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# Road Infrastructure and Tourism in Nigeria: Evidence from Ikogosi Warm Spring, Ekiti State

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## ABSTRACT

This study explores the influence of road transport infrastructure quality on tourism patronage at Ikogosi Warm Spring, a notable eco-tourism destination in Ekiti State, Nigeria. The importance of accessible and reliable road infrastructure in stimulating tourism growth, particularly in rural settings, cannot be overemphasized. Data were collected from 150 tourists through structured questionnaires and analyzed using multiple regression techniques. The analysis focused on five key dimensions of road infrastructure: road surface condition, signage and lighting, connectivity and accessibility, safety and security, and government investment in maintenance. Findings revealed that poor road surface conditions and negatively perceived government road maintenance significantly deterred tourist visits. In contrast, signage and lighting, connectivity, and safety showed limited statistical influence on patronage levels. These outcomes suggest that tourists are particularly responsive to the physical condition of access roads and disruptions caused by poorly executed or untimely government interventions. Based on these insights, the study recommends that tourism-related government agencies prioritize timely road surface improvements and adopt more transparent, visitor-sensitive approaches to road works. Attention should also be given to functional signage, safe access routes, and consistent road maintenance policies. This study contributes to the discourse on transport-tourism linkages by highlighting the complex interplay between infrastructure quality and visitor behavior, offering policy-relevant insights for enhancing sustainable tourism development in Nigeria's interior destinations.

***Keywords:*** Road Infrastructure; Tourism Patronage; Regression Analysis; Ikogosi Warm Spring; Nigeria

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# 1. Introduction

Tourism has increasingly become a powerful driver of economic diversification, job creation, and cultural preservation across the globe. In developed countries such as France, the United States, and Spain, the tourism sector thrives partly because of the high quality of transport infrastructure, particularly road networks, which guarantee accessibility, safety, and comfort for tourists. These countries have institutionalized road infrastructure planning as a strategic pillar in tourism development, resulting in efficient connectivity between attractions, reduced travel times, and high levels of tourist satisfaction [1]. In contrast, many developing nations, including Nigeria, face persistent challenges in leveraging tourism as a viable economic sector due to poor infrastructure and inconsistent investment priorities.

Despite its rich cultural heritage and diverse natural attractions, Nigeria's tourism industry remains underdeveloped, contributing just 3.65% to national GDP [2]. One of the most critical yet often neglected constraints to tourism growth in the country is the deplorable state of road transport infrastructure. Roads serve as the primary means of accessing most tourist destinations in Nigeria, yet they are frequently in poor condition, riddled with potholes, lacking directional signage and lighting, and often unsafe. These infrastructure deficits negatively affect tourists' perception, satisfaction, and intention to revisit destinations.

Ikogosi Warm Spring in Ekiti State exemplifies this challenge. Known for its unique confluence of warm and cold springs a natural rarity it was once a prominent tourist attraction for both domestic and international visitors. However, in recent years, a steep decline in patronage has been observed. Field observations and reports attribute this decline largely to the poor quality of roads leading to the site [3]. Critical aspects of road infrastructure including road surface condition, availability of signage and lighting, connectivity to other destinations, road safety, and government investment in maintenance have significantly influenced how tourists experience and evaluate their visits.

Although the Ekiti State Government allocated ₦24.28 billion in 2024 for various road infrastructure projects, including those connecting to Ikogosi, the impact of these investments on tourism outcomes remains uncertain [3]. The need to empirically examine how these specific dimensions of road infrastructure influence tourist satisfaction and patronage is urgent and timely.

The study draws on two theoretical frameworks: The Tourism Area Life Cycle (TALC) model and Accessibility Theory. The TALC model suggests that infrastructure quality is a central determinant of whether a tourist destination evolves, stabilizes, or declines. Applying this framework, Ikogosi appears to be in the stagnation stage, with diminishing tourist traffic and deteriorating infrastructure. Accessibility Theory reinforces this by emphasizing that ease of access is a fundamental precondition for tourism development. If tourists cannot reach a site safely, comfortably, and efficiently, the destination loses competitiveness regardless of its natural appeal.

Empirical studies in Nigeria and other parts of Sub-Saharan Africa have reinforced these arguments. For instance, Khadaroo and Seetanah [4] found that road quality was directly linked to rural tourism viability in Ekiti and Ondo States. Similarly, Khadaroo and Seetanah [4] reported that poor roads in Nigeria result in long travel times, increased costs, and lower tourist satisfaction. World Bank [1] notes that over 80% of Nigerian roads are in substandard condition, with inadequate signage, lighting, and maintenance contributing to low transport efficiency.

While many of these studies have focused on broader regional trends or urban centers, limited research has explored how specific infrastructure dimensions' influence tourism patronage at Ikogosi Warm Spring. This study seeks to fill that gap by analyzing five key relationships: the effect of road surface condition on tourist satisfaction and visitation; the impact of signage and lighting on perceived ease of travel; the role of connectivity in determining visit frequency; how safety and security affect tourists' decisions; and the influence of government road maintenance investment on tourist perceptions.

Accordingly, the objective of this study is to examine the effect of road surface condition, signage, lighting, road connectivity, perceived safety, and government maintenance investment on tourist patronage at Ikogosi Warm Spring. Specifically, the study seeks to determine how these dimensions of road infrastructure influence tourists' satisfaction and willingness to revisit, with a view to offering policy recommendations for improving rural tourism accessibility and infrastructure-driven development in Nigeria.

### Statement of Problem

Tourism in Nigeria, despite its vast natural and cultural endowments, remains underdeveloped. A critical yet often overlooked factor limiting tourist patronage is the poor condition of access roads to key destinations. In the case of Ikogosi Warm Spring a rare natural attraction where warm and cold springs converge the tourism potential is grossly undermined by deteriorating road conditions that make access difficult, uncomfortable, and sometimes dangerous. Tourists face bumpy rides, frequent vehicle breakdowns, and extended travel times, all of which discourage repeat visits and reduce positive word-of-mouth promotion. Local businesses that depend heavily on tourist inflows also experience reduced revenue and stunted growth due to declining patronage.

Although Ikogosi Warm Spring, located in Ekiti State in southwestern Nigeria, has historically attracted both domestic and international tourists due to its hydrothermal uniqueness, recent years have witnessed a sharp decline in tourist traffic. Media reports, stakeholder interviews, and field observations repeatedly highlight the deplorable condition of roads leading to the site, marked by erosion, potholes, inadequate signage, and poor maintenance. Despite several government-led tourism promotion campaigns, there remains a consistent disconnect between policy ambitions and infrastructural realities, particularly in rural tourism destinations like Ikogosi.

The core issue lies in the misalignment between tourism policy objectives and infrastructure investment priorities. While the Nigerian government continues to advocate for tourism as a non-oil economic driver, insufficient investment in road transport infrastructure remains a persistent bottleneck. Accessibility is foundational to tourist satisfaction, safety, and loyalty, yet the lack of coordination between tourism authorities and road agencies has resulted in fragmented development and unsustainable outcomes for rural tourist zones such as Ikogosi.

Theoretically, the study adopts the Tourism Area Life Cycle (TALC) model, which posits that infrastructure quality significantly influences a destination's progression or regression. Additionally, Accessibility Theory underlines the central role of transport infrastructure in shaping tourist flows. In this context, Ikogosi appears to be in the stagnation phase of the TALC model, where poor access roads are stifling growth, lowering visitor satisfaction, and threatening the long-term viability of the destination.

While previous studies such as Umukoro et al.[5] have broadly established a positive correlation between road infrastructure and tourism development in Ekiti, Ondo, and Osun States, these studies tend to treat rural tourist sites in aggregate or focus on broader regional patterns. What sets this study apart is its micro-level, destination-specific focus on Ikogosi Warm Spring, an iconic but neglected site, with empirical data that can better inform targeted interventions.

By addressing this intersection between road transport infrastructure and tourism performance, this research seeks to promote a more coherent and effective strategy for unlocking the tourism potential of Ikogosi and similar destinations across Nigeria.

## 2. Hypotheses

$H_1$. *Road surface condition has no significant effect on tourist satisfaction and visitation to Ikogosi Warm Spring.*

$H_2$. *Availability of road signage and lighting has no significant impact on tourists' perceived ease of travel to Ikogosi Warm Spring.*

$H_3$. Road connectivity and accessibility do not significantly influence the frequency of visits to Ikogosi Warm Spring.

$H_4$. *Perceived road safety and security conditions have no significant relationship with tourists' decision to visit Ikogosi Warm Spring.*

$H_5$. *Government investment in road maintenance has no significant effect on tourist perception and patronage of Ikogosi Warm Spring.*

## 3. Literature Review

### 3.1. Concepts

#### 3.1.1. Road Transport Infrastructure

Road transport infrastructure refers to the physical and organizational framework that facilitates the movement of people, goods, and services by road. This includes highways, rural and urban roads, bridges, signage, lighting systems, drainage, safety barriers, and supporting facilities such as terminals and rest stops[6]. It serves as a fundamental enabler of socio-economic development, especially in countries

where road transport is the primary mode of travel and freight movement.

In developing economies like Nigeria, road infrastructure plays a pivotal role in connecting remote areas to economic centers, facilitating trade, improving access to social services, and supporting sectors such as tourism and agriculture[7–9]. However, the quality and coverage of road infrastructure remain a challenge. World Bank[1] report reveals that over 80% of Nigeria's roads are in poor or fair condition, significantly impeding travel efficiency and safety. This deficiency leads to increased travel times, high vehicle maintenance costs, and constrained access to essential locations, including tourist destinations.

From a tourism management perspective, the quality of road infrastructure is critical for destination competitiveness and accessibility. Poor road conditions can diminish the attractiveness of even the most compelling tourist sites, leading to reduced visitation, lower tourist satisfaction, and a decline in economic benefits associated with tourism[7]. As destination accessibility theory suggests, infrastructure quality is one of the foremost determinants of a tourist's decision to visit a location, particularly in rural or underdeveloped regions.

Current studies further emphasize the multidimensional nature of road infrastructure quality. These include factors such as road surface condition, signage and lighting, connectivity to major hubs, safety, and regular maintenance[8]. Collectively, these dimensions' influence not only physical access to a site but also the overall travel experience. Where infrastructure is deficient, tourism development becomes unsustainable, and communities lose out on potential socioeconomic opportunities.

Thus, road transport infrastructure should be viewed not merely as a physical asset but as a strategic development instrument. Its planning, development, and maintenance are central to achieving sustainable tourism, regional integration, and inclusive economic growth.

### 3.1.2. Road Surface Condition

Road surface condition is a critical factor in shaping tourists' travel decisions, especially in rural or heritage destinations. Previous studies like Abdukadir[9] suggest that well-paved and motorable roads significantly enhance accessibility and comfort, increasing tourism inflow. Conversely, deteriorated or unpaved roads discourage repeated visits and extend travel time[10]. However, these studies primarily focus on general transport corridors or urban destinations, with limited attention to natural resort areas like Ikogosi. This gap underscores the need to examine how road conditions influence tourism in geographically secluded destinations.

### 3.1.3. Signage and Lighting

Yusuf[11], highlights that directional clarity and visual safety infrastructure are critical components of tourist-friendly destinations. In a recent study, Okosun et al.[12] found that poor signage along major tourism corridors in Nigeria contributed significantly to reduced tourist satisfaction and delays. Effective road signage and proper lighting ensure navigation clarity and nighttime safety. According to Onatere & Ubururhe[13], tourists are more confident navigating areas where directional signage and lighting are reliable. In contrast, Amanawa[14] found inconsistencies in signage deployment in Nigerian tourist corridors, leading to disorientation and delayed access. However, these studies do not sufficiently address how such infrastructural elements affect the perception of first-time visitors in forest-adjacent attractions like Ikogosi Warm Spring. Our research builds on this limitation by exploring signage and lighting as perceived by tourists in a unique ecotourism destination.

### 3.1.4. Connectivity and Accessibility

Connectivity and accessibility capture how well a destination is linked to major cities or transport hubs and the ease with which tourists can reach the site. High levels of connectivity reduce travel barriers and promote the movement of tourists across multiple attractions. Connectivity and accessibility influence tourists' willingness to visit and their overall satisfaction. Research by Orimaye et al.[15] emphasizes the importance of intermodal linkages and feeder road networks in improving destination accessibility. Meanwhile, Ajayi[16] argue that while road networks exist, poor integration with local transport services undermines accessibility. Most of these findings are generalized and urban-centric. In contrast, Ikogosi's location in a semi-rural landscape raises distinct challenges in network integration and last-mile connectivity, which our study addresses.

### 3.1.5. Safety and Security

Safety and security are also essential aspects of road transport infrastructure, encompassing both physical road design elements and the broader perception of personal se-

curity. Tourists are more likely to visit destinations where they feel safe during transit. Features such as guardrails, pedestrian walkways, speed calming devices, and visible law enforcement presence contribute to this perception. In Nigeria, rising concerns about road safety and security have been linked to a decline in tourist movements along certain routes[11]. Safety-related issues not only deter first-time visitors but also damage the reputation of destinations, particularly among international tourists. Safety and security are recurring concerns among tourists in Nigeria. Studies like Orimaye et al.[15] report that the presence of security patrols, road safety infrastructure, and emergency response systems boosts destination attractiveness. In contrast, other studies argue that perceived insecurity along rural roads deters patronage. However, these analyses often omit natural resort areas where terrain and remoteness compound security concerns. Ikogosi Warm Spring, bordered by dense vegetation, offers a relevant context to test these assumptions and develop location-specific insights.

### 3.1.6. Road Maintenance and Government Investment

This underscores the role of public policy and sustained funding in preserving infrastructure quality. Maintenance ensures that roads remain functional, safe, and attractive over time, while government investment signals political will and commitment to development. In 2024, for instance, the Ekiti State Government approved ₦24.28 billion for road rehabilitation projects, including roads leading to the Ikogosi Warm Spring, in an effort to revitalize tourism in the region[3]. Regular maintenance and visible investment are critical not only for operational efficiency but also for instilling confidence in potential visitors and tourism investors.

Together, these dimensions provide a comprehensive framework for understanding how road infrastructure quality affects tourism patronage. When road networks are well maintained, safe, well-connected, properly signposted, and supported by active government intervention, they enhance the overall tourist experience, attract more visitors, and boost local economies. Conversely, deficiencies in any of these areas can lead to reduced accessibility, lower satisfaction, and a decline in tourist arrivals. This study builds on these concepts to empirically investigate the extent to which road infrastructure quality influences tourist behavior and satisfaction at the Ikogosi Warm Spring in Ekiti State. The effectiveness of road transport infrastructure is often contingent on sustained maintenance and government investment. Findings from Onipe[17] indicate that poorly maintained infrastructure erodes the quality of tourist experience and results in rising vehicle operating costs. Abdukarim et al.[18] add that inconsistent budgetary allocations to tourism-linked infrastructure projects have slowed development in Ekiti State. Yet, few studies assess how these realities impact a known but undercommercialized destination like Ikogosi. Our research fills this empirical gap by exploring how investment patterns and maintenance culture influence road usability and patronage.

### 3.1.7. Tourism Patronage

Tourism patronage refers to the degree to which individuals or groups engage with or support tourism destinations through visitation, spending, or advocacy. It encompasses not only the frequency and volume of tourist visits but also the intensity of engagement, duration of stay, visitor satisfaction, and the likelihood of repeat visits or recommendations. Essentially, tourism patronage serves as a key indicator of a destination's appeal, competitiveness, and long-term sustainability[17].

The concept of tourism patronage is multidimensional, shaped by a combination of demand-side factors such as tourist motivations, income levels, and preferences, as well as supply-side attributes including destination accessibility, infrastructure quality, service delivery, safety, and the uniqueness of attractions[18]. When infrastructure particularly transport infrastructure is inadequate, even the most attractive destinations may struggle to sustain patronage, as accessibility and perceived value decline.

In developing economies, including Nigeria, tourism patronage is often volatile and highly sensitive to both physical and policy-related constraints. Poor road conditions, security concerns, and inconsistent government investment tend to discourage tourists, particularly international visitors who expect higher service standards and travel convenience[19]. Moreover, tourism patronage in such contexts is closely tied to word-of-mouth marketing and the destination image, which are both influenced by the perceived ease of travel and overall visitor experience[19].

In line with this, tourism scholars have emphasized that patronage is not merely a function of attraction quality but of the totals in which road transport infrastructure plays a foundational role. For instance, Van & Shimizu[20] argue

that road accessibility significantly impacts tourism flows in Nigeria, affecting not just the number of tourists but also their spending patterns and satisfaction levels. Similarly, Olusola's[21] findings indicate that improved road networks correlate positively with domestic tourism growth in low- and middle-income countries, suggesting that tourism patronage is elastic to changes in infrastructure investment.

Importantly, tourism patronage is also shaped by emotional and psychological perceptions of the destination, which are reinforced through the experience of ease, safety, and comfort during travel. In this respect, the condition of roads leading to tourism sites can act as a barrier or catalyst, either deterring potential visitors or enhancing their overall experience. For example, destinations like Ikogosi Warm Spring, which are rich in natural and cultural appeal but hindered by deteriorating access roads, may experience declining tourism patronage despite their intrinsic attractiveness[16].

Understanding tourism patronage in empirical terms often involves assessing indicators such as visitor inflows, satisfaction surveys, repeat visit intentions, and occupancy rates. However, to explain the underlying dynamics, especially in underperforming tourism destinations, scholars advocate for models that integrate infrastructure quality, destination management, and visitor perception[21].

In sum, tourism patronage is a complex but essential concept in tourism development and planning. It reflects the real-world implications of infrastructure quality, policy commitment, and service delivery at tourism sites. In the context of Nigeria's road-dependent tourism sector, improving road infrastructure is not just a matter of physical development but a strategic lever for boosting tourism patronage, enhancing regional economies, and preserving cultural heritage.

### 3.2. Synthesis and Research Gap

While existing literature offers rich perspectives on the components of road transport infrastructure, many studies are descriptive, location-neutral, and lack integrated analysis at the site-specific level. This study contributes critically by synthesizing diverse infrastructural elements and applying them to a distinctive tourism location—Ikogosi Warm Spring. Unlike prior studies, we consider the interplay between infrastructure quality and the uniqueness of the natural environment, thus offering nuanced insights for both scholars and policymakers.

## 4. Theoretical Framework

This study is underpinned by two complementary theories: The Tourism Area Life Cycle (TALC) Model proposed by Butler (1980) and the Accessibility Theory as articulated in transport and tourism studies[22]. These theories offer valuable insights into the role of transport infrastructure in the development, sustainability, and patronage of tourism destinations.

### 4.1. Tourism Area Life Cycle (TALC) Model

The TALC Model was proposed by Richard W. Butler in 1980[22]. It describes the evolution of tourism destinations through a series of stages: exploration, involvement, development, consolidation, stagnation, and decline or rejuvenation. Each stage reflects changes in tourist numbers, local engagement, infrastructure, and destination image.

In the context of this study, the TALC model provides a robust framework for assessing the developmental trajectory of Ikogosi Warm Spring. The destination appears to be in the stagnation stage, where visitor numbers have plateaued or declined due to infrastructure-related constraints, particularly poor road conditions. According to Butler's[22] model, without timely intervention through infrastructure improvement and innovation, a site in the stagnation phase risks slipping into long-term decline. However, with strategic investments such as road rehabilitation funded by the Ekiti State Government there is potential for rejuvenation and renewed tourism patronage.

### 4.2. Accessibility Theory

The Accessibility Theory, while not credited to a single individual, has been extensively used in transport geography and tourism studies to explain the importance of ease of movement to and from destinations. The theory posits that a destination's attractiveness and utilization depend significantly on how accessible it is via existing transport networks[22]. In simpler terms, accessibility is the degree of ease with which tourists can reach a location using available modes of transport.

In this study, Accessibility Theory not only establishes a functional link between road infrastructure and visitation, but also explains the mediating role of perception and satisfac-

tion in shaping patronage. Accessibility influences tourists' perception of safety, convenience, comfort, and efficiency factors which contribute to their overall satisfaction and likelihood of repeat visits. Poor road surface conditions, lack of signage, and lighting deficiencies may lead to negative travel experiences, which in turn lower satisfaction and deter future patronage. Conversely, good road infrastructure enhances perceived value and convenience, increases satisfaction, and boosts tourist loyalty and referrals.

Empirical studies further support these associations. For instance, Awaritefe [23] found that access road quality had a significant positive effect on revisit intention in tourist sites across Oyo State. Similarly, World Bank [1] reports highlight the importance of integrated and well-maintained transport networks in improving destination competitiveness and visitor satisfaction, especially in emerging tourism markets.

Together, these two theories provide a solid foundation for understanding how road infrastructure influences the developmental stage and attractiveness of a tourism site like Ikogosi Warm Spring. They help frame the research problem, justify the study variables, and provide theoretical justification for the hypotheses tested.

## 4.3. Conceptual Framework

The conceptual framework below (**Figure 1**), guided by the TALC Model and Accessibility Theory, illustrates the theorized pathways through which road infrastructure elements influence tourism patronage via tourists' perception and satisfaction.

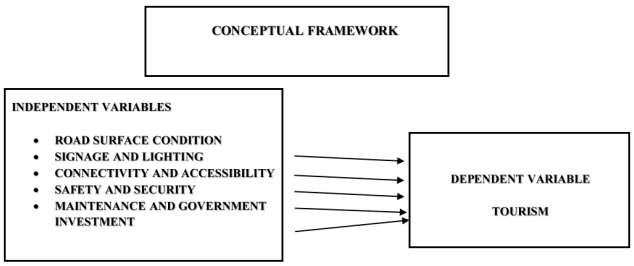


**Figure 1.** Conceptual/Theoretical Development of Road Infrastructure and Tourism.

## 4.4. Empirical Review

Empirical investigations across various geographical contexts have consistently affirmed the significant influence of road transport infrastructure on tourism patronage. In developed economies such as the United Kingdom and the United States, the relationship is often characterized by robust road networks that enhance tourists' mobility, comfort, and experience, leading to increased patronage. Gavurova et al. [24] investigated 27 European OECD countries from 2010–2018, examining road transport indicators and tourism expenditure. Using cluster, correlation, and regression analyses, they found road density and infrastructure investment influenced tourism differently across development levels. In developed nations, business and domestic tourism were significant, while in less developed countries, leisure tourism and foreign visitor expenditure dominated. The researchers concluded that well-paved roads and directional signage not only reduced travel stress but also increased tourists' intention to revisit and recommend destinations.

In developing countries, the scenario is often constrained by underinvestment in transport infrastructure, which hampers the full realization of tourism potentials. Mejía et al. [25] reviewed 14 studies on road project delays in Africa and Asia, revealing financial, material, and planning challenges as key causes. Such delays hinder timely completion of road infrastructure, which is vital for tourist mobility, accessibility, and destination competitiveness. Inefficient road projects ultimately reduce tourism patronage, visitor satisfaction, and broader economic benefits in developing countries.

In Uganda, Kaziro et al. [26] used 200 observations and multiple linear regression examined road surface quality, access, maintenance, and operator support on tourism outcomes. Findings showed road surface quality, access, and maintenance significantly enhanced visitation, participation, spending, and perceptions, while reducing challenges and creating opportunities. Tourism operator support had smaller but positive effects, underscoring infrastructure's central role in tourism growth. Improved roads were associated with reduced travel time, enhanced safety, and better overall experience, which in turn encouraged return visits and extended stays.

In the Nigerian context, several localized studies have similarly demonstrated the critical role of road infrastructure in influencing tourism patronage. Shakur [7] examined the role of road transportation in enhancing tourism activities at Freedom Park, Lagos. Using a sample of 196 tourists and descriptive statistical tools, they observed that although Lagos generally boasts a functional road network, the poor

condition of access roads to Freedom Park discouraged patronage. Many respondents identified road accessibility as a major consideration in their tourism choices.

Similarly, a national assessment by Agina et al.[8] analyzed how infrastructural development including road, air, and ICT infrastructure influences Nigeria's destination competitiveness. Using secondary data and regression analysis, the study found that insufficient infrastructure correlates negatively with international tourist arrivals, underscoring the essential role of reliable road networks in supporting tourism demand.

In Calabar Metropolis, Cross River State, Umukoro et al.[5] examined the influence of tourism site infrastructure on visitor patronage using an independent t-test. With a sample size of 100 tourists, they found that inadequate infrastructure especially deteriorated access roads significantly lowered tourist satisfaction. Respondents pointed to poor road signage, lack of lighting, and traffic congestion as major impediments to their tourism experience.

Similarly, Olusola[21] conducted a study across 27 tourist destinations in Osun State to investigate the impact of infrastructure accessibility on domestic tourism. Using a sample of 371 respondents, linear regression and Pearson correlation techniques were applied. The study found a strong and statistically significant relationship ($r = 0.706$, $p = 0.005$) between road accessibility and tourism patronage. Destinations with better road connectivity recorded higher visitation rates, while those with difficult access suffered from low patronage and poor tourist satisfaction.

These empirical findings across diverse contexts underscore the indispensable role of road transport infrastructure in fostering tourism development. In both advanced and emerging economies, the quality, safety, and accessibility of road networks have a direct impact on tourists' decision-making processes, satisfaction levels, and overall experiences. For a site like Ikogosi Warm Spring in Nigeria renowned yet challenged by deteriorating road access, these studies collectively emphasize the urgent need for targeted infrastructural investments to revive and sustain tourism patronage.

# 5. Methodology

This study employed a descriptive survey research design to examine how various dimensions of road transport infrastructure influence tourism patronage at Ikogosi Warm Spring in Ekiti State, Nigeria. The descriptive design was deemed appropriate as it enables the researcher to collect, describe, and analyze data from a defined population in a natural setting without manipulating any variables. This approach was particularly suitable for gathering firs thand information from tourists who have directly experienced the road infrastructure leading to the destination.

The study population comprised all domestic and international tourists who visited the Ikogosi Warm Spring during the period of the study. Ikogosi is one of Nigeria's most iconic tourism sites, known for its rare convergence of warm and cold springs. According to estimates from the Ekiti State Tourism Board, the site attracts an average of about 2000 tourists per quarter during peak periods such as weekends, public holidays, and school vacations. Given the transient nature of the population, obtaining data from every visitor was not feasible. Therefore, a sample size of 150 respondents was purposively selected for the study, based on accessibility and the average number of tourists during peak periods. This sample size is consistent with similar empirical studies[11, 16], thereby providing a comparative justification for its appropriateness.

A purposive sampling technique was adopted to ensure that only actual tourists who had visited the site and experienced the access roads were included in the sample. This non-probability sampling method was considered most suitable due to the research focus on specific experiences and perceptions related to road infrastructure quality. However, the use of purposive sampling introduces potential limitations such as selection bias and reduced generalizability of the findings. These limitations are acknowledged and addressed through methodological transparency and clear articulation of the study context.

Data were collected through a structured questionnaire designed to measure five key dimensions of road transport infrastructure quality: road surface condition, availability of signage and lighting, road connectivity and accessibility, perceived road safety and security, and government investment in road maintenance. The dependent variable, tourism patronage, was measured through indicators such as tourist satisfaction, frequency of visits, and willingness to recommend or revisit the destination.

To ensure the reliability of the research instrument, a

pilot study was conducted with 20 tourists at a comparable tourist site within Ekiti State. Responses from the pilot test were analyzed using Cronbach's Alpha, which yielded a coefficient of 0.86, indicating a high level of internal consistency and reliability of the questionnaire items. In addition to the reliability analysis, further validation of the questionnaire was conducted through expert review. Three subject-matter specialists in the fields of tourism, transport studies, and research methodology assessed the instrument for clarity, relevance, and coverage. Their suggestions informed minor revisions to enhance construct and content validity. This multi-step validation process ensured that the instrument captured the core constructs of interest with precision and relevance.

The data collected were analyzed using the Statistical Package for the Social Sciences (SPSS), version 21. Descriptive statistics such as frequency counts, means, and standard deviations were used to summarize the demographic characteristics of respondents and their general responses. To test the research hypotheses, Multiple Linear Regression Analysis was employed. This technique was selected because it allows for the examination of the individual and collective influence of the five dimensions of road infrastructure on tourism patronage outcomes such as satisfaction and visitation. The use of inferential statistics helped determine whether the observed relationships were statistically significant, using a 95% confidence level and a 5% margin of error ($p < 0.05$).

This methodology provides a robust framework for understanding the infrastructural barriers affecting tourism development in rural destinations like Ikogosi Warm Spring and offers empirical insights for policymakers, tourism managers, and infrastructure planners.

The multiple regression analysis was conducted to examine the combined effect of five predictor variables—road surface condition, signage and lighting, connectivity and accessibility, safety and security, and road maintenance/government investment on the dependent variable, tourism patronage at Ikogosi Warm Spring in Ekiti State, Nigeria.

The results showed a multiple correlation coefficient (R) of 0.270, indicating a weak positive relationship between the independent variables and tourism patronage (**Table 1**). The coefficient of determination (R Square) was 0.073, which implies that only 7.3% of the variation in tourism patronage can be explained by the model. This relatively low $R^2$ value highlights the model's limited explanatory power, suggesting that a substantial proportion (92.7%) of the variation in tourism patronage is influenced by other factors not included in the current study, such as quality of hospitality services, cost of travel, environmental aesthetics, or social media influence. This limitation is acknowledged and points to the need for broader variable inclusion in future research.

**Table 1.** Model Summary on Road Infrastructure and Tourism in Nigeria: Evidence from Ikogosi Warm Spring, Ekiti State.

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change | |
| 1 | 0.270[a] | 0.073 | 0.040 | 1.08439 | 0.073 | 2.256 | 5 | 144 | 0.052 | 1.680 |

Notes: a. Predictors: (Constant), Road Maintenance and Government Investment, Road surface condition, Safety and security, Signage and Lighting, Connectivity and Accessibility; b. Dependent Variable: Tourism Patronage.
Source: Field Work, 2025 (SPSS VERSION 21).

The adjusted R Square was 0.040, reflecting a modest adjustment for the number of predictors in the model and the sample size. This means that, after accounting for the potential inflation of R Square, the model still explains approximately 4.0% of the variation in tourism patronage.

The standard error of the estimate was 1.084, indicating the average distance of the observed values from the predicted values in the model. This value shows a moderate level of prediction error, consistent with the relatively low explanatory power of the model.

In terms of statistical significance, the F-change value was 2.256, with an associated significance level (Sig. F Change) of 0.052. This *p*-value is slightly above the conventional 0.05 threshold, suggesting that the model is not statistically significant at the 5% level, but it is marginally significant and may still offer practical relevance particularly in exploratory or policy-related tourism studies where infrastructural decisions are of public interest.

The Durbin-Watson statistic was 1.680, which falls within the acceptable range of 1.5 to 2.5. This indicates that

there is no significant autocorrelation in the residuals, thereby supporting the validity of the regression assumptions.

In summary, the regression model demonstrates that while road transport infrastructure variables have a weak and statistically marginal influence on tourism patronage, their importance should not be dismissed. The findings suggest the presence of other omitted variables that warrant further investigation to develop a more comprehensive model of tourism behavior.

**Table 2** was used to test the overall significance of the multiple regression model exploring the influence of road transport infrastructure quality on tourism patronage at Ikogosi Warm Spring. The purpose of the ANOVA test in regression is to determine whether the independent variables, when taken together, significantly predict the dependent variable in this case, tourism patronage.

**Table 2.** ANOVA on Road Infrastructure and Tourism in Nigeria: Evidence from Ikogosi Warm Spring, Ekiti State.

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 13.265 | 5 | 2.653 | 2.256 | 0.052b |
| | Residual | 169.328 | 144 | 1.176 | | |
| | Total | 182.593 | 149 | | | |

Notes: a. Dependent Variable: Tourism Patronage; b. Predictors: (Constant), Road Maintenance and Government Investment, Road surface condition, Safety and security, Signage and Lighting, Connectivity and Accessibility.
Source: Field Work, 2025 (SPSS VERSION 21).

The regression sum of squares was 13.265 with 5 degrees of freedom (df), representing the variation in tourism patronage that is explained by the five independent variables: road surface condition, signage and lighting, connectivity and accessibility, safety and security, and government investment in road maintenance. The residual sum of squares was 169.328 with 144 degrees of freedom, indicating the portion of the variation in tourism patronage that remains unexplained by the model.

The total sum of squares was 182.593, which represents the overall variance in the dependent variable. The mean square for regression was calculated as 2.653, while that of the residual was 1.176. These values were used to compute the F-statistic, which was 2.256.

The significance value ($p$-value) associated with the F-statistic was 0.052. This result is slightly above the commonly accepted threshold of 0.05, indicating that the model is not statistically significant at the 5% level. However, because the $p$-value is very close to 0.05, the result may be considered marginally significant, especially in exploratory research or policy-based studies. It suggests that the five predictor variables collectively have a modest influence on tourism patronage, though not strong enough to confidently reject the null hypothesis at the 95% confidence level.

The ANOVA result indicates that while the regression model shows some predictive power, its overall explanatory strength is limited. This further implies that other unmeasured factors may play a more dominant role in shaping tourism patronage at Ikogosi Warm Spring. Nevertheless, the variables studied remain relevant for infrastructure and tourism development planning.

The regression analysis provides insights into the individual effects of the various road transport infrastructure variables on tourism patronage at Ikogosi Warm Spring, Ekiti State (**Table 3**).

The constant term has a value of 6.196 and is statistically significant at the 1% level ($p = 0.000$). This implies that when all the predictor variables are held constant at zero, the baseline level of tourism patronage is expected to be 6.196 units. This value provides a reference point for interpreting the influence of the independent variables.

Among the five predictor variables, road surface condition exhibits a statistically significant negative relationship with tourism patronage ($B = -0.401$, $p = 0.035$). This means that as the quality of road surfaces deteriorates, tourism patronage tends to decline. The standardized beta coefficient ($\beta = -0.178$) reflects a moderate negative impact, suggesting that poor road conditions substantially discourage tourists from visiting the destination.

Road maintenance and government investment also shows a statistically significant negative influence on tourism patronage ($B = -0.189$, $p = 0.032$). This finding is particularly noteworthy because it is counterintuitive—one might expect government investment in road infrastructure to enhance tourism, not diminish it. A possible explanation is that such investment is often reactive rather than proactive,

occurring after road conditions have already become poor. Another explanation could involve the timing and visibility of these projects, where tourists may not see or experience the benefits during their visits. Additionally, public trust issues or negative perceptions of government-led projects may reduce the effectiveness of such investments in attracting tourists. This unexpected result underscores the need for further qualitative investigation or policy-level analysis to understand how government investment is perceived and how it impacts tourism behavior in practice.

**Table 3.** Coefficients on Road Infrastructure and Tourism in Nigeria: Evidence from Ikogosi Warm Spring, Ekiti State.

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | 95.0% Confidence Interval for B | | Correlations | | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound | Zero-Order | Partial | Part | Tolerance | VIF |
| 1 | (Constant) | 6.196 | 1.290 | | 4.802 | 0.000 | 3.646 | 8.746 | | | | | |
| | Road surface condition | −0.401 | 0.189 | −0.178 | −2.123 | 0.035 | −0.775 | −0.028 | −0.155 | −0.174 | −0.170 | 0.914 | 1.095 |
| | Signage and Lighting | 0.007 | 0.221 | 0.003 | 0.031 | 0.976 | −0.431 | 0.444 | −0.032 | 0.003 | 0.002 | 0.714 | 1.401 |
| | Connectivity and Accessibility | 0.196 | 0.215 | 0.087 | 0.913 | 0.363 | −0.228 | 0.621 | 0.007 | 0.076 | 0.073 | 0.708 | 1.413 |
| | Safety and security | −0.199 | 0.191 | −0.089 | −1.042 | 0.299 | −0.577 | 0.179 | −0.116 | −0.087 | −0.084 | 0.893 | 1.120 |
| | Road Maintenance and Government Investment | −0.189 | 0.087 | −0.179 | −2.167 | 0.032 | −0.362 | −0.017 | −0.191 | −0.178 | −0.174 | 0.946 | 1.057 |

Note: a. Dependent Variable: Tourism Patronage.
Source: Field Work, 2025 (SPSS VERSION 21).

On the other hand, the remaining variables like signage and lighting, connectivity and accessibility, and safety and security do not exhibit statistically significant relationships with tourism patronage. Specifically:

- Signage and lighting has a coefficient of 0.007 and a *p*-value of 0.976, indicating a negligible and non-significant effect. This suggests that improvements in signage and lighting, in the current context, do not have a measurable influence on attracting tourists.
- Connectivity and accessibility shows a positive but statistically insignificant relationship (B = 0.196, $p$ = 0.363). This implies that while accessible road networks might contribute to ease of travel, they may not yet be sufficient to significantly boost tourism patronage on their own.
- Safety and security has a negative but non-significant coefficient (B = −0.199, $p$ = 0.299), suggesting that concerns about safety may exist but are not strong enough in this context to significantly affect tourist decisions.

Importantly, all Variance Inflation Factor (VIF) values range from 1.057 to 1.413, which are well below the threshold of 10, indicating no issues of multicollinearity among the predictor variables.

In summary, the regression analysis reveals that both road surface condition and government investment in road maintenance significantly impact tourism patronage, though in a negative direction. This unexpected result regarding government investment suggests a disconnect between infrastructural inputs and tourist outcomes, possibly due to issues of project visibility, timeliness, or public perception. These findings call for a deeper, possibly mixed-method exploration to complement the quantitative results and better inform tourism infrastructure policy and planning in similar contexts.

# 6. Discussion of Findings

The current study identifies road surface condition as a statistically significant negative predictor of tourism patronage, meaning that poorer road surfaces are associated with reduced tourist visits. This mirrors earlier findings that emphasize the importance of road quality in socio-economic outcomes. For instance, Igbalajobi et al. [6] demonstrated that deteriorating rural roads in Ado Ekiti led to lower market attendance by increasing travel costs and hindering mobility. Their results highlighted that good road surfaces facilitate economic activity through enhanced accessibility. Similarly, Onipe [17] observed that maintaining road infrastructure positively influenced agricultural productivity and access to markets patterns attributable to improved road quality that also echo across tourism contexts. The consistent negative influence of poor road surface on tourism patronage in the present study thus reinforces the well-established link between road

condition and mobility centered economic behavior.

This finding is also supported by studies from international contexts. For example, Jangra et al.[27] found that high quality roads and signage significantly enhanced tourist satisfaction and likelihood of revisitation. Likewise, Kaziro et al.[26], working in Uganda, confirmed that road quality had a direct and strong positive impact on tourist inflow and overall travel experience. These empirical alignments validate the assertion that tangible road surface quality remains central to tourism success, irrespective of region.

Despite this alignment, the study reveals a counterintuitive negative effect of road maintenance and government investment on tourism patronage. This diverges from much of the existing literature but aligns partially with research that questions the efficacy or timing of such investments. Feng et al.[28] concluded that although transportation infrastructure can foster local communities' positive attitudes and tourism support, traffic congestion an unintended by-product of expansion can undermine those attitudes. This suggests that infrastructure improvements may generate short-term disturbances (traffic, construction disruption) that temporarily or even persistently deter tourists. Moreover, Towobola[29] assessment of Nigerian road policy concludes that while high-profile projects (such as flyovers and highway upgrades) can improve transport systems; their ultimate success depends heavily on public perception and trust in the implementation process. Suboptimal timing and public mistrust may result in paradoxical negative outcomes.

This paradox is consistent with findings from Shakur[7], who observed that although Lagos boasts a functional network, poorly maintained access roads near tourist centers still discourage visitation. It appears that tourists not only evaluate infrastructure presence but also quality, visibility, and reliability factors which influence their perception of government commitment and tourism value. Thus, even where government investment exists, a lack of tangible outcomes during the tourist's timeframe of travel may lead to dissatisfaction and reduced patronage.

Other variables like signage and lighting, connectivity and accessibility, and safety and security were statistically insignificant in this model. This echoes findings by Umukoro et al.[5], who noted that location ambiance and tour guide quality did not significantly influence visitor patronage in Calabar, even where security and artifact availability did. In your case, it may indicate that the tangible quality of roads is more influential for tourists than supplementary factors unless those supplementary factors reach a threshold of perceived quality or necessity.

A deeper reflection suggests two possibilities. First, field conditions at Ikogosi may show that signage, lighting, or security infrastructure is either generally adequate or uniformly poor across the site, leading to minimal variability in tourist perception thus, no statistical significance. Second, measurement limitations might have contributed to the outcome. The use of self-reported Likert scales, while useful for perception analysis, may not have captured nuanced differences in the availability, reliability, or strategic positioning of signage and lighting infrastructure. Similarly, safety and accessibility may be interpreted differently by domestic and international tourists, introducing respondent bias. These measurement issues could attenuate the estimated effect sizes in the regression model.

This observation aligns with Umukoro et al.[5], who found in Calabar that while visitors cited security and access roads as concerns, the strongest deterrents remained visibly poor infrastructure suggesting that unless signage and safety infrastructure reaches a critical failure or excellence threshold, their impact may be drowned by broader road quality issues. Furthermore, Olusola[21] also confirmed that in Osun State, the defining factor for tourism engagement was ease of road access rather than the presence of streetlights or road signs.

Taken together, your research supports the broader theoretical framework that physical infrastructure, especially road surface quality, plays a critical role in drawing tourists, as seen in prior studies across market, agricultural, and tourism contexts. However, the negative association between government investment and tourism suggests a complex reality: infrastructure investments might be reactive (targeting already deteriorating roads), poorly timed, or perceived as inefficient, possibly leading to transient declines in patronage until improvements are visible, accessible, and trusted.

These nuances reinforce the findings of Jangra[27], who observed that road upgrades in Indian hill stations failed to generate immediate tourism growth due to tourists' negative impressions of ongoing construction. A similar delay in perceived benefits may explain the insignificance or negative signs of certain predictors in your model.

This complexity invites more nuanced policy design and deeper mixed-method investigations to understand not only whether infrastructure exists but how it is experienced and interpreted by different tourist groups. Specifically, qualitative interviews or structured observation studies could enrich future research and improve the responsiveness of infrastructure-related tourism policy.

# 7. Contribution to Knowledge

This study contributes meaningfully to the existing body of knowledge on the nexus between transport infrastructure and tourism development by offering nuanced, context-specific insights from a renowned Nigerian tourist destination Ikogosi Warm Spring in Ekiti State. While prior studies have often emphasized the positive role of infrastructural investments in tourism growth, this research provides empirical evidence that not all infrastructural elements exert statistically significant or positive effects on tourism patronage.

Specifically, the study establishes that road surface condition is a critical determinant of tourism patronage, aligning with global best practices that link physical access quality with visitor satisfaction and repeat visitation. However, the negative and significant relationship between road maintenance/government investment and tourism patronage unveils a paradox previously underexplored in existing literature. This suggests that infrastructural investment, when reactive or poorly implemented, may initially deter tourists due to disruptions or delayed outcomes, offering a novel interpretation of government infrastructural impact in tourism contexts.

Furthermore, the insignificance of factors such as signage and lighting, connectivity and accessibility, and safety and security indicates that tourists may prioritize core mobility experiences over peripheral infrastructure unless such elements meet a critical threshold. This diverges from conventional assumptions in tourism planning and calls for a reassessment of investment priorities in developing countries.

By integrating regression analysis with contextual interpretation, the study adds to methodological rigor in tourism transport research and offers policymakers, tourism managers, and infrastructure planners evidence-based guidance for targeted road investment strategies that align with tourist behavior and expectations.

# 8. Conclusions

This study examined the influence of various dimensions of road transport infrastructure quality on tourism patronage at Ikogosi Warm Spring, a prominent tourist destination in Ekiti State, Nigeria. The findings reveal that road surface condition and road maintenance/government investment significantly influence tourism patronage, while signage and lighting, connectivity and accessibility, and safety and security do not have statistically significant effects.

The result for road surface condition confirms that tourists are highly sensitive to the physical condition of access roads, which affects their willingness to travel to and revisit the destination. This supports prior studies indicating that poor road conditions reduce mobility and dampen tourist satisfaction. However, the negative association between road maintenance/government investment and tourism patronage suggests that such efforts may not be effectively implemented, timely, or communicated to potential visitors, possibly leading to reduced interest or perceptions of inconvenience during construction periods.

The insignificance of signage, accessibility, and safety/security implies that tourists visiting Ikogosi Warm Spring may prioritize direct travel experience and road usability over auxiliary infrastructure, unless those components fall below minimum acceptable thresholds. This finding may also reflect limitations in how tourists perceive and evaluate these features at the destination. Collectively, the study reinforces the critical role of visible and functional road infrastructure in enhancing or hindering tourism patronage and calls for more strategic and perception-sensitive infrastructure planning and monitoring to achieve desired tourism outcomes.

Based on the findings, several policy directions are recommended. Government agencies should prioritize the improvement of road surface conditions leading to Ikogosi Warm Spring, as this variable had the strongest significant influence on tourist patronage. Investments should focus on durable paving, effective drainage, and regular grading to enhance road reliability and visitor comfort. Furthermore, road maintenance and infrastructure investment programs must be better synchronized with tourist seasons and clearly

communicated to the public. The negative impact of government investment may stem from disruptive timing or lack of transparency; hence, planning should minimize visitor inconvenience and highlight completed improvements to boost tourist confidence.

Although signage, lighting, and safety infrastructure were not statistically significant in this study, they should not be overlooked. Authorities should ensure these amenities meet acceptable standards, as their absence may only become influential when they deteriorate or fail completely. This reinforces that statistical insignificance does not necessarily imply irrelevance. Additionally, stakeholders in the tourism and transport sectors should collaborate to improve overall accessibility experiences, incorporating user feedback and perception tracking mechanisms. Although connectivity and accessibility were not statistically significant, qualitative insights may reveal contextual barriers not captured quantitatively. Tourism promotion bodies should also align their messaging with actual infrastructure improvements, ensuring that tourists are aware of the quality of access routes and the progress made. This will help manage expectations and rebuild trust in destinations previously affected by poor infrastructure.

This study is not without limitations. The use of a cross-sectional survey design restricts the ability to capture changes in tourist perceptions over time or account for seasonal variations in travel behavior. Moreover, reliance on quantitative Likert-scale items may not fully reflect the nuanced ways tourists interpret aspects such as signage quality, safety, or connectivity potentially underestimating their true influence. Future research should therefore consider adopting mixed-method approaches, integrating qualitative interviews or focus groups to provide deeper insights into tourists' infrastructure perceptions and experiences. Additionally, longitudinal studies could examine how infrastructure upgrades or policy changes affect tourism patronage over time. Such approaches would enrich understanding and support evidence-based infrastructure and tourism development strategies for destinations like Ikogosi Warm Spring.

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# Institutional Review Board Statement

Not applicable.

# Informed Consent Statement

Informed consent was obtained from all the respondents involved in the study.

# Data Availability Statement

Due to ethical and privacy considerations, the data are not publicly available but are available from the corresponding author on reasonable request.

# Conflicts of Interest

The author declares no conflict of interest.

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