local communities are visibly benefiting from tourism at Kakrebihar.	4.5258	0.6574	-1.7809	4.7730	
STP3	There are clear initiatives to conserve the archeology and wildlife diversity of the area.	4.6609	0.6969	-2.7401	8.7316	
STP4	Sustainable tourism guidelines for visitors are readily available and clear.	4.4988	0.8389	-1.9436	3.4438	
STP5	Visitor activities at Kakrebihar are designed to minimize environmental impact and promote conservation awareness.	4.5160	0.7047	-1.7832	3.7268	
STP6	I noticed efforts to reduce the carbon footprint of tourism operations.	4.5332	0.7677	-2.1472	5.2416	
STP7	The use of renewable energy sources is evidenced at the site.	4.4226	0.7146	-1.5053	3.1324	
VEQ	Visitor Experience Quality	4.5184	0.5848	-0.9652	1.0056	0.84
VEQ1	My visit provided valuable insights, knowledge, and numerous photo opportunities.	4.5577	0.5922	-1.2524	1.9544	
VEQ2	I experienced a deep sense of peace, safety and rejuvenation, with comfortable wildlife viewing.	4.6118	0.5406	-1.1505	1.3881	

Source: Authors' compilation

Item	Description	Mean	SD	Skewness	Kurtosis	α
VEQ3	Interactions with staff and locals, as well as high-quality interpretive materials, enriched my experience.	4.4300	0.6073	-0.7516	0.5907	
VEQ4	Facilities, guided tours, and hands-on activities met my expectations and contributed to a smooth visit.	4.4742	0.5819	-0.7229	0.3622	
VL	Visitor Loyalty	4.2531	0.8357	-1.2043	1.2879	0.86
VL1	I am eager to plan another visit to Kakrebihar.	4.3243	0.6862	-0.9725	1.3739	
VL2	Kakrebihar has become one of my favorite travel destinations.	4.2064	0.8915	-1.1214	0.8113	
VL3	I feel a strong personal connection to Kakrebihar.	4.1376	0.9420	-0.9634	0.0429	
VL4	I prefer Kakrebihar over other similar sites I have visited.	4.2727	0.7636	-1.2303	2.3358	
VL5	I consider Kakrebihar a must-visit destination for like-minded travelers and already recommended to several friends and colleagues.	4.3243	0.8584	-1.4642	1.8400	
VS	Visitor Satisfaction	4.4649	0.6233	-1.0602	1.8895	0.85
VS1	My visit to Kakrebihar was well worth the time, effort and money.	4.4889	0.5781	-0.6818	-0.0976	
VS2	The site's management, organization, and service quality were impressive.	4.5160	0.5291	-0.3620	-1.2233	
VS3	Hospitality of the local residents met or exceeded my expectations.	4.4054	0.6697	-1.3217	3.4051	
VS4	The visual aesthetics and balance between archeology and nature enhanced my visit.	4.4005	0.7118	-0.9558	0.3239	
VS5	The measures for visitor safety and security of the destination were satisfactory.	4.5135	0.6031	-1.3621	4.1843	

Table 2 offered descriptive statistics for 5 constructs 26 items, each with 407 observations (nobs). The study's variables demonstrated positive ratings and good reliability overall. DA had a mean of 4.32 (SD = 0.79), with a slight left skew (Skewness = -1.23) and moderate kurtosis (1.51), and a high internal consistency (= 0.87). STP scored 4.52 (SD = 0.73), with a strong left skew (Skewness = -1.95) and leptokurtic distribution (Kurtosis = 4.51), showing acceptable reliability (= 0.75). VEQ had a mean of 4.52 (SD = 0.58), moderate left skew (Skewness = -0.97), and kurtosis (1.01), with good internal consistency (= 0.84). VL recorded a mean of 4.25 (SD = 0.84), a slight left skew (Skewness = -1.20), and moderate kurtosis (1.29), with strong reliability (= 0.86). VS scored 4.46 (SD = 0.62), with a left skew (Skewness = -1.06) and leptokurtic distribution (Kurtosis = 1.89), and demonstrated good internal consistency (= 0.85). Overall, the variables showed reliable scales, with Cronbach's alpha values ranging from

0.75 to 0.87.

Similarly, the mean scores for the items range between 4.14 and 4.66, suggesting generally high ratings. Standard deviations vary from 0.53 to 0.94, indicating some variability in responses. Skewness values are predominantly negative, ranging from -0.36 to -2.74, suggesting that most distributions are left-skewed, with respondents tending to select higher ratings. Kurtosis values vary, with some items exhibiting high kurtosis (e.g., STP3 with 8.73), indicating a peaked distribution with heavy tails, while others show kurtosis values close to zero, indicating more normal distributions. Overall, the data appears to be relatively consistent with some slight deviations from normality.

Therefore, the researcher before proceeding to further analysis, the researcher assessed the normality of the measurement items using both univariate (Shapiro-Wilk) and multivariate (Mardia) normality tests. Ensuring data normality is crucial, as the estimation methods in CFA and SEM rely on the data being normally distributed.

Table 3. Normality Test

Variables	Shapiro-Wilk Test Statistics	p-value
DA	0.7524	p<0.01
STP	0.6388	p<0.01
VEQ	0.6923	p<0.01
VS	0.7142	p<0.01
VL	0.7632	p<0.01
Skewness	17448.1194	0.0000
Kurtosis	92.5941	0.0000

Source: Authors' compilation

Table 3 presents the findings from the Shapiro-Wilk test and Mardia's test, showing that all variables (DA, STP, VEQ, VS, VL) significantly depart from normality, with test statistics ranging from 0.63 to 0.76 and p-values of 0.0000. Mardia's measures of skewness (17,448.12) and kurtosis (92.59) further indicate significant deviations from multivariate normality. This implies that none of the variables conform to a normal distribution. Consequently, the researcher opted to use the maximum likelihood robust (MLR) estimator, also known as the Satorra-Bentler rescaling method, for estimating the measurement model instead of the standard maximum likelihood (ML) estimator (Rosseel Y, 2012).

Exploratory Factor Analyses

Exploratory Factor Analysis (EFA) was conducted in R Studio to uncover the underlying relationships among the measured variables. The "Kaiser–Meyer–Olkin" (KMO) measure was first used to assess sampling adequacy, confirming that the data was appropriate for dimensional reduction with a KMO value of 0.9 (Kaiser & Ford, 1984). Following this, "Bartlett's Test of Sphericity" was performed to verify that the correlation matrix significantly differed from an identity matrix, resulting in a significant finding (chisq (325) = 5630.93, $p < .001$) and validating the data's suitability for factor analysis (Bartlett, 1950). Subsequently, Parallel Analysis was conducted along with an Oblique (oblimin) rotation, which accommodates inter-factor correlations, and Maximum Likelihood (ML) estimation. These methods, highlighted in the literature for their effectiveness in developing valid factors, were implemented following best practices in psychological research (Fabrigar et al., 1999).

An initial parallel analysis revealed that six factors had eigenvalues exceeding 1. However, in

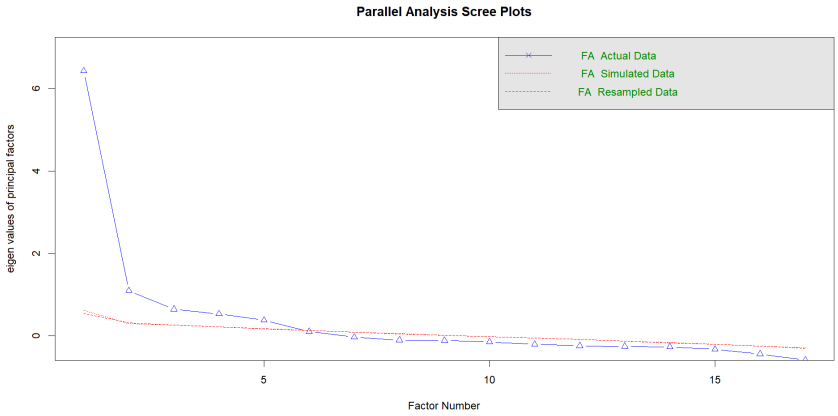

Figure 1. Parallel Analysis Scree Plots

accordance with the theoretical framework of the study, a five-factor solution was chosen. During the iterations, items VL1, VL4, VS1, DA1, DA5, STP1, STP2, STP6, and STP7 were removed due to item loadings being less than .5 or cross-loadings exceeding 0.3. Ultimately, 17 items were retained to ensure comprehensive conceptual coverage and strong loadings. The results from the Parallel Analysis identified five factors, as depicted in Figure 1.

Parallel analysis depicted the reduced subset of 15 items with five-factor solution (2 (136) = 3599.07, p < .001, TLI =.92, RMSEA =.07), explaining 61 percent of the variance. The EFA with a reduced number of items held consistency, with all items loading onto their prior factors at the > .50 level with no cross loadings, as shown in Table 4.

Table 4. Standardized Loadings (Pattern Matrix) Based Upon Correlation Matrix

Item	ML5	ML4	ML3	ML1	ML2	h^2	u^2	Com
DA2	0.05	0.27	-0.07	0.66	-0.02	0.66	0.34	1.4
DA3	0.12	-0.02	0.05	0.74	0.01	0.69	0.31	1.1
DA4	0.04	0.05	0.28	0.60	0.01	0.69	0.31	1.4
STP3	0.04	-0.05	0.01	0.06	0.60	0.38	0.62	1.0
STP4	0.00	0.08	0.00	-0.06	0.72	0.51	0.49	1.0
STP5	-0.01	-0.02	-0.01	0.00	0.80	0.65	0.35	1.0
VEQ1	0.12	0.72	-0.03	0.09	0.00	0.67	0.33	1.1
VEQ2	0.00	0.66	0.16	-0.10	0.00	0.52	0.48	1.2
VEQ3	0.03	0.68	0.05	0.06	0.02	0.58	0.42	1.0
VEQ4	-0.01	0.57	0.11	0.21	-0.05	0.58	0.42	1.4
VL2	-0.01	0.04	0.87	-0.01	-0.01	0.78	0.22	1.0
VL3	0.05	0.03	0.75	0.15	0.02	0.77	0.23	1.1
VL5	0.15	0.20	0.53	-0.13	0.01	0.49	0.51	1.6
VS2	0.78	0.05	-0.05	0.05	0.05	0.67	0.33	1.0
VS3	0.71	-0.03	0.00	0.13	-0.01	0.60	0.40	1.1
VS4	0.62	-0.07	0.25	0.07	0.03	0.61	0.39	1.4
VS5	0.65	0.18	-0.01	-0.16	-0.08	0.46	0.54	1.3

Source: Authors' compilation

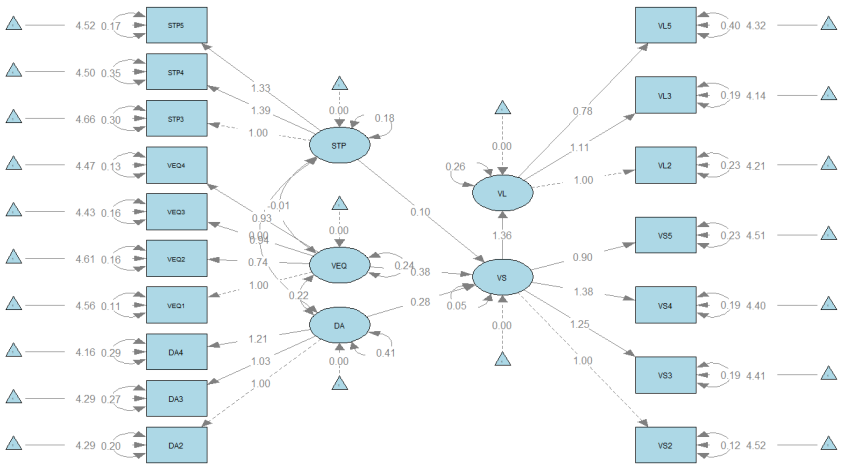

Figure 2. Path Diagram

Confirmatory Factor Analysis

Consequently, after model generated through EFA, CFA was carried in R using the Lavaan package Rosseel Y's (2012) to model estimation, and the SEM Tools package Jorgensen et al.'s (2021) for reliability and validity of model. The robust maximum-likelihood (MLR) has been employed due to non-normality in data and fixed factor variances to 1 as a means of scaling the latent variables (Brown, 2015; Kline, 2023). For the data to be internal consistency reliable, Fornell's Composite reliability (CR) > 0.7 . Further, convergent and discriminate validity is measured below the diagonal matrix. Generally, an AVE value > 0.5 met the convergent validity (Fornell & Larcker, 1981). AVE $>$ MSV determined the discriminate validity (Fornell & Larcker, 1981). Table 5 reports the estimates for each factors validity statistics.

Table 5. Reliability and Validity

Factor	CR	AVE	MSV	ASV	DA	VS	STP	VL	VEQ
DA	0.85	0.653	0.533	0.377	0.808				
VS	0.833	0.557	0.533	0.372	0.73	0.746			
STP	0.754	0.509	0.008	0.004	0.02	0.089	0.713		
VL	0.848	0.653	0.501	0.353	0.691	0.656	0.067	0.808	
VEQ	0.843	0.574	0.516	0.379	0.704	0.718	-0.057	0.708	0.757

Source: Author's compilation

Table 5 present the Fornell's Composite reliability (CR) for factors, which all are greater than 0.7 provide evidence of construct reliability. Following model convergent validity was deemed suitable as factors' AVE $> .50$. In addition, factor's AVE more than MSV, provide evidence of the model's discriminant validity. This provides evidence of discriminant validity between factors as well as construct validity within each factor. CFA indicated measurement model fits the data well, according to both incremental and absolute measures of fit index ($2(142) = 400.478$, $p < .001$, CFI=.945, TLI =.934, SRMR, 0.039, RMSEA = .051*).

After measurement model is established, the structural model was carried to investigate the relationship among the latent variables using MLR estimation for SEM, as recommended by Rosseel (2012) for non-normal data. The estimated SEM is depicted in Figure 2.

In complex SEM studies like this one, which involve more than 12 measurement items, achieving a perfect alignment between the theoretical and observed structural models at a 5 percent

statistical significance level can be challenging . In such instances, the ratio of the chi-square statistic to the degrees of freedom (DF) should be below three Bollen and Long's (1992), which is demonstrated in the estimated SEM model (496.106/313 = 1.585), indicating a good model fit. Additionally, all other model-fit indices are satisfied, with the CFI and TLI exceeding 0.90 and both RMSEA and SRMR below 0.08. Therefore, the SEM estimations are considered valid. The model accounts for approximately 70.53 percent of the variance in visitor satisfaction and 53.9 percent in visitor loyalty, as indicated by the r-squared values of the latent endogenous variables. A summary of hypothesis testing based on the SEM model presented in Figure 2 is detailed in Table 6.

Table 6. Hypothesis Results

Path	Estimate	Std. Err	z-value	P(>|z|)	Std.lv	Std.all
STP → VS	0.103	0.042	2.462	0.014	0.109	0.109
VEQ → VS	0.382	0.081	4.700	0.000	0.460	0.460
DA → VS	0.283	0.072	3.945	0.000	0.447	0.447
VS → VL	1.362	0.144	9.451	0.000	0.734	0.734

Source: Author's compilation

The table 6 presents the results of the SEM, showing the relationships between Sustainable Tourism Practices (STP), Visitor Experience Quality (VEQ), and Destination Attractiveness (DA) with Visitor Satisfaction (VS), as well as the impact of VS on Visitor Loyalty (VL). The path coefficient for STP to VS is 0.103 ($p = 0.014$), indicating a positive and statistically significant relationship, with a standardized estimate of 0.109, suggesting that sustainable practices moderately enhance visitor satisfaction. VEQ emphasizing a strong positive association with VS, with a coefficient of 0.382 ($p < 0.001$) and a standardized estimate of 0.460, shows the critical role of quality of visitor experiences in driving satisfaction. Similarly, DA positively influences VS with a coefficient of 0.283 ($p < 0.001$) and a standardized estimate of 0.447, highlighting the significance of destination attributes in contributing to visitor satisfaction. Finally, VS has a substantial impact on VL, with a coefficient of 1.362 ($p < 0.001$) and a high standardized estimate of 0.734, demonstrating that visitor satisfaction is a key predictor of loyalty. These findings provide empirical support for the hypothesized model and offer actionable insights for enhancing visitor satisfaction and loyalty.

5 Discussion

The results of this study provide valuable insights into visitor satisfaction and loyalty within the framework of sustainable tourism dynamics at Kakrebihar, which encompasses both an archaeological site and a forest preserve. The results indicate that Sustainable Tourism Practices (STP), Visitor Experience Quality (VEQ), and Destination Attractiveness (DA) all play crucial roles in shaping visitor satisfaction (VS), which, in turn, strongly influences visitor loyalty (VL).

The significant positive relationship between STP and VS ($\beta = 0.103$, $p = 0.014$) suggests that sustainable practices are valued by visitors and contribute to their overall satisfaction. This aligns with the growing body of literature Jasrotia, Kamila, and Patel's (2023), Juandi, Andari, and Setiyorini's (2018), Mathew, Cabral, and Mohandas's (2024), Solís-Radilla et al.'s (2019), and Trišić et al.'s (2024) that emphasizes the importance of sustainability in tourism, particularly in archeological and natural sites, where the preservation of cultural and environmental integrity is paramount. However, the relatively modest effect size (Std.all = 0.109) implies that while sustainability is imperative, it may not be the major driver of visitor satisfaction, suggesting that

other factors may have a more substantial impact.

VEQ emerged as the strongest predictor of VS, with a substantial path coefficient ($\beta = 0.382$, $p < 0.001$) and a high standardized estimate (Std.all = 0.460). This finding underscores the critical role that the quality of visitor experiences plays in shaping satisfaction levels. High-quality experiences, which may include well-maintained facilities, engaging activities, and excellent service, significantly enhance visitors' overall satisfaction. This result is consistent with previous research Baker and Crompton's (2000), Carlianti, Syahyunan, and Fauzan Azhmy's (2024), C. F. Chen and Chen's (2010), Scott's (2004), and Tung and Ritchie's (2011), which has consistently highlighted the significance of delivering exceptional visitor experiences in fostering satisfaction and, consequently, loyalty.

DA also significantly influences VS ($\beta = 0.283$, $p < 0.001$; Std.all = 0.447), indicating that the intrinsic attributes of the destination, such as its natural beauty, cultural heritage and overall appeal, are key determinants of visitor satisfaction. This finding reinforces the notion that destinations with unique and attractive features are more likely to satisfy visitors, thereby contributing to progressive word-of-mouth and repeat visits (Albayrak & Caber, 2013; Auliya & Prianti, 2022; Garrod & Fyall, 2017; Žabkar, Brenčič, & Dmitrović, 2010; Zhou et al., 2024). Perhaps the most compelling finding is the strong impact of VS on VL ($\beta = 1.362$, $p < 0.001$; Std.all = 0.734). This suggests that pleased visitors are highly likely to develop loyalty towards the destination, which can manifest in the form of recurrence visits, positive recommendations and long-term advocacy (C. F. Chen & Phou, 2013; C. F. Chen & Tsai, 2007; Chiu, Zeng, & Cheng, 2016; Kozak & Rimmington, 2000; L., 1977; S. Lee, Jeon, & Kim, 2011; Tran et al., 2023) . The strength of this relationship highlights the centrality of satisfaction in the visitor's decision-making process and its critical role in ensuring the sustainability of tourism destinations like Kakrebihar. In summary, this study demonstrates the interconnectedness of sustainable practices, experience quality, and destination attractiveness in driving visitor satisfaction, which in turn, significantly influences loyalty.

6 Conclusion and Recommendations

This study provides a comprehensive examination of the factors influencing visitor satisfaction and loyalty at Kakrebihar, an archeological site and forest preserve. The findings highlight the pivotal role of Visitor Experience Quality (VEQ) as the most significant driver of visitor satisfaction, followed by Destination Attractiveness (DA) and Sustainable Tourism Practices (STP). The strong positive association between visitor satisfaction and visitor loyalty underscores the importance of ensuring high levels of satisfaction to cultivate a loyal visitor base. These insights reinforce the interconnectedness of sustainable practices, quality experiences, and destination appeal in enhancing visitor satisfaction and promoting long-term loyalty.

Based on these insights, in Kakrebihar focus should be on enhancing visitor experience quality by investing in well-maintained facilities, engaging activities, and excellent visitor service. Preserving and promoting the destination's attractiveness through conservation efforts and targeted marketing is also crucial. Additionally, integrating and effectively communicating sustainable tourism practices can further enhance visitor satisfaction. Finally, strategies to build visitor loyalty, such as loyalty programs and personalized follow-up communication, should be prioritized to encourage repeat visits and positive word-of-mouth. Implementing these recommendations will help Kakrebihar maintain its appeal and ensure its sustainability as a preferred tourism destination.

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