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Physical Characteristics of Lakes and their Suitability for Ecotourism Development in Cross River State, Nigeria

Opue, Marydoris Eleagbe.,	A	Department of Hospitality and Tourism Management University of Calabar, Calabar.
Oba, Demitrus O.		
Atemgweye, Gregory Ikashi		
Anake, Clement Bekongfe		

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Correspondence Email:

mexydoris@gmail.com

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Abstract

This study examined the physical characteristics of lakes and their suitability for ecotourism development in Cross River State, Nigeria. Lakes possess significant ecological and aesthetic attributes that can support sustainable tourism and socioeconomic development when properly managed. However, many lakes in Cross River State remain underutilized despite their rich natural resources and tourism potential. The study adopted a descriptive survey research design involving 350 respondents selected from six lake communities: Kwa Falls Lake, Egwebe Lake, Refome Lake, Ejagham Lake, Nkum Apambe Lake, and the Afi River Wetland/Lake System. Data were collected using structured questionnaires and analyzed using frequency, percentages, and Pearson Product Moment Correlation. Findings revealed that the selected lakes possess attractive physical features such as forest vegetation, scenic landscapes, wetlands, biodiversity, and freshwater resources that enhance their ecotourism suitability. The Pearson correlation analysis showed a strong positive relationship between the physical characteristics of lakes and their suitability for ecotourism development ($r = 0.890$, $p < 0.05$). The study also identified poor infrastructure, environmental degradation, and inadequate government support as key factors limiting effective utilization of the lakes for tourism purposes. The study concluded that the physical and ecological qualities of the lakes provide a strong foundation for ecotourism development in Cross River State. It recommended improved infrastructure, environmental conservation, and integrated tourism

	planning to enhance sustainable lake-based ecotourism development.

Introduction

Ecotourism has become an important aspect of sustainable tourism development due to its focus on environmental conservation, cultural preservation, and socioeconomic benefits for local communities. Natural attractions such as forests, mountains, rivers, wetlands, and lakes constitute essential resources for ecotourism development across the world. Lakes are particularly significant because they provide opportunities for recreation, sightseeing, biodiversity conservation, and livelihood support. (Eja et al., 2012; Oba et al., 2018; Imo & Orok, 2019; Atemgweye et al, 2023).

In recent years, there has been increasing recognition of the role of freshwater ecosystems in tourism and rural development. According to UNWTO (2023), lakes and wetland ecosystems contribute significantly to nature-based tourism due to their scenic landscapes and ecological diversity. Lakes surrounded by forests and biodiversity-rich environments often attract tourists interested in recreational and ecological experiences. Lakes differ from rivers due to their relatively stable water volume and spatial confinement, which allow them to serve as reservoirs of both ecological and economic value (Abubakar & Nwankwo, 2021).

Cross River State is one of Nigeria's most environmentally rich states, possessing extensive rainforest ecosystems, wetlands, waterfalls, and freshwater bodies. Lakes such as Kwa Falls Lake, Egwebe Lake, Refome Lake, Ejagham Lake, Nkum Apambe Lake, and the Afi River Wetland System exhibit significant natural and scenic features capable of supporting ecotourism development. A study by Oba, Abang and Ambe, (2018). Showed that lakes in cross river poses a great potential that can be enhance their marketing assets if well harnessed tracing that in all ramification, the vegetation, wildlife and aquatic life, size all joint together to make them worth developing immediately, this will in no small measure raise the economic status of the state. Despite these resources, many lakes in the state remain poorly developed and underutilized for tourism purposes.

The suitability of lakes for ecotourism development depends largely on their physical characteristics, including accessibility, biodiversity, scenic beauty, water quality, vegetation cover, and environmental stability. Where these features are properly managed and supported with adequate infrastructure, lakes can become major tourism destinations capable of generating employment, revenue, and environmental awareness.

This study therefore examines the physical characteristics of selected lakes in Cross River State and their suitability for ecotourism development.

Objectives of the Study

The main objective of the study was to examine the physical characteristics of lakes and their suitability for ecotourism development in Cross River State.

The specific objectives were to:

1. Identify the major physical characteristics of selected lakes in Cross River State.

2. Assess the suitability of the lakes for ecotourism development.
3. Examine the relationship between physical lake characteristics and ecotourism potential.
4. Identify environmental and infrastructural factors affecting lake utilization.

Literature Review

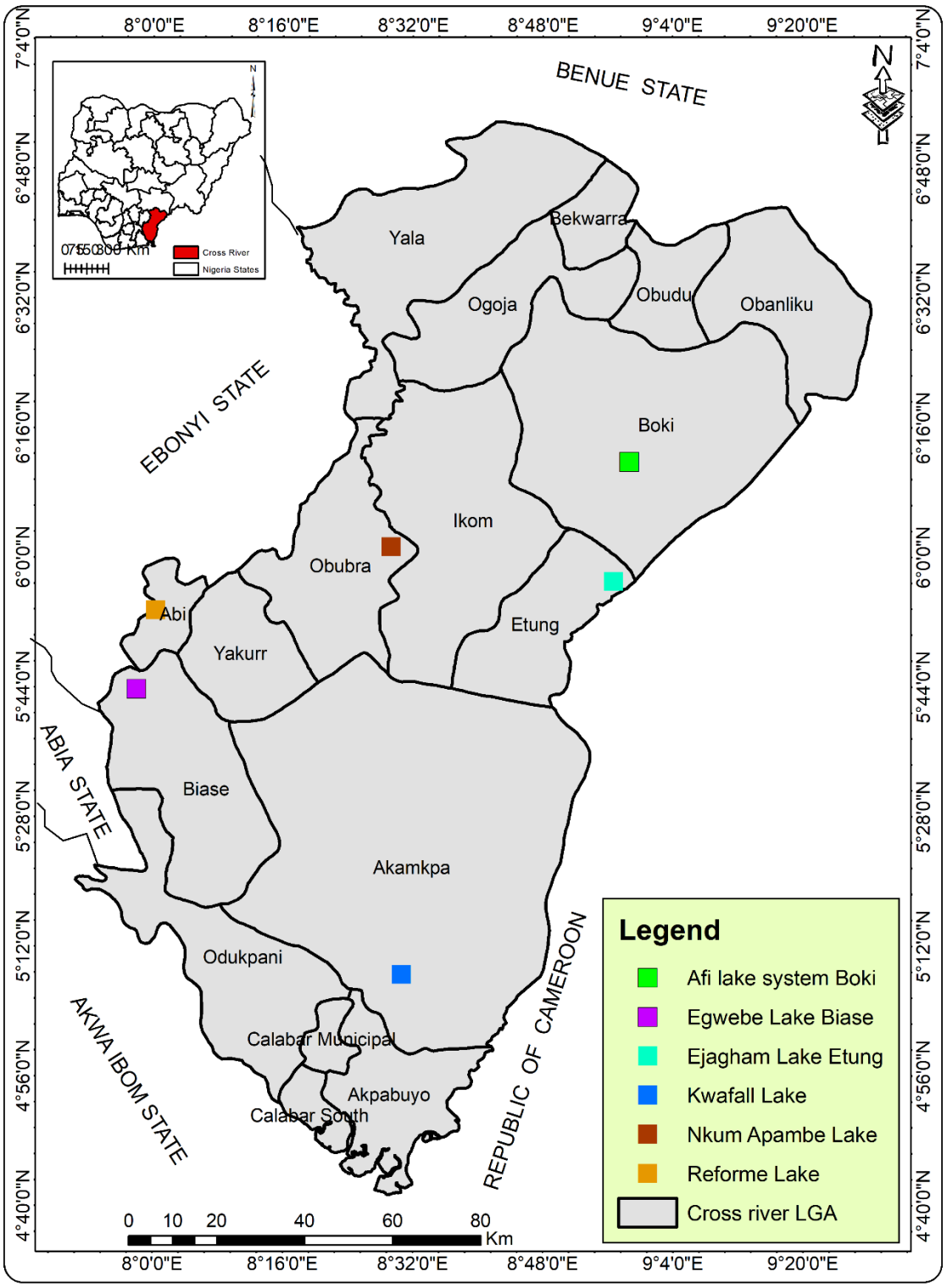
The physical characteristics of natural attractions play a critical role in determining their tourism value and sustainability. According to UNEP (2022), freshwater ecosystems become suitable for ecotourism when they possess environmental quality, biodiversity richness, and scenic appeal capable of attracting visitors. Study by UNWTO (2023) emphasized that lakes surrounded by natural vegetation and wildlife habitats offer important recreational opportunities such as boating, sightseeing, bird watching, and ecological research. The study further noted that accessibility and environmental protection are important determinants of tourism viability.

According to IUCN (2020), biodiversity and ecosystem integrity are essential components of successful ecotourism destinations. Lakes located within protected or forested environments tend to attract more ecotourists due to their ecological uniqueness and natural beauty. Again, OECD (2022) observed that poor infrastructure and weak environmental management reduce the tourism competitiveness of natural destinations in developing countries. Accessibility through road networks and availability of accommodation facilities significantly influence tourist visitation. Recent studies in Nigeria have shown that many freshwater resources remain underdeveloped despite their tourism potential. Nwokorie and Obiora (2023) argued that inadequate investment, poor policy implementation, and environmental degradation continue to limit tourism development across many ecological sites in Nigeria.

The Sustainable Development Theory provides the theoretical framework for this study. The theory emphasizes balancing environmental conservation with economic and social development to ensure long-term sustainability (WCED, 1987). In ecotourism development, sustainable utilization of natural resources such as lakes requires integrated planning and environmental management. Ajake et al. (2023) observed that although Cross River State possesses numerous lakes with high aesthetic value, their remote locations and poor access roads reduce their attractiveness for tourism investment. Lakes with scenic landscapes, biodiversity richness, accessibility, and favorable climatic conditions are more likely to attract ecotourists (Fagence, 2018; Ramsar Convention Secretariat, 2010).

Materials and Methods

The study adopted a descriptive survey research design. The study area consisted of six selected lakes in Cross River State, namely Kwa Falls Lake (Akamkpa LGA), Egwebe Lake (Biase LGA), Refome Lake (Abi LGA), Ejagham Lake (Etung LGA), Nkum Apambe Lake (Obubra LGA), and the Afi River Wetland/Lake System (Boki LGA).



CROSS RIVER STATE LGAs' MAP SHOWING SOME SELECTED LAKES

Source: Department of geography and environmental science, University of Calabar, (2025).

A sample size of 350 respondents was selected from the lake communities using purposive and simple random sampling techniques. Primary data were collected through structured questionnaires administered to residents within the selected communities. The questionnaire focused on lake characteristics, accessibility, biodiversity, scenic value, tourism suitability, and environmental challenges. Data were analyzed using descriptive statistics such as frequency and percentages, while Pearson Product Moment Correlation was used to test the hypothesis regarding the relationship between physical characteristics and ecotourism development.

Results

Demographic Characteristics of Respondents

Figure 2 presents the distribution of respondents by sex. The results indicate that 187 respondents (53.4%) were male, while 163 respondents (46.6%) were female. This distribution shows a slight dominance of male respondents in the study area. The implication of this finding may be associated with the fact that lake-related activities such as fishing, transportation, and other outdoor economic engagements are traditionally male-dominated in many rural communities. However, the relatively balanced representation of both male and female respondents enhances the credibility of the study, as it reflects inclusiveness and allows for diverse perspectives regarding lake utilization and ecotourism development.

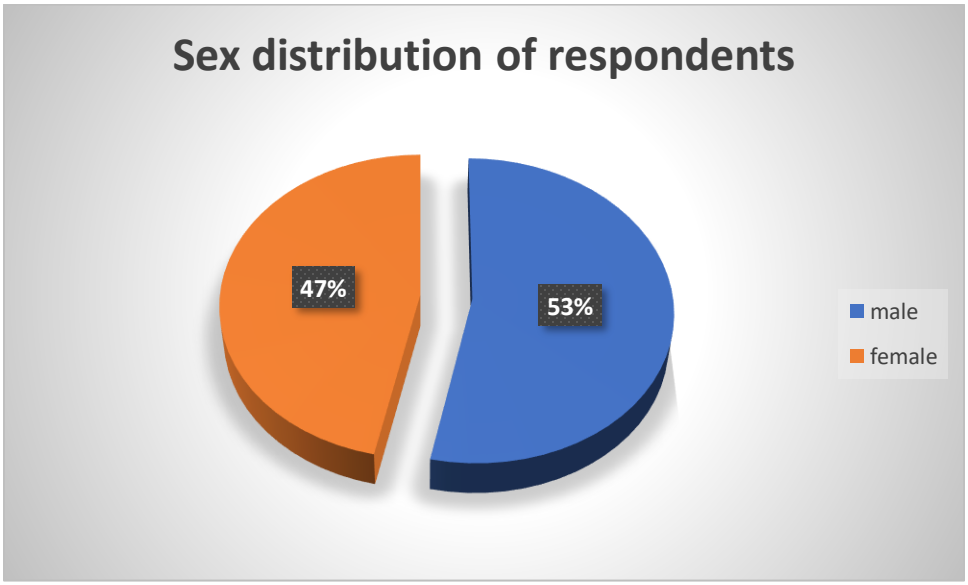


FIG.2: Sex distribution of respondents

Source: Researcher's fieldwork, 2026

Table 1 shows that the majority of respondents fall within the economically active age brackets. Specifically, 103 respondents (29.4%) were aged 21–30 years, and 91 respondents

(26.0%) were between 31–40 years. Additionally, 67 respondents (19.1%) were aged 41–50 years, while 45 respondents (12.9%) were 51 years and above. Only 44 respondents (12.6%) were below 20 years. This distribution indicates that a significant proportion of respondents are within the productive and economically active population. The dominance of respondents within the 21–40 age range suggests a strong potential labor force that could actively participate in lake-based ecotourism development initiatives. The presence of older respondents also provides valuable indigenous knowledge and long-term experience regarding lake use and community resource management.

Table 1: Age Distribution of Respondents

Age Group	**Frequency**	**Percentage (%)**
Below 20	44	12.6
21–30	103	29.4
31–40	91	26.0
41–50	67	19.1
51 years and above	45	12.9
Total	**350**	**100.0**

Source: Researchers' fieldwork, (2026).

Figure 3 indicates that 135 respondents (38.6%) had secondary education, 84 respondents (24.0%) had primary education, and 72 respondents (20.6%) had tertiary education, while 59 respondents (16.9%) had no formal education. The data show that a considerable proportion of respondents possess at least basic educational qualifications. The relatively high percentage of respondents with secondary and tertiary education suggests a moderate level of literacy within the study communities. This level of education may positively influence awareness, understanding, and adoption of ecotourism initiatives. Education is often associated with greater environmental awareness and openness to sustainable development strategies. However, the presence of respondents without formal education underscores the need for community sensitization and capacity-building programs if lake-based ecotourism development is to be effectively implemented.

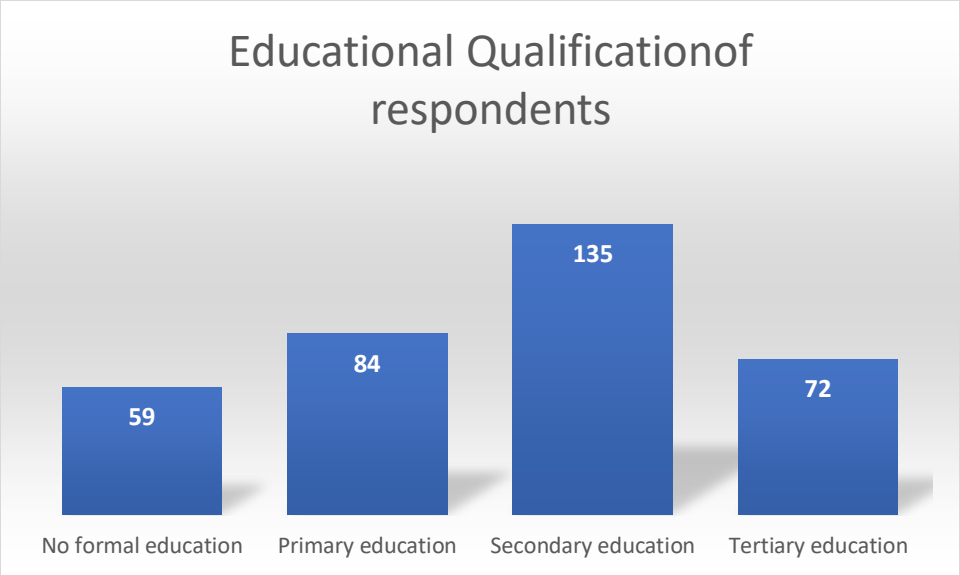


FIG. 3: Educational Qualification

Physical characteristics of lakes and ecotourism development

Table 2 presents the natural features identified by respondents around the lake. The findings indicate that forest vegetation is the most prominent feature, reported by 219 respondents (62.6%). This is followed by scenic landscapes, identified by 168 respondents (48.0%), and wildlife presence, reported by 141 respondents (40.3%). Wetlands account for 97 respondents (27.7%), while a small proportion of 18 respondents (5.1%) indicated the absence of notable natural features. The predominance of forest vegetation suggests that the lake is situated within a rich ecological environment characterized by dense plant cover. Such environments are essential for biodiversity conservation and provide a suitable setting for nature-based tourism activities. The high proportion of respondents identifying scenic landscapes further emphasizes the aesthetic appeal of the lake, which is a critical factor in attracting tourists.

Table 2: Natural Features around the Lake

Natural Feature	**Frequency**	**Percentage (%)**
Forest vegetation	219	62.6
Wildlife	141	40.3
Scenic landscape	168	48.0
Wetlands	97	27.7
None	18	5.1

Source: Researchers' fieldwork, (2026).

Table 3: physical characteristics for Ecotourism development

S/N	Name of Lake	Local Government Area (LGA)	Unique Features	Reasons for Ecotourism Development
1	Kwa Falls Lake (Kwa River Basin)	Akamkpa	Located within tropical rainforest; scenic waterfall and river system; rich biodiversity	Scenic landscape suitable for sightseeing, photography, eco-lodges, hiking, and nature-based tourism
2	Agbokim Waterfalls Lake Basin	Etung	Series of cascading waterfalls surrounded by forest; cross-border ecological landscape	High aesthetic value; potential for adventure tourism, bird watching, and eco-recreation
3	Refome Lake	Abi	The lake is surrounded by dense mangrove vegetation and floodplains	Potential for community-based ecotourism, fishing tourism, and cultural festivals
4	Nkum Apambe Lake	Obubra	Calm freshwater lake with surrounding vegetation and fishing activities	Suitable for boat rides, recreational fishing, and community-managed ecotourism
5	Afi River Wetland/Lake System	Boki	Located near Afi Mountain Wildlife Sanctuary; rich wildlife including primates	Strong ecotourism potential due to wildlife sanctuary proximity; eco-education and conservation tourism
6	Egwebe Lake	Biase	The lake lies within high rainforest terrain with rich biodiversity	Rich flora and fauna; ideal for eco-trails, biodiversity conservation tourism

Source: Researchers' fieldwork, (2026).

Table 4 presents correlation result. Most respondents indicated that the lakes possess attractive environmental qualities capable of supporting tourism development. The Pearson Product Moment Correlation analysis showed a strong positive relationship between physical characteristics of lakes and ecotourism potential ($r = 0.890$, $p < 0.05$). Based on this result, the null hypothesis (H_0) was rejected, while the alternative hypothesis (H_1) was accepted, indicating that a significant relationship exists between the physical characteristics of lakes and their suitability for ecotourism development in Cross River State. This finding implies that the sustainability and attractiveness of lakes as ecotourism destinations largely depend on their physical condition. Therefore, efforts aimed at environmental conservation, pollution control, and infrastructure improvement is essential for enhancing the ecotourism potential of lakes and ensuring long-term socioeconomic benefits.

Table 4: relationship between the physical characteristics of lakes and their suitability for ecotourism development

Correlations

		Potential for ecotourism development	Physical Condition of Lake
Potential for ecotourism development	Pearson Correlation	1	.890**
	Sig. (2-tailed)		.000
	N	350	350
Physical Condition of Lake	Pearson Correlation	.890**	1
	Sig. (2-tailed)	.000	
	N	350	350

**. Correlation is significant at the 0.01 level (2-tailed).

The study also identified major constraints affecting lake utilization, including environmental degradation, poor road networks, inadequate infrastructure, and limited government support. The ANOVA result presented in Table 4.34 examines the influence of challenges associated with lake-based ecotourism development on the utilization of lakes for ecotourism in Cross River State. The analysis shows a between-group sum of squares of 525.597 and a within-group sum of squares of 21.820, with degrees of freedom of 5 and 344 respectively. The computed F-value is 1657.209, with a significance level (p-value) of 0.000. This indicates that there are statistically significant differences among the identified challenges in relation to their influence on lake utilization. Based on the decision rule, since the p-value (0.000) is less than the significance level of 0.05, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted. This implies that the challenges associated with lake-based ecotourism development have a significant influence on the utilization of lakes for ecotourism. The finding suggests that factors such as environmental degradation, infrastructure deficiencies, lack of funding, and poor management play a critical role in limiting effective utilization.

Discussion

The findings indicate that the selected lakes possess important ecological and scenic features suitable for ecotourism development. This agrees with UNEP (2022), which emphasized that environmental quality and biodiversity are major determinants of ecotourism attractiveness.

The strong positive relationship between lake characteristics and ecotourism potential supports the findings of UNWTO (2023), which observed that lakes with scenic landscapes and ecological diversity attract higher tourism interest.

The study also found that inadequate infrastructure and environmental challenges limit effective tourism utilization. This aligns with OECD (2022), which argued that poor accessibility and weak environmental management reduce destination competitiveness.

The findings further demonstrate that sustainable management and conservation are essential for maintaining the ecological value of lake ecosystems. Similar observations were made by IUCN (2020), which emphasized that conservation supports long-term tourism sustainability.

Overall, the study confirms that the lakes in Cross River State possess substantial but underutilized ecotourism potential.

Conclusion

The study concluded that the physical characteristics of lakes in Cross River State significantly influence their suitability for ecotourism development. The selected lakes possess attractive environmental features including biodiversity, scenic landscapes, wetlands, and forest vegetation capable of supporting sustainable tourism development. However, environmental degradation, inadequate infrastructure, and poor institutional support continue to hinder effective utilization of these resources. Sustainable management and strategic investment are therefore necessary for transforming the lakes into viable ecotourism destinations.

Recommendations

1. Government should improve road networks and tourism infrastructure around lake communities.
2. Environmental conservation programs should be strengthened to protect lake ecosystems.
3. Local communities should be actively involved in tourism planning and environmental management.
4. Private sector investment in ecotourism facilities should be encouraged.
5. Awareness campaigns should be organized to promote lake-based ecotourism opportunities.

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