

Ecotourism Potentials Assessment of Farin Ruwa Waterfall and its Implications for Sustainable Development in Wamba Local Government Area, Nasarawa State

Yunana-Solomon Happy Numtimai¹, Sunday Yusuf Kpalo², Muhammad Yaro Jibrin³

^{1&3}Department of Urban and Regional Planning, Nasarawa State University, Keffi, Nigeria.

²Department of Geography, Nasarawa State University, Keffi, Nigeria.

*Corresponding Author: Yunana-Solomon Happy Numtimai

DOI: <https://doi.org/10.5281/zenodo.23478297>

Article History	Abstract	
Original Research Article	<i>Tourism is one of the fastest-growing sectors globally, contributing significantly to economic diversification, employment creation, and community development. Ecotourism, in particular, has emerged as a sustainable development approach that promotes environmental conservation while enhancing local livelihoods. Despite Nigeria's abundant natural and cultural resources, many ecotourism destinations remain underdeveloped due to inadequate infrastructure, weak planning frameworks, limited community participation, and poor policy implementation. Farin Ruwa Waterfall in Wamba Local Government Area of Nasarawa State typifies this challenge, as its vast ecological and cultural assets remain largely untapped. This study assessed the ecotourism potentials of Farin Ruwa Waterfall and examined its implications for sustainable development in Wamba Local Government Area through the identification of natural and cultural tourism attractions at Farin Ruwa Fall and identification of potential tourism products that can be developed at the Waterfall. The study adopted a cross-sectional research design using both qualitative and quantitative methods. Data were obtained through reconnaissance surveys and structured questionnaires administered to tourists and local residents, and analyzed using descriptive statistical techniques. Findings reveal that Farin Ruwa Waterfall possesses exceptional scenic, recreational, scientific, and biodiversity values, complemented by rich cultural traditions and strong community support for ecotourism development. However, poor access roads, inadequate visitor facilities, weak basic services, and limited institutional management were identified as major constraints. The study concludes that Farin Ruwa Waterfall has high ecotourism potential but requires deliberate planning, infrastructure improvement, and community-based management. It recommends integrated planning, conservation strategies, community participation, and supportive policies to promote sustainable tourism development in Nasarawa State.</i>	
Received: 20-08-2026		
Accepted: 25-09-2026		
Published: 19-10-2026		
Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.		
Citation: Yunana-Solomon Happy Numtimai, Sunday Yusuf Kpalo, & Muhammad Yaro Jibrin. (2026). Ecotourism potentials assessment of Farin Ruwa Waterfall and its implications for sustainable development in Wamba Local Government Area, Nasarawa State. UKR Journal of Multidisciplinary Studies, 2(10), 33-39.		

Keywords: Ecotourism, Sustainable Development, Tourism Planning, Farin Ruwa Waterfall, Wamba LGA, Nasarawa State.

Introduction

Tourism is widely acknowledged as a key contributor to economic prosperity, environmental stewardship, and socio-cultural enrichment in regions across the world (Ijatuyi, Yessoufou & Patrick, 2025). In response to growing concerns about the environmental and social impacts of conventional mass tourism, sustainable alternatives such as ecotourism have gained prominence. Ecotourism emphasizes conservation of natural

ecosystems, responsible visitor behavior, and meaningful engagement of host communities in tourism decision-making (Aniramu, 2025). Within the context of spatial planning and development, ecotourism has emerged as a strategic approach to harnessing natural attractions while safeguarding ecological integrity.

Ecotourism is recognized for its potential to contribute to balanced regional and rural development by expanding

economic opportunities, enhancing local infrastructure, and stimulating community participation in environmental conservation (Nkanu Onnoghen, 2025). The deliberate integration of ecotourism development into policy frameworks can help redistribute development attention beyond major urban centers to rural and peripheral areas. This approach supports inclusive growth by strengthening rural economies and improving access to basic services, which aligns with broader sustainable development objectives (Ijatuyi, 2025).

In Nigeria, tourism has been identified as a promising sector for economic diversification and job creation in the face of fluctuating oil revenues. Recent studies on Nigerian eco-destinations highlight both the opportunities and the challenges inherent in developing ecotourism as a sustainable economic sector (Aniramu et al., 2025). The country's natural endowments, including waterfalls, forests and wildlife reserves, present significant potential for ecotourism growth, but many sites remain underdeveloped due to limited planning attention, inadequate infrastructure, and weak stakeholder coordination. This situation underscores the importance of empirical planning research to support evidence-based decision making and sustainable tourism practices (Aniramu et al., 2025).

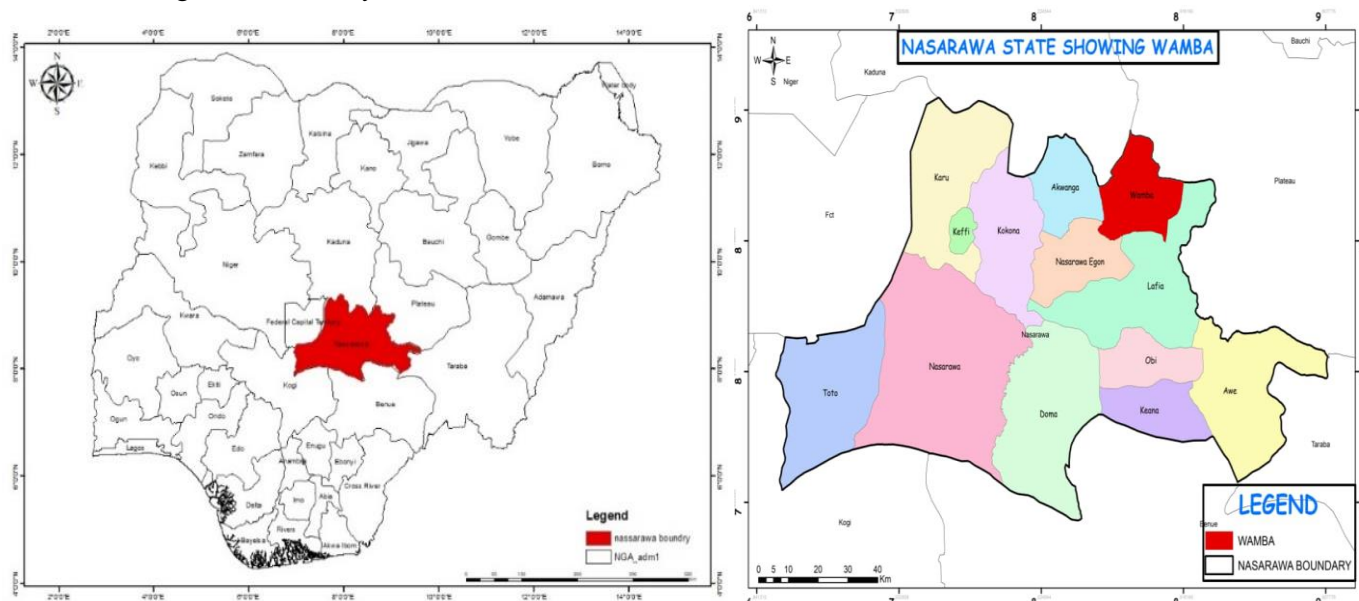
Farin Ruwa Waterfall, located in Wamba Local Government Area of Nasarawa State, is one of Nigeria's most remarkable natural attractions with high ecotourism potentials. Despite its aesthetic and ecological appeal, the site's contribution to local development has been constrained by challenges such as poor access, insufficient visitor facilities, and lack of integration with regional development plans. These constraints highlight a pressing need for systematic assessment of the waterfall's ecotourism potentials within a planning and sustainability framework that aligns with Nigeria's broader economic and environmental goals. This study assesses the ecotourism

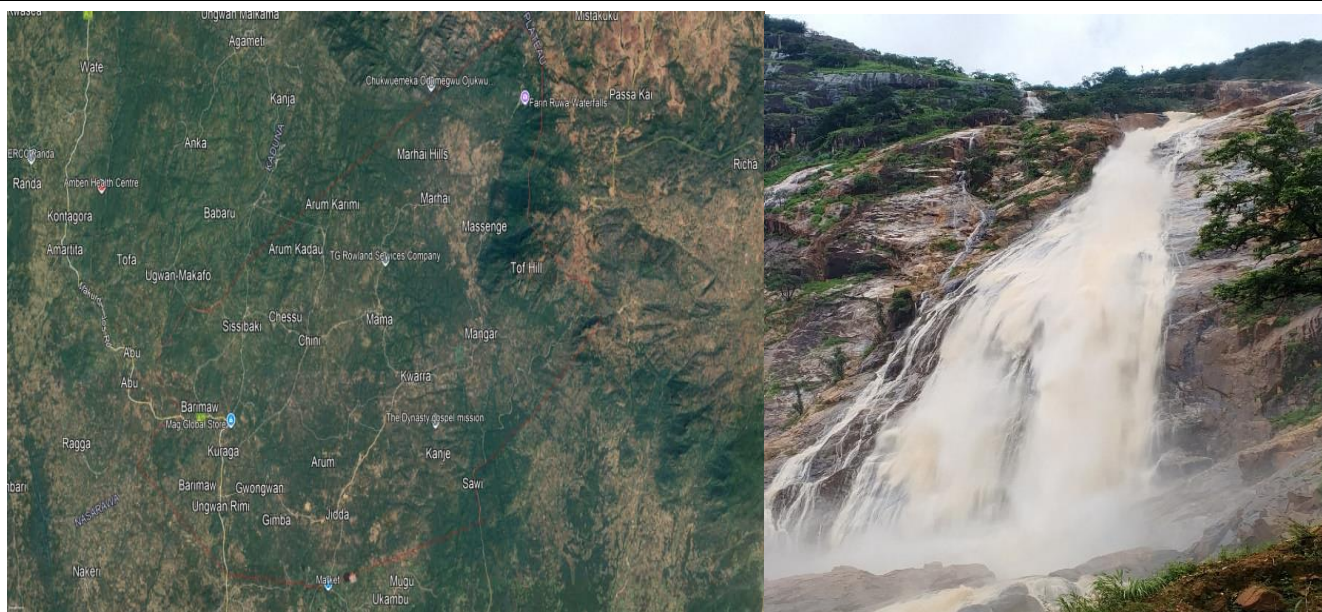
potentials of Farin Ruwa Waterfall in Wamba LGA of Nasarawa State, with the aim of identifying its development prospects by identifying the natural and cultural tourism attractions and potential tourism products that can be developed at the Waterfall. The study contributes to planning knowledge on sustainable tourism development and offers insights for policy makers, planners, and stakeholders in designing effective strategies for ecotourism-based regional growth.

Study Area

Wamba Local Government Area (LGA) is one of the thirteen Local Government Areas in Nasarawa State, located in the North-Central geopolitical zone of Nigeria. The LGA has its administrative headquarters in Wamba town and lies approximately at latitude 8°56'N and longitude 8°36'E. It occupies a strategic position within the state and is situated close to notable natural attractions, including the Farin Ruwa Waterfall. Wamba is bounded by Akwanga and Nasarawa Eggon LGAs and is accessible through a network of rural roads that link it with major towns within Nasarawa State and neighboring Plateau State.

The total land area of Wamba LGA is approximately 1,156 square kilometres, characterized by undulating terrain, hills, and rocky outcrops typical of the central Nigerian highland environment. The population of the area was 72,894 according to the 2006 National Population Census, with steady growth projected in recent years. The LGA consists of several towns and settlements including Wamba, Mama, Yashi, Nakere, Kado, Wuji, Konwah, Ragga, and Sisinbaki, among others. The area also operates under traditional administrative structures within the Wamba Emirate system, which plays an important role in local governance and community organization.





Land use in Wamba is predominantly agricultural, reflecting its rural and agrarian character. The majority of the population engages in subsistence and small-scale farming, cultivating crops such as cassava, maize, rice, sorghum, and legumes, alongside tree crops like palm produce and cashew. Trading activities are also significant, supported by periodic markets such as the Wamba Central Market. In addition to agriculture, the area is endowed with mineral resources including barite, columbite, tantalite, and gemstones, although these remain largely underexploited.

The vegetation of the area falls within the Guinea Savannah ecological zone, consisting of grasses interspersed with scattered trees such as locust bean, shea butter, and mahogany. The physical environment is partly mountainous and rocky, with fertile soils suitable for agricultural production. The climate is tropical, characterized by two distinct seasons: a rainy season from March to October and a dry season from November to February, influenced by the Harmattan winds. The mean annual temperature is relatively high, averaging about 31°C, with March typically being the hottest month and August the coolest.

In terms of infrastructure and socio-economic characteristics, Wamba LGA is semi-rural with limited but developing social amenities such as primary and secondary schools, healthcare facilities, and rural road networks. The population is ethnically diverse, comprising groups such as Hasha, Eggon, Kulere, Arum, Ninzom, and other minority communities, with Christianity and Islam as the dominant religions. Economic activities revolve around farming, petty trading, transportation, and local crafts. The surrounding settlements and rural communities serve as the primary host environment for tourism resources such as Farin Ruwa Waterfall, making the area significant for ecotourism development and regional planning interventions.

Methodology

This section discussed the type and source of data including methods involved in acquisition of data for the study. It also discusses the statistical technique employed to analyze the data collected.

Research Design

This study adopted a cross-sectional survey design, which involved the collection of data from respondents at a single point in time using both quantitative and qualitative approaches. The design was considered appropriate because it enabled checklist the natural and cultural tourism attractions and identify potential development products at the Waterfall. A reconnaissance survey of the study area was conducted prior to the main fieldwork. This preliminary field visit provided firsthand knowledge of the physical characteristics of the site, accessibility conditions, settlement structure, and existing tourism activities. The reconnaissance also guided the identification of relevant variables and the design of the survey instrument.

Population of the Study

The population of Wamba Local Government Area was 72,894 according to the 2006 National Population Census. Using an annual national growth rate of 3.83%, the population was projected to 148,876 for the year 2025 using the exponential growth model:

$$P_o = P_t(1 + r/100)^t$$

Where:

P_o = Projected population

P_t = Base population (2006)

r = Annual growth rate (3.83%)

t = Number of years

The population was further projected to 216,533 for the year 2035. However, for the purpose of this study, the

sampling frame was limited to households in the two host communities of Massenge (2,225 households) and Marhai (1,376 households), giving a total of 3,601 households.

Sample Size

The sample size for the study was determined using the Yamane (1967) formula, which is widely used for finite populations:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

n = Sample size

N = Population size (3,601 households)

e = Level of precision (0.05)

$$n = \frac{3601}{1 + 3601(0.0025)} = \frac{3601}{10.0025} \approx 360$$

Accordingly, a total of 360 questionnaires were administered for the study.

Sampling Technique

A simple random sampling technique was adopted to ensure that each household had an equal chance of being selected, thereby minimizing sampling bias. The sample was proportionately distributed between the two host communities, with 222 questionnaires administered in Massenge and 138 questionnaires in Marhai.

Sources of Data

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

Primary Data

Primary data were collected through the administration of structured questionnaires to residents of the host communities and visitors to the ecotourism destination. The questionnaire captured information on socio-economic characteristics, tourism experiences, ecotourism potentials etc.

Secondary Data

Secondary data were obtained from existing literature and institutional sources. These included textbooks, journal articles, previous research on ecotourism, tourism development reports, maps, and tourism promotional materials such as guidebooks and tourist maps.

Methods of Data Collection

Questionnaire Survey

A structured questionnaire was used to collect data on:

- Socio-economic and demographic characteristics of respondents
- Available natural and cultural attractions
- Existing ecotourism products and activities
- Perceived ecotourism development potentials

Spatial Mapping

Spatial data were processed and analyzed using ArcGIS to produce maps showing the location of the study area.

Method of Data Analysis

Data obtained from the field survey were analyzed using descriptive statistical techniques, including frequency distribution, percentages, tables, and graphical illustrations. These methods were used to summarize respondents' characteristics, available natural and cultural attractions, perceived ecotourism development potentials.

Results and Discussion

This section analyses the study's findings and discusses their implications for sustainable ecotourism development at Farin Ruwa Waterfall.

Socio-demographic Characteristics of Respondents

This contains the socio-demographic characteristics of the respondents in terms of sex, age, occupation, educational level and duration of residence at the study area.

Table 1: Socio-Demographic Characteristics of Respondents (n = 360)

The socio-demographic profile of the 360 respondents indicates a slightly higher proportion of males (55.6%) than females (44.4%), suggesting a balanced representation of gender. The majority of respondents were within the 31–50 years age group (44.4%), followed by 18–30 years (33.3%), indicating that most participants were in the economically active age range. In terms of occupation, farming (38.9%) and trading (25.0%) dominated, reflecting the agrarian and commercial nature of the host communities, while civil servants, students, and artisans constituted smaller proportions. Educationally, most respondents had attained secondary (41.7%) or tertiary (25.0%) education, while 33.3% had primary or no formal education, highlighting moderate literacy levels in the area. A significant proportion of respondents (61.1%) had resided in the community for over 10 years, indicating a stable population with strong local knowledge of the ecotourism site, whereas 38.9% had lived in the community for less than 10 years. Overall, these characteristics suggest that the sampled population is experienced, economically active, and well-placed to provide reliable information on the ecotourism potentials of Farin Ruwa Waterfall.

Variable	Category	Frequency	Percentage (%)
Sex	Male	200	55.6
	Female	160	44.4
Age Group (years)	18–30	120	33.3
	31–50	160	44.4
	51 and above	80	22.3
Occupation	Farmers	140	38.9
	Traders	90	25.0
	Civil Servants	70	19.4
	Students	40	11.1
	Artisans	20	5.6
Educational Level	No formal education	40	11.1
	Primary	80	22.2
	Secondary	150	41.7
	Tertiary	90	25.0
Duration of Residence (years)	Less than 5	50	13.9
	5–10	90	25.0
	Over 10	220	61.1

Table 2: Natural Attractions (Geomorphological Features) of Farin Ruwa Fall

The geomorphological characteristics of Farin Ruwa Waterfall highlight its strong potential as a prime ecotourism destination due to its outstanding natural features and landscape diversity. The impressive height of about 150 meters, wide water spread, and seasonal variations in water volume create a striking scenic environment capable of attracting both local and

international visitors seeking nature-based recreation and adventure. The presence of secondary cascades, natural pools, rock terraces, and panoramic viewpoints further enhances the range of ecotourism activities such as hiking, sightseeing, photography, and educational tours. In addition, the granite and basaltic rock formations shaped through long-term geological processes provide opportunities for scientific study and environmental education, thereby increasing the site’s value for research, conservation awareness, and leisure.

Geomorphological Feature	Description	Remark
Height of Main Waterfall	Approximately 150 meters high	One of the highest waterfalls in West Africa; provides spectacular vertical drop
Width of Main Waterfall	Around 50–60 meters wide during peak rainy season	Width decreases during dry season due to reduced water volume
Presence of Secondary Cascades	2–3 smaller cascades downstream	Found along the river course, forming scenic views and natural pools
Unique Rock Formations	Granite and basaltic outcrops forming steep cliffs and boulders	Rock layers display erosion patterns and columnar structures
River Channel Morphology	Meandering stream with plunge pool at the base	Evident erosion and sediment deposition downstream
Vegetation Cover around Falls	Dense tropical vegetation with tall trees and shrubs	Provides natural shade and enhances scenic beauty

Table 3: Cultural Attractions (Tangible Heritage)

The tangible cultural heritage around Farin Ruwa Waterfall reflects the long-standing historical presence and cultural identity of the Gwandara people. Ancient settlements, traditional routes, and historical remains indicate strong

human–environment relationships and patterns of past habitation. These features provide important insights into indigenous lifestyles, migration, and settlement history. Consequently, they enhance the site’s tourism value by presenting Farin Ruwa as a cultural landscape that preserves local heritage and indigenous knowledge.

Tangible Heritage	Description/Features	Remark
Historical Sites (Old Settlements)	Remains of early Gwandara settlements located near the falls	Visible traces of ancient homesteads and traditional pathways
Traditional Architecture	Mud and thatch structures, with decorative motifs and circular layouts	Common in nearby villages, symbolizing indigenous architectural styles
Artifacts	Tools, pottery, and traditional hunting implements found around the area	Some preserved in local households as symbols of heritage
Sacred Sites	Specific areas regarded as spiritually significant near the waterfall	Access restricted to certain rituals and elders

Table 4: Cultural Attractions (Intangible Heritage) of Farin Ruwa Fall

The intangible cultural heritage of the Farin Ruwa area represents an important component of its overall ecotourism value by preserving and showcasing the living traditions of the host community. Cultural festivals associated with water spirits, harvest periods, and ancestral reverence strengthen social cohesion and sustain intergenerational knowledge transfer within the

community. These events create opportunities for cultural performances, traditional cuisine, music, and storytelling, thereby offering visitors authentic cultural experiences beyond the natural attraction of the waterfall. As a result, the presence of vibrant rituals, oral traditions, and artistic expressions enhances the identity of Farin Ruwa as a dynamic cultural landscape, increasing its attractiveness and competitiveness as a culturally enriched ecotourism destination.

Intangible Heritage	Description/Features	Remark
Local Festivals	Annual festivals celebrating water, harvest, and ancestral spirits	Attracts visitors and strengthens community bonds
Folklore and Myths	Legends surrounding the origin of the waterfall and its spiritual guardian	Passed down orally across generations
Traditional Music and Dance	Indigenous drumming, flutes, and dances performed during festivals and ceremonies	Integral part of communal celebrations
Traditional Beliefs and Rituals	Rituals performed for rain, fertility, and protection	Conducted by custodians of local shrines

Potential Tourism development Products

Farin Ruwa Waterfall offers diverse tourism product potentials that support sustainable ecotourism through both nature-based and cultural experiences. Activity-oriented options such as hiking, bird watching, camping, and photography can attract adventure seekers and nature enthusiasts. Experience-based products including cultural festivals, guided tours, storytelling, homestays, and local cuisine can further enrich visitor experience while encouraging community involvement. When properly planned and managed, these products can enhance environmental conservation, stimulate local livelihoods, and ensure long-term tourism sustainability.

Table 5: Ecotourism Potentials at Farin Ruwa Waterfall

The findings indicate that Farin Ruwa Waterfall possesses strong potential for both activity-based and experience-based ecotourism development due to its rich natural and

cultural resources. Nature-oriented activities such as hiking, bird watching, camping, and photography recorded high to very high potential, reflecting the area's rugged terrain, dense vegetation, scenic landscapes, and overall environmental quality, while rock climbing and swimming showed moderate potential due to the need for safety provisions and proper management. In addition, cultural and community-based experiences including festivals, guided nature walks, local cuisine, and environmental education demonstrated high potential, highlighting the cultural vitality and biodiversity value of the area, whereas homestays and storytelling showed moderate to high potential, indicating community readiness and the availability of indigenous knowledge. Overall, the results reveal a well-balanced mix of natural and socio-cultural assets capable of supporting sustainable, community-based ecotourism if supported by adequate planning, infrastructure, and management strategies.

Product Potential	Category	Ecotourism Activity/Product	Resource Basis at Farin Ruwa	Potential Level
Activity-Based	Nature Adventure	Hiking/Trail Walking	Rugged terrain, forest paths, and scenic landscapes around the falls	High
Activity-Based	Wildlife/Nature	Bird Watching	Dense vegetation and diverse habitats supporting bird species	High
Activity-Based	Adventure Tourism	Rock Climbing	Presence of rock formations and steep surfaces near the waterfall	Moderate
Activity-Based	Water-Based Recreation	Swimming (in safe areas)	Natural pools and calm sections of the water downstream	Moderate
Activity-Based	Outdoor Recreation	Camping	Open spaces and natural environment suitable for eco-campsites	High
Activity-Based	Nature Appreciation	Photography	Scenic waterfall, cascades, vegetation, and landscape features	Very High
Experience-Based	Cultural Tourism	Cultural Festivals	Rich local traditions, music, dance, and seasonal cultural events	High
Experience-Based	Community-Based Tourism	Homestays	Willing host communities and strong local attachment to the area	Moderate–High
Experience-Based	Environmental Education	Guided Nature Walks	Presence of unique flora, fauna, and geological features	High
Experience-Based	Cultural Interpretation	Storytelling Sessions	Local myths, history, and indigenous knowledge about the falls	Moderate–High
Experience-Based	Cultural Experience	Local Cuisine Experiences	Traditional foods and local agricultural products	High

Conclusion and Recommendation

The study established that Farin Ruwa Waterfall possesses significant natural and cultural resources capable of supporting sustainable ecotourism development in Wamba LGA. Its scenic landscape, rich biodiversity, and vibrant cultural heritage provide strong prospects for activity-based and community-based tourism, with high community support for its development. However, poor accessibility, inadequate infrastructure, limited basic services, and weak institutional support currently constrain its full potential. Addressing these challenges, coordinated planning, continuous monitoring to ensure sustainable management of the site, investment, and stakeholder collaboration is essential for enhancing its contribution to local economic development, environmental conservation, and livelihood improvement.

References

1. Aniramu, O., Okebugwu, J., Olawale, J., et al. (2025). *Structural equation modelling of tourism development in Nigerian eco-destinations*. Sustainable Earth Reviews.
2. Ijatuyi, E. J., Yessoufou, K., & Patrick, H. O. (2025). *Sustainable tourism and green space: exploring how green spaces contribute to local tourism economies*. Discover Sustainability.
3. Nkanu Onnoghen, U., Ubuh Kujoh, J., Unachukwu, S. S., Ijeoma Orji, E., & Anabaraonye, B. (2025). *Enhancing eco-tourism through eco-volunteerism in Nigeria*. Eco-Tourism and Sustainable Development.