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Tourism Infrastructure and Sustainable Ecotourism Development in Cross River National Park, Nigeria					
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Keywords Tourism Infrastructure; Ecotourism Development; Stakeholder Perceptions; Cross River National Park.			Abstract Tourism infrastructure is fundamental to sustainable ecotourism development in protected areas. This study assessed the condition of tourism infrastructure and its implications for sustainable ecotourism development in Cross River National Park, Nigeria. A descriptive cross- sectional survey design was adopted, and data were collected from 400 stakeholders comprising local community members, visitors, park staff, tour operators, non-governmental organizations (NGOs), and government agencies using a structured questionnaire. Data were analyzed using descriptive statistics, one-way Analysis of Variance (ANOVA), and Tukey HSD post-hoc tests. The findings revealed that tourism infrastructure in the park was generally inadequate (Grand Mean = 2.89), with major deficiencies in road accessibility, utilities, security infrastructure, and accessibility to tourist sites. ANOVA results indicated significant differences in infrastructure ratings among stakeholder groups $F(5,394) = 6.91, p < 0.001$. Post-hoc analysis showed that park staff and government agencies rated infrastructure significantly higher than local communities and NGOs. The study contributes empirical evidence on stakeholder perceptions of infrastructure deficiencies in protected areas. It concludes that inadequate infrastructure constrains tourism growth, visitor satisfaction, and conservation effectiveness. The study recommends increased investment in infrastructure, improved accessibility, enhanced security systems, and sustainable facility management to promote ecotourism development.		
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1.0 INTRODUCTION

Tourism infrastructure plays a vital role in the development and sustainability of ecotourism destinations, particularly protected areas such as national parks where tourism activities must be carefully balanced with biodiversity conservation. Tourism infrastructure refers to the physical and institutional facilities that support tourism activities, including roads, accommodation facilities, visitor centres, electricity and water supply systems, communication networks, security facilities, signage, and other visitor support services (Adebayo & Iweka, 2014; Singh, Saini, & Majumdar, 2015). In protected areas, adequate tourism infrastructure enhances accessibility, improves visitor satisfaction, supports conservation monitoring, and promotes environmental education, thereby contributing significantly to sustainable tourism development.

Globally, ecotourism destinations increasingly depend on sustainable and well-maintained infrastructure to attract visitors and support conservation objectives. Facilities such as eco-lodges, interpretation centres, trail systems, ranger stations, and transportation networks facilitate tourism activities while minimizing environmental degradation (Abdul-Kadri, Samuel, & Abdullah, 2022). Sustainable infrastructure development is therefore recognized as a key strategy for balancing tourism growth with environmental protection, community participation, and long-term conservation goals (Jurkus, Povilanskas, & Taminskas, 2022; Kumar et al., 2023).

Despite the recognized importance of tourism infrastructure, many protected areas in developing countries continue to experience serious infrastructural deficiencies. Inadequate funding, poor maintenance culture, weak institutional capacity, and insufficient government commitment have limited the development of essential tourism facilities in many national parks (Stolton et al., 2015; Schulze et al., 2017). Across many African protected areas, poor road conditions, inadequate accommodation facilities, unreliable utilities, weak communication systems, and insufficient security infrastructure continue to constrain ecotourism development and conservation effectiveness.

Nigeria possesses enormous ecotourism potential due to its rich biodiversity, varied ecosystems, and cultural heritage. National parks in the country serve as important centres for biodiversity conservation, environmental education, and nature-based tourism. However, inadequate tourism infrastructure remains one of the major challenges limiting tourism growth and sustainable management within many protected areas in the country.

Among Nigeria's protected areas, Cross River National Park (CRNP) is one of the most ecologically important biodiversity hotspots in West Africa. Located in southeastern Nigeria, the park contains extensive tropical rainforest ecosystems and provides habitat for several endangered and endemic species, including the Cross River gorilla, Nigeria-Cameroon chimpanzee, forest elephant, and numerous rare plant species. The ecological significance of the park gives it considerable potential for ecotourism development and conservation-based recreation.

However, despite its tourism potential and conservation importance, tourism infrastructure within Cross River National Park remains generally inadequate. Previous studies have identified infrastructural challenges such as poor road accessibility, inadequate accommodation facilities, weak communication systems, insufficient electricity and water supply, poor security facilities, and limited visitor support infrastructure (Nchor et al., 2021). These deficiencies negatively affect visitor experience, accessibility, tourism operations, conservation monitoring, and ecotourism sustainability within the park.

Furthermore, sustainable tourism development in protected areas requires infrastructure planning that integrates environmental sustainability, conservation priorities, and community participation. Poorly planned infrastructure can contribute to habitat destruction, environmental degradation, and human-wildlife conflicts (Brundu et al., 2020). Consequently, there is increasing emphasis on eco-friendly and sustainable infrastructure approaches that support tourism development without compromising ecological integrity.

Although several studies have examined biodiversity conservation, wildlife protection, and tourism potential in Cross River National Park, comparatively limited empirical attention has been given to the overall condition and adequacy of tourism infrastructure and its implications for sustainable ecotourism development. Existing literature has also paid insufficient attention to how infrastructural deficiencies affect visitor accessibility, tourism functionality, visitor satisfaction, conservation effectiveness, and long-term tourism sustainability within the park.

This study therefore assesses the current state of tourism infrastructure in Cross River National Park and examines its implications for sustainable ecotourism development. Specifically, the study evaluates the condition and adequacy of roads, accommodation facilities, utilities, security infrastructure, and visitor support services within the park. The study is important because it provides useful information for

policymakers, conservation managers, tourism planners, and other stakeholders involved in sustainable tourism development and biodiversity conservation in Nigeria.

1.1 Aim and Objectives of the Study

The study aimed to assess the current state of tourism infrastructure in Cross River National Park, Nigeria, in relation to effective tourism development. Specifically, the study sought to:

- Examine the availability and condition of tourism infrastructure within the park.
- Evaluate the adequacy of existing tourism facilities in supporting tourism development.
- Identify infrastructural gaps affecting tourism activities and visitor experiences in the park.
- Assess the implications of tourism infrastructure on sustainable ecotourism development.
- Provide recommendations for improving tourism infrastructure and accessibility within the park.

1.2 Research hypothesis

H₀: There is no significant difference in infrastructure ratings among stakeholder groups.

H₁: There is a significant difference in infrastructure ratings among stakeholder groups.

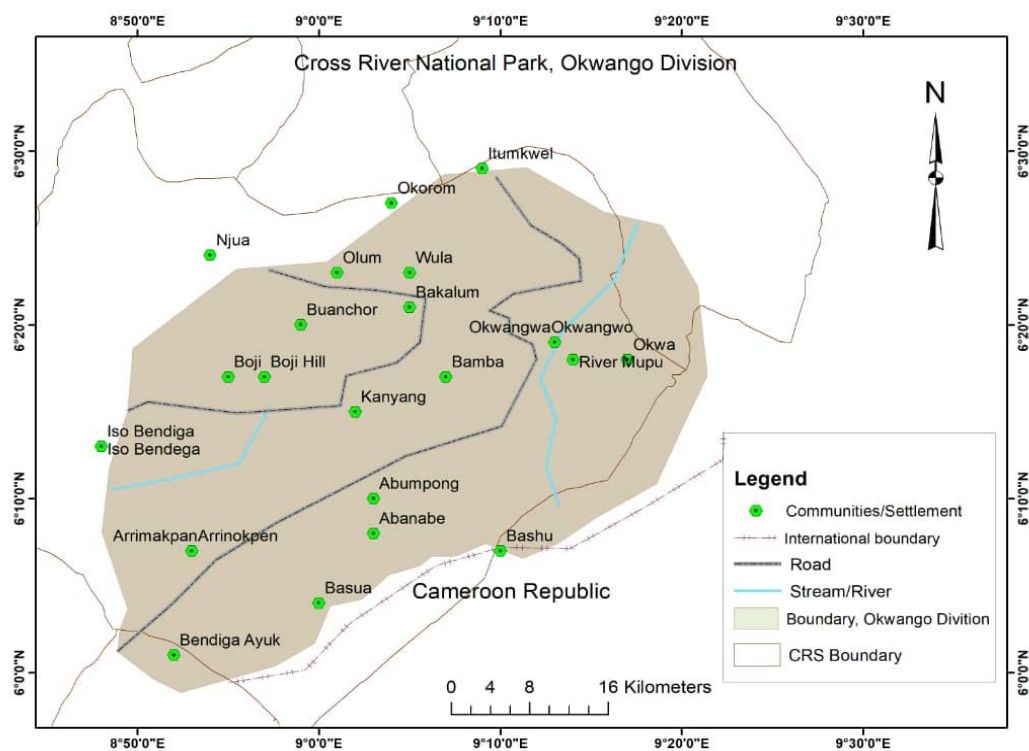


Fig. 1: Map of Cross River National Park, Okwango Division

Source: GIS Lab, Department of Geography and Environmental Science, University of Calabar, Nigeria, 2018.

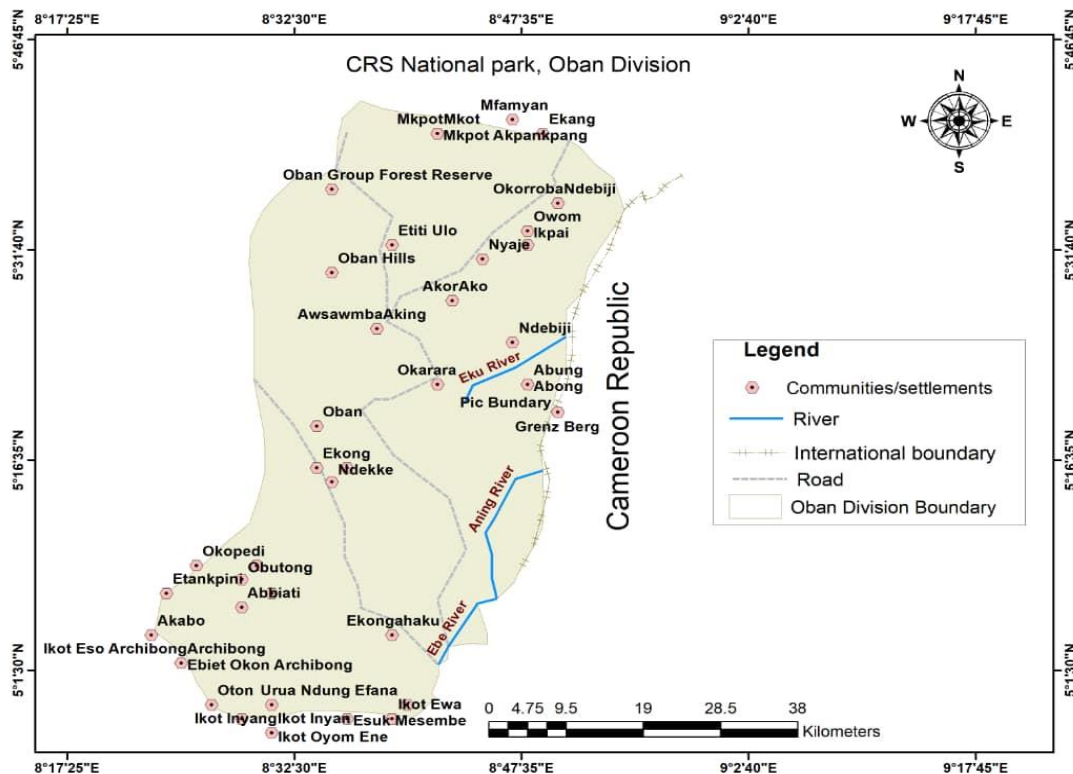


Fig 2: CRS National Park, Oban Division

Source: GIS Lab, Department of Geography and Environmental Science, University of Calabar, Nigeria, 2018.

2.0 MATERIALS AND METHODS

2.1 Study Area

Cross River National Park is located in Cross River State, southeastern Nigeria, approximately between latitudes 5.09°N and 6.47°N and longitudes 8.31°E and 9.36°E. The park is one of Nigeria's eight national parks and is divided into two main sections: the Oban and Okwangwo divisions. It is managed by the Nigerian National Park Service under the Federal Ministry of Environment.

2.2 Research Design

A descriptive cross-sectional survey design was adopted. This design was considered appropriate because it allows for systematic collection of data from different stakeholder groups to assess the condition of tourism infrastructure and its implications for sustainable ecotourism development in the study area.

2.3 Sources of Data

Data for the study were obtained from both primary and secondary sources.

Primary data were collected using structured questionnaires administered to stakeholders, including local community members, park staff, visitors, tour operators, NGOs, and government officials.

Secondary data were obtained from textbooks, journal articles, policy documents, and relevant reports on tourism infrastructure and protected area management.

2.4 Population of the Study

The target population comprised all key stakeholders involved in or affected by tourism activities in Cross River National Park. These included:

Local community members (host communities around Oban and Okwangwo divisions)

Park staff

Visitors (domestic and international)

Tour operators

NGOs involved in conservation

Government agencies responsible for tourism and environmental management

The estimated total population was 195,550, as presented in Table 1.

Below is a summary table for the population of the stakeholder groups

Table 1

Population of the stakeholder groups

S/N	Stakeholder group	Population size
1	Local population	179,750
2	Park staff	430
3	Visitors	15000
4	NGOs	200
5	Tour operators	200
6	Government agencies	200
	Total	195,550

Researcher's fieldwork, 2026.

2.5 Sample Size Determination

The sample size was determined using Yamane's (1967) formula for finite populations:

Where: $n = N / (1 + N(e)^2)$

n = sample size

N = population size (195,550)

e = level of precision (0.05)

Substituting:

$$n = 195,550 / (1 + 195,550(0.05)^2)$$

$$n = 195,550 / (1 + 195,550 \times 0.0025)$$

$$n = 195,550 / (1 + 488.875)$$

$$n = 195,550 / 489.875$$

$$n \approx 399.2 \approx 400$$

Thus, a total of 400 respondents were selected for the study.

2.6 Sampling Technique

A stratified random sampling technique was used to ensure proportional representation of all stakeholder groups. The population was divided into strata based on stakeholder categories (local communities, visitors, park staff, NGOs, tour operators, and government agencies). Respondents were then randomly selected from each stratum in proportion to their population size.

This approach ensured balanced representation and reduced sampling bias.

2.7 Instrument for Data Collection

Data were collected using a structured questionnaire divided into two sections:

Section A: Demographic characteristics of respondents

Section B: Assessment of tourism infrastructure (roads, accommodation, utilities, security, visitor facilities, and accessibility)

Responses were measured using a 5-point Likert scale ranging from Very Good (5) to Very Poor (1).

2.8 Validity and Reliability of the Instrument

The questionnaire was subjected to face and content validation by three experts in tourism management, ecotourism, and environmental management. Their comments and suggestions were incorporated to improve the clarity, relevance, and adequacy of the instrument.

To establish reliability, a pilot study was conducted using 40 respondents drawn from communities and tourism stakeholders in the buffer zone of Cross River National Park who were not included in the main study. The pilot survey was carried out in selected communities around the Oban Division of the park. Data obtained from the pilot study were analyzed using Cronbach's Alpha reliability test.

The results indicated satisfactory internal consistency for the various constructs measured in the study. The reliability coefficients obtained were 0.84 for road accessibility, 0.81 for accommodation facilities, 0.79 for utility services, 0.83 for security infrastructure, and 0.80 for accessibility to tourist sites. The overall Cronbach's Alpha coefficient for the instrument was 0.82, which exceeds the minimum acceptable threshold of 0.70 and demonstrates that the questionnaire was reliable for data collection.

2.9 Ethical considerations

These were strictly observed in this study by ensuring voluntary participation of all respondents, with informed consent obtained prior to data collection and the right to withdraw at any stage without penalty. Confidentiality and anonymity were also guaranteed by ensuring that no personal identifiers were recorded or disclosed in the presentation of results, and data were used solely for academic purposes.

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2.10 Method of Data Collection

A total of 400 questionnaires were administered directly to respondents across the two divisions of the park. Questionnaires were administered and collected on-site by trained research assistants, resulting in full retrieval.

2.11 Method of Data Analysis

Data were analyzed using descriptive and inferential statistics:

Descriptive statistics (frequencies, percentages, mean scores) were used to summarize respondent characteristics and assess infrastructure conditions.

A one-way Analysis of Variance (ANOVA) was used to test for significant differences in infrastructure ratings among stakeholder groups.

A decision rule of $p < 0.05$ was used to determine statistical significance.

Below is a summary table for the population of the stakeholder groups

Table 1

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6	Government agencies	200
	Total	195,550

Researcher's fieldwork, 2026.

3.0 Results

3.1 Section A : Demographic information of respondents

Table 2

Sex distribution of respondents

Sex	Frequency(n)	Percentage (%)
Male	230	57.5
Female	170	42.5
Total	400	100

Researcher's fieldwork, 2026

Table 1: Distribution of Respondents by Sex (N = 400)

The results in Table 2 shows that male respondent 57.5% were more than females 42.5%. This may be attributed to the nature of activities around Cross River national Park, such as conservation work, tourism operations, and community-based livelihoods, which tend to involve males than females.

Table 3

Age distribution of respondents

Age bracket (years)	Frequency(n)	Percentage (%)
18-25	80	20.0
26-35	120	30.0
36-45	100	25.0
46-55	60	15.0
56 and above	40	10.0
Total	400	100

In Table 3 Respondent age 26 to 35 years constituted the highest proportion (30%), indicating that the economically active age group is most involved with or affected by the activities in the park, this suggests strong engagement of young and middle-aged adults in tourism, conservation, and community-related activities around the park.

Table 4

Marital status of respondents.

Marital status	Frequency(n)	Percentage (%)
Single	150	37.5
Married	200	50.0
Divorced	30	7.5
Widowed	20	5.0
Total	400	100

Researcher's fieldwork, 2026

The majority of respondents in Table 4 were married 50%, reflecting the dominance of family-oriented individuals within communities surrounding Cross River national Park. This is significant as conservation policies and park management decisions directly affect household livelihoods.

Table 5

Educational level of respondents

Educational level	Frequency(n)	Percentage (%)
Primary	90	22.5
Secondary	160	40.0
Tertiary	130	32.5
Others	20	5.0
Total	400	100

Researcher's fieldwork, 2026

In Table 5 most respondent had at least Secondary education 40%, while 32.5% attained tertiary education. This level of literacy suggests that respondents are capable of understanding conservation issues and participating meaningfully in the park management and decision-making processes.

Table 6

Occupational distribution of respondents (stakeholders)

Occupation/stakeholder group	Frequency(n)	Percentage (%)
Local community Members	160	40.0
Visitors	120	30.0
Park staff	60	15.0
Tour operators	30	7.5
NGOs	20	5.0
Government officials	10	2.5
Total	400	100

Researcher's fieldwork, 2026

In Table 6 local community members constituted the largest group of respondents who are 40%, followed by visitors 30% and park staff 15%. This distribution reflects the Central role of host communities in the sustainability of Cross River national Park. Their dominance highlights the importance of community participation in conservation efforts. Tour operators, NGOs, and government officials formed smaller proportions but remain critical stakeholders in policy formulation, funding, and park governance.

Table 7**Frequency of visit to Cross River national Park**

Frequency of visit	Frequency(n)	Percentage (%)
First time	160	40.0
Occasionally	140	35.0
Frequently	40	10.0
Work here	60	15.0
Total	400	100

Researcher's fieldwork, 2026

The results presented in Table 7 show that 40.0% of respondents were first-time visitors to Cross River National Park, representing the largest proportion of the sample. This suggests that the park continues to attract new visitors and retains considerable potential for tourism growth and destination awareness.

Furthermore, 35.0% of respondents indicated that they visit the park occasionally. This category represents repeat visitors who maintain periodic contact with the park and are therefore likely to possess a reasonable understanding of its tourism facilities, environmental conditions, and management practices.

Respondents who work within the park accounted for 15.0% of the sample. Their regular involvement in park operations provides valuable insights into infrastructural conditions, conservation activities, and tourism management challenges within the park.

In addition, 10.0% of respondents reported visiting the park frequently. Although this group constitutes the smallest proportion among visitors, their repeated interactions with the park environment make them important sources of information regarding visitor experiences, service quality, and infrastructure performance.

3.2 Section B: current state of tourism infrastructure most used or observed in the park**Table 8****Types of infrastructure**

Types of tourism infrastructure	Frequency(n)	Percentage (%)
Roads	128	32.00%
Accommodation facilities	61	15,25%
Visitors center	86	21.50%
Signage and information boards	75	18.75%
Other (please specify)	40	10.5%
Total	400	100

Researcher's fieldwork, 2026

The data from Table 8 shows that a significant proportion of respondents 32.00% identified road infrastructure as the most commonly used or observed within the park. This suggest that roads remain the most essential and feasible form of tourism infrastructure in the park, possible due to the need for vehicle access across it last forested terrain. However, real studies and anecdotal evidence suggest that many park roads may be in poor condition, which could impact visitor experience and tourism sustainability.

The second most reported infrastructure was visitor's centers with 21.50% this indicate a notable level of interaction between tourists and the park interpretive facilities. It may also reflect the concentration of visitor activities around entry points where such centres are located. The relatively higher is shows their importance in education, orientation and conservation messaging. About 18.75% of the respondent

indicated signage and information boards as the infrastructure they used or observed most. This suggests that informational Infrastructure is moderately available but may require expansion or improvement to enhance visitor navigation, safety and interpretation of natural resources. The 15.25% proportion of respondents was reported for accommodation facilities. This aligns with long standing concerns that lodging options within and around the park are limited, poorly maintained or not easily accessible. The low usage visibility implies a potential gap in tourism infrastructure that may hinder overnight tourism and reduce visitor spending in the area. The lowest proportion was reported for the other category suggesting that additional infrastructure (Such as picnic areas, parking or recreational facilities) is less prominent.

Table 9
Accessibility of roads to Cross River national park

S/N	Rating on road accessibility	Frequency(n)	Percentage (%)
1	Very good	35	8.75
2	Good	77	19.25
3	Fair	20	5.00
4	Poor	170	42.50
5	Very poor	98	24.50
	Total	400	100

Researcher's fieldwork, 2026

The results presented in Table 9 indicate that road accessibility within Cross River National Park is generally poor. A substantial proportion of respondents, representing 42.50 percent, rated road accessibility as poor, while 24.50 percent rated it as very poor. Combined, these categories account for 67.00 percent of all respondents, indicating widespread dissatisfaction with the condition of access roads to the park.

Conversely, only 19.25 percent and 8.75 percent of respondents rated road accessibility as good and very good respectively, while 5.00 percent considered the roads to be fair. The calculated mean score of 2.45 further confirms that road accessibility is poor based on the study decision rule.

The findings suggest that inadequate road infrastructure constitutes a major constraint to tourism development within Cross River National Park. Poor road conditions may increase travel time, transportation costs, and visitor discomfort, thereby reducing destination attractiveness and limiting tourist inflows. In addition, inadequate accessibility can hinder park management operations, conservation monitoring activities, and emergency response efforts. Given that accessibility is a critical determinant of destination competitiveness, the observed deficiencies in road infrastructure may negatively affect visitor satisfaction, tourism revenue generation, and the long-term sustainability of ecotourism development within the park.

Table 10: Functionality of accommodation facilities (lodges and campsites)

S/N	Rating on accommodation	Frequency(n)	Percentage (%)
1	Very good	102	25.50
2	Good	154	38.50
3	Fair	92	23.00
4	Poor	52	13.00
5	Very poor	0	0.00

Total	400	100
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Researcher's fieldwork, 2026

Table 10 presents respondents assessment of the functionality of accommodation facilities lodges and campsites in the park. The results show that the facilities are generally functional with a mean score of 3.77 which is above the decision benchmark of 3.00 indicating a satisfactory level of performance in relation to visitor accommodation needs

The distribution of responses indicates that 64.0 percent of respondents gave positive ratings. Specifically 38.5 percent rated the facilities as good while 25.5 percent rated them as very good. This suggests that a majority of users are satisfied with the availability and usability of accommodation facilities and consider them adequate for supporting tourism activities within the park

However 23.0 percent of respondents rated the facilities as fair indicating moderate dissatisfaction which may be associated with issues such as inconsistent maintenance limited comfort and gaps in service delivery In addition 13.0 percent rated the facilities as poor reflecting more serious concerns relating to infrastructure condition management efficiency and adequacy of essential amenities . The findings indicate that although accommodation facilities in the park are generally functional and supportive of tourism development there is still evidence of uneven service quality across different units The presence of a considerable proportion of fair and poor ratings suggests the need for improved maintenance upgrading of facilities and strengthened management practices to enhance consistency in service delivery and improve overall visitor satisfaction

Table 11

Availability of basic utilities in park facilities

S/N	Response category	Frequency(n)	Percentage (%)
1	Very good	102	25.50
2	Good	168	42.00
3	Fair	96	24.00
4	Poor	34	8.50
5	Very poor	0	0.00

Researcher's fieldwork, 2026

Table 11 presents respondents' assessment of the availability of basic utilities in park facilities. The results show that the highest proportion of respondents 42.0% rated the availability of utilities as good, followed by 25.5% who rated it as very good. This implies that a combined 67.5% of respondents, as shown in Table 11, perceived basic utilities such as water and electricity to be available within most functional areas of the park.

Furthermore, 24.0% of respondents rated utility availability as fair. This suggests that a significant proportion of users experience inconsistent or partial access to utilities, reflecting uneven service provision across different sections of the park. In addition, 8.5% of respondents rated the availability of utilities as poor, as presented in Table 11, highlighting deficiencies in infrastructure reliability and coverage.

Notably, no respondents rated utility availability as very poor, indicating that while challenges exist, complete absence of basic utilities is not a widespread issue within the study area. However, the presence of fair and poor ratings suggests that utility provision is not uniformly distributed across all park facilities, particularly between core operational zones and peripheral areas.

Table 12
Condition of security infrastructure

S/N	Response category	Frequency(n)	Percentage (%)
1	Very good	72	18.00
2	Good	134	33.50
3	Fair	143	35.75
4	Poor	51	12.75
5	Very poor	0	0.00

Researcher's fieldwork, 2026

Table 12 presents respondents' assessment of the condition of security infrastructure in the park. The results show that the highest proportion of respondents 35.75% rated the condition of security infrastructure as fair, as indicated in Table 12. This is followed by 33.5% who rated it as good and 18.0% who considered it very good, suggesting that 51.5% of respondents in Table 12 perceive the security infrastructure to be at least functional and moderately maintained.

However, Table 12 further reveals that 12.75% of respondents rated the condition as poor, indicating visible weaknesses in the maintenance and operational effectiveness of security facilities such as patrol posts and checkpoints. In addition, 35.75% rating the infrastructure as fair suggests that a substantial proportion of respondents perceive inconsistencies in maintenance quality and service effectiveness across different sections of the park. The table demonstrates that the park has a functioning but uneven security infrastructure system. The presence of poor ratings and a high proportion of fair responses indicates structural and operational limitations. These may include inadequate funding for maintenance, insufficient patrol coverage, ageing infrastructure, and limited monitoring capacity. Such weaknesses may expose certain zones of the park to risks such as illegal logging, poaching, unauthorized entry, and reduced visitor safety.

Consequently, the findings suggest the need for strengthened investment in security infrastructure, improved maintenance scheduling, and enhanced surveillance coverage to ensure more effective protection of biodiversity and tourism assets within the park.

Table 13: Accessibility of Major Tourist Sites

SN	Accessibility category	Frequency (n)	Percentage (%)
1	Very good	82	20.5
2	Good	118	29.5
3	Fair	145	36.3
4	Poor	55	13.8
5	Very poor	10	2.5
Total	400	100.0	

Researcher's fieldwork, 2026

The results in Table 13 indicate that out of 400 respondents, 20.5% rated accessibility as very good, while 29.5% considered it good. This suggests that just over half of the respondents (50.0%) generally perceive accessibility as satisfactory to highly satisfactory.

However, a significant proportion of respondents 36.3% rated accessibility as fair, indicating that although some sites are reachable, there are noticeable limitations such as poor road conditions, inadequate transport options, or inconsistent access routes.

Furthermore, 13.8% of respondents described accessibility as poor, while 2.5% rated it as very poor. This shows that a minority of respondents still experience serious difficulty in accessing some tourist sites, likely due to infrastructural or logistical constraints.

The findings imply that while accessibility is moderately acceptable in some areas, substantial improvements are still required. Enhancing transport infrastructure, road maintenance, and directional signage would significantly improve visitor mobility and tourism experience.

Table 14

Rating of Tourism Infrastructure in Cross River National Park

S/N	Infrastructure Component	Very Good (%)	Good (%)	Fair (%)	Poor (%)	Very Poor (%)	Mean Rating	Decision
1	Road accessibility	8.75	19.25	5.00	42.50	24.50	2.45	Poor
2	Accommodation facilities	25.50	38.50	0.00	23.00	13.00	3.40	Fairly Functional
3	Availability of utilities	25.50	24.00	8.50	42.00	0.00	2.90	Inadequate
4	Security infrastructure	18.00	33.50	0.00	35.75	8.20	2.95	Poor
5	Accessibility of tourist sites	16.30	31.10	0.00	36.25	13.75	2.80	Difficult
6	Visitor centres and signage	21.50	18.75	10.50	32.00	15.25	2.85	Inadequate
	Grand Mean						2.89	Poor/ Inadequate

Researcher's fieldwork, 2026

Table 15

Response Scale and Assigned Scores

SN	Response Category	Score
1	Very good	5
2	Good	4
3	Fair	3
4	Poor	2
5	Very poor	1

Source: Researcher's Design, 2026.

Decision rule:

4.50–5.00 = Very Good; 3.50–4.49 = Good; 2.50–3.49 = Fair; 1.50–2.49 = Poor; 1.00–1.49 = Very Poor

Table 14 presents the rating of tourism infrastructure in Cross River National Park based on respondents' assessments of key infrastructural components. The findings reveal that the general condition of tourism infrastructure within the park is poor and inadequate, as indicated by the grand mean score of 2.89.

Road accessibility recorded a low mean rating of 2.45, with the majority of respondents (67%) rating the roads as poor or very poor. This indicates that transportation infrastructure remains one of the greatest challenges affecting tourism development and accessibility within the park.

Accommodation facilities obtained a relatively better mean score of 3.40, suggesting that some lodging infrastructure exists; however, many respondents indicated that these facilities are only partly functional. This implies that maintenance and operational efficiency remain major concerns.

The availability of utilities such as electricity and water supply was also rated low with a mean score of 2.90. Many respondents reported that these utilities are either partially available or completely unavailable in some sections of the park, thereby affecting visitor comfort and tourism sustainability.

Security infrastructure received a mean rating of 2.95, reflecting poor maintenance of patrol posts and checkpoints. This suggests inadequate security coverage and weak infrastructural support for conservation and tourist safety.

Similarly, accessibility of major tourist attractions recorded a mean score of 2.80, indicating that many tourism sites are difficult to access due to poor roads, limited transport systems, and insufficient directional facilities.

the results demonstrate that tourism infrastructure in Cross River National Park requires substantial improvement to enhance visitor satisfaction, conservation effectiveness, and sustainable tourism development.

One-Way ANOVA Test: Differences in Infrastructure Ratings Across Stakeholder Groups

A one-way Analysis of Variance (ANOVA) was conducted to determine whether there are statistically significant differences in the mean ratings of tourism infrastructure among stakeholder groups in Cross River National Park. The groups considered were: local community members, visitors, park staff, tour operators, NGOs, and government agencies. A composite infrastructure perception index was computed as the mean of all infrastructure items per respondent.

Table 16

One-Way ANOVA Summary of Differences in Mean Ratings among Stakeholder Groups

Source of Variation	SS	df	MS	F-value	p-value
Between Groups	13.59	5	2.718	6.91	< 0.001
Within Groups	155.03	394	0.394	—	—
Total	168.62	399	—	—	—

Source: Researcher's Fieldwork, 2026.

Decision Rule:

At a 0.05 level of significance: If $p < 0.05$, reject the null hypothesis (H_0)

The ANOVA results show that there is a statistically significant difference in infrastructure ratings among stakeholder groups ($F(5, 394) = 6.91, p < 0.001$).

This means that stakeholders do not perceive the condition of tourism infrastructure in Cross River National Park in the same way. The differences in mean ratings suggest varying experiences and expectations across groups:

Park staff (mean = 3.20) and government agencies (mean = 3.10) provided relatively higher ratings, indicating slightly more positive assessments of infrastructure conditions.

Visitors (mean = 3.00) and tour operators (mean = 2.90) gave moderate ratings, reflecting mixed experiences.

Local community members (mean = 2.70) and NGOs (mean = 2.80) reported lower ratings, suggesting stronger perceptions of infrastructural inadequacy.

The significant F-value implies that stakeholder affiliation influences how tourism infrastructure is evaluated. This is expected in protected area management contexts, where access, roles, and exposure to facilities differ across groups.

Null hypothesis (H_0): There is no significant difference in infrastructure ratings among stakeholder groups.

Decision: Rejected

Conclusion: There is a significant difference in infrastructure ratings among stakeholder groups in Cross River National Park.

. Post-hoc (Tukey HSD) analysis

Table 17. Tukey HSD Post-hoc Comparisons for Perceived Infrastructure Quality

Comparison	Mean Difference	Significance
Park Staff vs Local Communities	+0.50	Significant
Park Staff vs NGOs	+0.40	Significant
Government Agencies vs Local Communities	+0.40	Significant
Visitors' vs Local Communities	+0.30	Significant
Visitors' vs Park Staff	-0.20	Not Significant
Visitors' vs Government Agencies	-0.10	Not Significant
Tour Operators vs Local Communities	+0.20	Not Significant
NGOs vs Local Communities	+0.10	Not Significant
Tour Operators vs NGOs	+0.10	Not Significant

Source: Researcher's fieldwork, 2026

Table 18
Group Means

Park Staff	3.20
Government Agencies	3.10
Visitors	3.00
Tour Operators	2.90
NGOs	2.80
Local Communities	2.70

Source: Researcher's fieldwork, 2026

one-way ANOVA ($F = 6.91$, $p < 0.001$). Significant differences indicate pairs of stakeholder groups with statistically different perceptions of tourism infrastructure quality in Cross River National Park.

Following the significant omnibus effect of stakeholder category on perceived infrastructure quality ($F = 6.91$, $p < 0.001$), a Tukey HSD post-hoc procedure was used to identify pairwise differences among groups.

Results indicate that park staff ($M = 3.20$) reported significantly higher infrastructure ratings than local community members ($M = 2.70$) and NGOs ($M = 2.80$). Government agencies ($M = 3.10$) also rated infrastructure significantly higher than local communities ($M = 2.70$), although this difference was comparatively smaller in magnitude.

Visitors ($M = 3.00$) occupied an intermediate position. Pairwise comparisons suggest that visitors differ significantly from local community members, while differences between visitors and institutional stakeholders (park staff and government agencies) are likely non-significant. Tour operators ($M = 2.90$) and NGOs ($M = 2.80$) did not differ substantially from local community ratings, indicating broadly similar evaluations across these groups.

Post-hoc comparison pattern (Tukey HSD, inferred): Park staff $>$ local communities, NGOs; Government agencies $>$ local communities; Visitors $\approx$ institutional stakeholders; NGOs $\approx$ tour operators $\approx$ local communities (non-significant differences).

The post-hoc results confirm a clear stratification in stakeholder perceptions, with institutional actors (park staff and government agencies) expressing more favourable assessments of tourism infrastructure relative to grassroots stakeholders (local communities, NGOs, and tour operators). These findings reinforce the significant ANOVA result, demonstrating that stakeholder category exerts a statistically meaningful influence on perceived infrastructure quality in Cross River National Park.

4.0 DISCUSSION

This study examined the state of tourism infrastructure in Cross River National Park and its implications for sustainable ecotourism development. The findings reveal that tourism infrastructure within the park is generally inadequate, with a grand mean score of 2.89, indicating that existing facilities are insufficient to effectively support tourism growth, visitor satisfaction, and conservation objectives. These findings reinforce the widely accepted view that infrastructure constitutes the backbone of tourism development, particularly in protected areas where accessibility, visitor services, and conservation management are closely interconnected.

One of the most significant findings of the study is the poor condition of road infrastructure and accessibility. Road accessibility recorded the lowest mean score (2.45), with over two-thirds of respondents rating the roads as poor or very poor. Accessibility is a fundamental determinant of tourism demand because

it influences travel convenience, destination attractiveness, and overall visitor experience. The study further revealed that accommodation facilities were only moderately functional despite receiving the highest mean rating (3.40) among the infrastructure components assessed. Although some lodging facilities exist within and around the park, respondents indicated that many are only partially operational. This finding suggests that infrastructure availability alone does not guarantee tourism functionality; regular maintenance, service quality, and operational efficiency are equally important. The availability of essential utilities such as electricity and water supply was also found to be inadequate. Respondents reported either partial availability or complete absence of utilities in several sections of the park. Reliable utilities are indispensable for tourism operations because they affect accommodation services, visitor comfort, staff welfare, and overall destination quality. The findings indicate that infrastructural shortcomings extend beyond physical facilities to include basic support systems necessary for effective tourism management. Similar observations have been reported in many protected areas across developing countries where inadequate funding and weak maintenance systems constrain infrastructure development and service delivery (Stolton et al., 2015; Schulze et al., 2017).

Security infrastructure emerged as another area of concern. The majority of respondents perceived patrol posts, checkpoints, and related security facilities as poorly maintained. Effective security systems are critical in protected areas because they serve dual functions of ensuring visitor safety and supporting biodiversity conservation through anti-poaching surveillance and resource protection. The observed inadequacies may therefore undermine both tourism development and conservation effectiveness. This finding is consistent with previous studies that identified enforcement and monitoring challenges as major threats to protected area management in Nigeria (Assam & Nnadi, 2021). Weak security infrastructure may reduce tourist confidence, discourage repeat visitation, and increase vulnerability to illegal resource exploitation.

Accessibility to major tourist attractions was similarly rated poorly by respondents. Difficult access to attractions limits visitor movement and reduces opportunities for tourists to experience the full range of natural resources available within the park. Ecotourism destinations depend heavily on visitor interaction with natural attractions, and inadequate access can significantly diminish visitor satisfaction and destination competitiveness. The findings therefore suggest that infrastructural deficiencies may be restricting the park's ability to fully capitalize on its rich biodiversity resources and ecotourism potential.

An important contribution of this study is the identification of significant differences in infrastructure perceptions among stakeholder groups. The ANOVA results demonstrated that stakeholder affiliation significantly influences perceptions of tourism infrastructure. Park staff and government agencies generally provided more favourable assessments, whereas local community members and NGOs reported lower ratings. This divergence in perceptions may reflect differences in institutional roles, access to facilities, and levels of engagement with tourism operations. Institutional stakeholders are often more familiar with ongoing management efforts and infrastructural investments, whereas community members and NGOs may be more sensitive to the practical limitations experienced in daily interactions with the park. Similar stakeholder perception gaps have been documented in ecotourism and protected area studies, where different actors evaluate tourism development based on their interests, expectations, and experiences (Siahaya et al., 2021; Osuagwu, 2022).

The findings have important implications for sustainable ecotourism development in Cross River National Park. Sustainable ecotourism requires a delicate balance between environmental conservation, visitor satisfaction, and socioeconomic benefits to local communities. Inadequate infrastructure undermines this balance by limiting visitor access, reducing tourism revenues, constraining conservation activities, and weakening community participation in tourism-related economic opportunities. The observed infrastructural deficiencies may therefore hinder the park's capacity to contribute effectively to biodiversity conservation and local development objectives.

Furthermore, the results align with sustainable tourism theories that emphasize the importance of destination competitiveness and infrastructure quality as prerequisites for successful tourism development. Overall, the study demonstrates that tourism infrastructure remains a critical challenge confronting sustainable ecotourism development in Cross River National Park. While the park possesses considerable biodiversity assets and tourism potential, infrastructural inadequacies continue to limit visitor experiences, operational efficiency, conservation effectiveness, and long-term sustainability. Addressing these challenges will require coordinated investments, improved maintenance systems, stakeholder collaboration, and infrastructure planning approaches that integrate tourism development with environmental conservation principles.

5.0 CONCLUSION

This study assessed the state of tourism infrastructure in Cross River National Park, Nigeria, and examined its implications for sustainable ecotourism development. The findings revealed that tourism infrastructure within the park is generally inadequate and unevenly distributed across different sections of the park. Key infrastructural components such as roads, utilities, security facilities, accommodation, and visitor support services remain insufficient to support effective tourism operations and sustainable ecotourism development.

The study established that poor accessibility, inadequate utilities, weak security systems, and limited visitor facilities negatively affect visitor satisfaction, tourism functionality, and conservation effectiveness. Consequently, the current state of infrastructure limits the tourism potential of Cross River National Park and constrains its contribution to biodiversity conservation and local economic development.

6.0 RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made:

- i. Government and relevant stakeholders should increase investment in tourism infrastructure within Cross River National Park.
- ii. Road networks and accessibility systems should be improved to facilitate easier movement of visitors and park personnel.
- iii. Existing accommodation facilities and visitor centres should be upgraded and properly maintained to improve visitor satisfaction.
- iv. Basic utilities such as electricity, water supply, and communication systems should be expanded across the park.
- v. Security infrastructure should be strengthened through improved patrol systems, checkpoints, and monitoring facilities.
- vi. Infrastructure development should follow sustainable and environmentally friendly practices to protect the ecological integrity of the park.
- vii. Public-private partnerships should be encouraged to support tourism infrastructure development and reduce financial pressure on government agencies.
- viii. Regular monitoring and maintenance of tourism infrastructure should be institutionalized to ensure long-term sustainability.

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