



# The Dynamics of Ecotourism Activities in Some Selected States in Nigeria Using Spaced Technology and Interactive Decision-Making Tool

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**How to cite this paper:** Babamaaji, R.A., Adepoju, M.O., Akinola, O., Seun, A., Karau, S., Eshiet, R.C.I., Tali, D.M., Simon, A.E., Ibrahim, H., Abdulmumin, I., Ezinne, E., Ezekiel, O., Maiwada, S., Binta, A., Fatimah, W., Kehinde, O., Ogbole, J., Magaji, L., Jibrin, A., Onoja, J., Egbe, S., Bassey, A., Priscilla, M., Tijesuni, O., Ali, J. and Goki, N. (2025) The Dynamics of Ecotourism Activities in Some Selected States in Nigeria Using Spaced Technology and Interactive Decision-Making Tool. *Open Access Library Journal*, 12: e12722. <https://doi.org/10.4236/oalib.1112722>

**Received:** November 28, 2024

**Accepted:** February 22, 2025

**Published:** February 25, 2025

## Abstract

Ecotourism is considered the most important cause of employment in the world. In this regard, it is a source for creating jobs and economy for a country by generating finances. Assessing ecotourism resources is crucial for tourism development and designing effective management strategies that balance economic, social, and environmental objectives. This study assesses the current ecotourism sites and factors affecting effective functioning in Nigeria using geospatial techniques for economic diversification. The study was carried out in 13 states of Nigeria, which included 7 northern states and 6 southern states. The northern states were Niger, Federal Capital Territory (FCT), Nasarawa, Plateau, Jigawa and Kano; while the southern states were Oyo, Ogun, Lagos, Ondo, Enugu, and Akwa Ibom. The datasets for this study were sourced from Office of the Surveyor General of the Federation (OSGOF) for Nigeria shape file, administration

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of questionnaire to obtain factors affecting existing ecotourism and GPS coordinates for spatial distribution. Geodatabase was created for the existing ecotourism sites visited during the study and the dashboard was created using Tableau Desktop 2022, which was later hosted online. The study concluded that if the identified factors militating against the management of ecotourism sites could be well addressed in Nigeria, the sector will by no means become viable again and provide valuable information for policymakers, investors, and local communities, helping to guide the development of sustainable and responsible ecotourism in Nigeria.

## Subject Areas

Tourism Economy

## Keywords

Ecotourism, Activities, Dynamics, Space Technology, Interactive Decision, Nigeria

## 1. Introduction

Ecotourism is a rapidly growing industry that has the potential to promote economic diversification and sustainable development in many regions around the world. It involves responsible travel to natural areas that conserves the environment and improves the well-being of local communities. Ecotourism offers opportunities for visitors to learn about and appreciate local cultures, biodiversity, and natural resources, while also generating income for local businesses and governments. Ecotourism generated revenue of about US\$20 billion a year and contributed to 20% of global international travel in combination with nature tourism. It is regarded as one of the most significant sources of employment in the world, directly or indirectly supporting 10% of all jobs globally [1]-[3]. Ecotourism in Africa is an important and growing industry, contributing \$194.2 billion to the continent's economy in 2019, accounting for 8.5% of the continent's GDP, according to the World Travel and Tourism Council. It is a major source of revenue for many African countries, providing employment opportunities and generating income for local communities. Africa has large expanses of undeveloped land where nature thrives in all its grandeur and also a wide range of ecotourism destinations that offer an unforgettable and responsible travel experience. Whether interested in seeing the wildebeest migration in Tanzania, exploring the Okavango Delta in Botswana, or seeing gorillas in the Democratic Republic of Congo. Nigeria's tourism industry contributed 34.2 billion Naira to GDP in 2019 and is estimated to grow at an average rate of 5.4% between 2022 and 2032, significantly exceeding the three percent growth rate of the overall economy, according to World Travel & Tourism Council. Ecotourism is an important component of this industry due to Nigeria's endowment with resources of international ecological and touristic importance

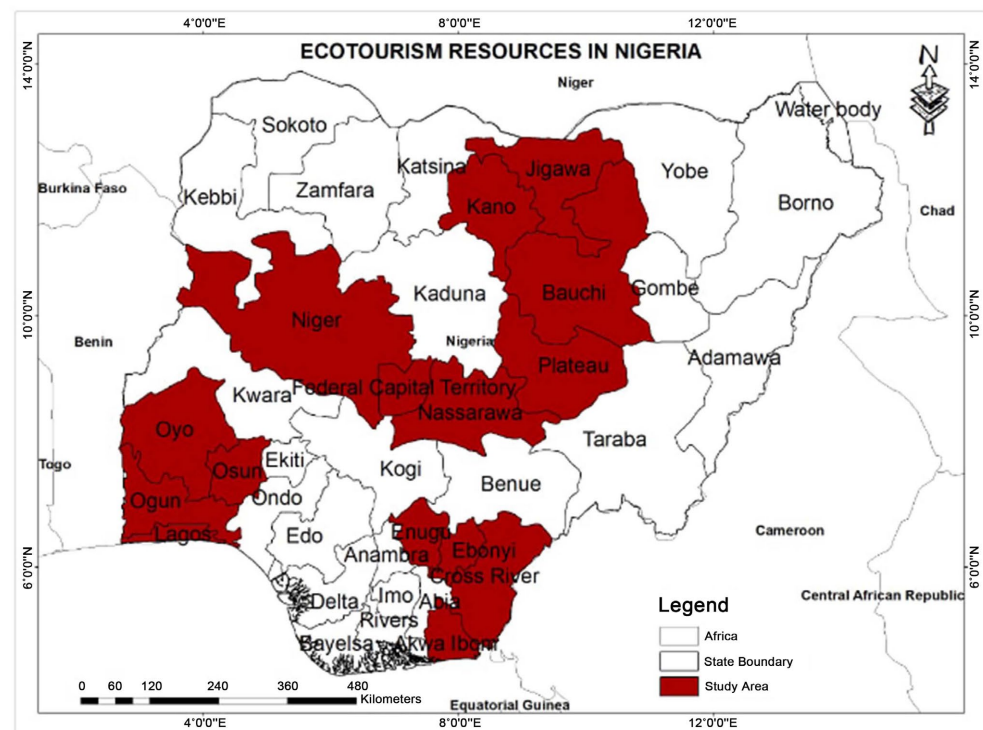
[4]. Though it is one of the country's important and fastest-growing industries that have the capacity to diversify the economy of the country but has not been fully developed [5] and the ecotourism resources still need to be improved, enhanced and better promoted to international standards [4] [6]. Ecotourism in Nigeria is facing numerous challenges, such as the threat to biodiversity, lack of infrastructures, sabotage, poor global image, insecurity, lack of awareness, poor tourism culture, insufficient facilities, poverty, corruption, underfunding, poor motivation of rangers, harassment by security personnel, poor road network, and poor maintenance culture [7]. Ecotourism resources in Nigeria, when developed, properly packaged, and promoted, can provide increased benefits such as employment, revenue generation, local empowerment, foreign exchange earnings, and markets for local products [8]. Geospatial technology is used to support ecotourism, such as Geographic Information System (GIS) and Remote Sensing (RS). GIS is a computer-based system for capturing, storing, checking, and displaying data related to positions on Earth's surface, while RS is the science of obtaining physical properties of an area without being there. These technologies are effective tools for storing, manipulating, and analyzing a great variety of spatial data with huge attributes [9]. The applications of GIS and RS have been widely discussed in environmental and resource management and also its importance in ecotourism, though it has not been widely applied. There have been comprehensive approaches and methods presented in recent years to assess ecosystem values [10]-[13]. Nigeria is home to a diverse range of ecosystems and wildlife, including savannahs, rainforests, wetlands, and marine habitats. The country's natural beauty and unique biodiversity make it an ideal destination for ecotourism, which has the potential to contribute significantly to the economy and local communities. However, despite its potential, ecotourism in Nigeria faces numerous challenges, including inadequate infrastructure, lack of interest and collaboration of the stakeholders of the industry, lack of tourism support facilities, lack of strategic marketing techniques, dissemination of information and awareness creation of the ecotourism industry and its importance to the national economy, limited investment, and inadequate information and data on the spatial distribution and abundance of ecotourism resources [14]. This study is aimed to address this gap by conducting a geospatial assessment of ecotourism resources in Nigeria, including the identification and mapping of ecotourism hotspots, the analysis of environmental factors that influence ecotourism potential, and the development of a comprehensive database of ecotourism resources in the country which will also contribute to the Sustainable Development Goals (SDGs) such as the economic development of the country (SDG 8.9.1) while protecting its unique and valuable ecosystems (SDG 11.4.1) by promoting the conservation of natural resources (SDG 15.3.1) and supporting local communities.

## **2. Methodology**

### **2.1. Study Area**

The Federal Republic of Nigeria is located approximately between latitudes 4°N and 14°N, and between longitudes 3°E and 15°E. It lies wholly within the tropics

along the Gulf of Guinea, on the west coast of Africa. It is bounded on the west by the Republic of Benin, on the north by the Republic of Niger and on the east by the Republic of Cameroon and on the south by the Atlantic Ocean [15]. The country has a total length (north-south) of about 853 km. Nigeria, which is the most populous black nation in the world, has a population of over 140 million according to National Population Commission 2006 [16]. With a total area of about 923768.64 sq kilometres (356,669 sq miles), the country occupies about 14% of West Africa, but supports more than 60% of the population of the region. Nigeria, being one of the largest countries in Africa, has 36 states and 774 Local Government Areas (LGAs) and Abuja as the Federal Capital city, as shown in **Figure 1**.



**Figure 1.** Nigeria map showing the study area.

#### *Sources and Types of Data*

Both primary and secondary data were collected for this study in order to enable the identification of the existing ecotourism sites in the selected states, examine the factors affecting tourism activities and the current state of each of the selected ecotourism by obtaining the list of existing ecotourism sites from tourism board, literature reviews and administration of questionnaires, as shown in **Table 1**.

**Table 1.** Dataset and source.

S/N	DATA	SOURCE	Format
1	Factors affecting ecotourism	Questionnaire	
2	GPS coordinates	Garmin GPS	Vector
3	Nigeria shape file	OSGOF	Vector

## 2.2. Work Flow

The first part involved the identification and ground truthing of the existing ecotourism sites through fieldwork. The second part was the data interpretation and creation of interactive dashboard (data visualization) for the analysis of the factors affecting ecotourism activities, the current state and potential for each ecotourism sites using Tableau software. A handheld Garmin GPS (global positioning system), GPS map 76CS X was used to capture the coordinates data directly by field measurement. However, the coordinates of each ecotourism site were captured as point data in a strategic location on the site. Some strategic respondents were interviewed to acquire more information about the ecotourism site, particularly the qualitative data to support the quantitative data with respect to the description and characteristics of the ecotourism sites. Photos of some strategic resources of the ecotourism sites were taken, including the researchers using a handheld camera. This is to indicate the researchers' physical presence at the sites and the originality of the pictures as well as to augment the field measurements and questionnaire survey.

Purposive, and accidental sampling methods were employed in meeting the respondents for the questionnaire survey and the key informant interviews. This is because the information required is strategic and possessed by some key people who can only be identified purposively. The research design proposed the administration of a uniform minimum of ten copies of questionnaire on community members per ecotourism site and collection of coordinates as shown in the flow chart (Figure 2). This would yield an expected sample size of a minimum of fifteen respondents per ecotourism site. Roughly, the expected sample size would be 15 multiplied by the number of identified sites.

### *Data Interpretation and Visualisation*

Data interpretation and visualization were carried out using Tableau Desktop 2022 software according to [17].

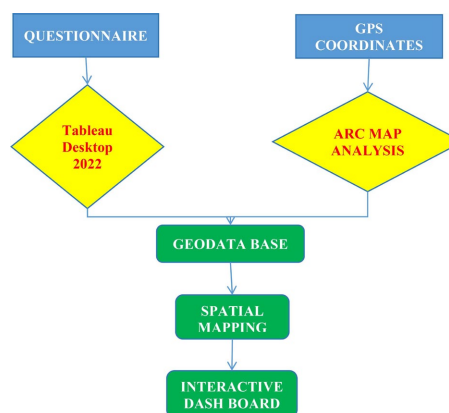


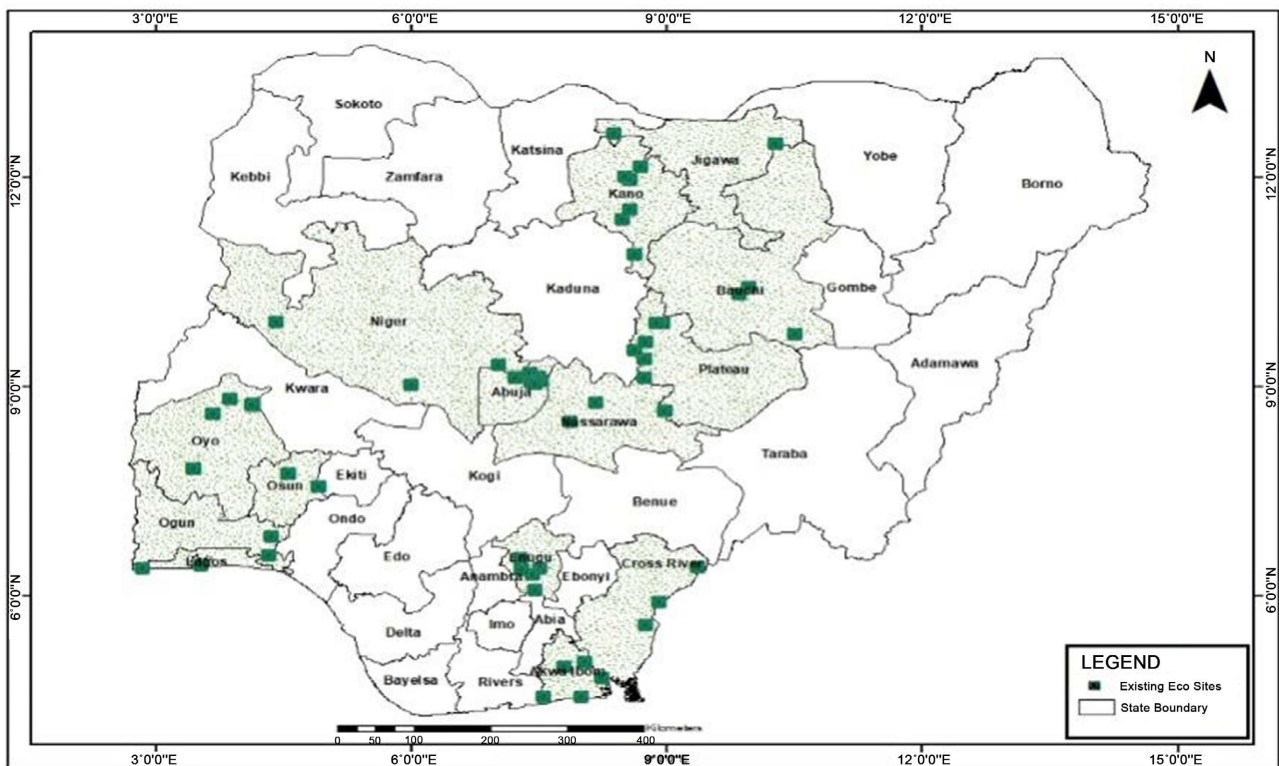
Figure 2. Flow chart showing work flow.

## 3. Results and Discussion

### *Identification of the Location of Existing Ecotourism Sites in Nigeria*

**Figure 3** shows some identified existing ecotourism sites at the southwest, southeast and south-south regions of Nigeria comprising Akwa Ibom, Enugu, Lagos, Ogun, Ondo, Oyo, Osun and Calabar and the coordinates of each ecotourism sites respectively. It further indicated that 8 ecotourism sites were identified in Akwa Ibom, 10 in Enugu, 2 in Lagos, 3 in Ogun, 3 in Oyo/Osun and 3 in Cross River.

A total of 46 existing ecotourism sites were identified in the Northern zone. **Figure 3** depicts some identified existing ecotourism sites in Nigeria’s northwest, northeast, and north-central regions, including Niger, Abuja, Nasarawa, Plateau, Kano, Bauchi, and Jigawa, as well as the coordinates of each site.



**Figure 3.** Some identified existing ecotourism sites in northern and southern Nigeria.

*Factors Affecting Tourism Activities*

The factors affecting tourism activities in Nigeria are numerous and they play a key role in influencing the viability of ecotourism generally. The study identified some major factors to include poor road network, insecurity which comprises banditry, kidnapping, very poor facilities with dilapidated buildings, lack of basic amenities and facilities, and so on as shown in various states below.

**3.1. Generation of Interactive Dashboard of Some Current Ecotourism Sites**

*Bauchi Community*

Bauchi recorded the most respondents with the community having 34 women

and 89 men interviewed. The student population accounted for 71.5% of the occupation of the responds, with others and traders accounting for the remaining occupation. There was a strong positive relationship between ecotourism and the community as 78% of the respondents indicated the importance of ecotourism to the community. As such, the importance of the ecotourism sites has resulted in the establishment of basic amenities, healthcare facilities, improved security, and other beneficial factors. The merits of the ecotourism sites showed similarities with the area's security, with only 30% of the community indicating security challenges as a result of the ecotourism sites. Of the 30% indicating security challenges as a result of the ecotourism site, banditry and kidnapping accounted for 40% of the challenges, with other crime-related vices responsible for 60%, as shown in Figure 4.

Finally, respondents indicated that the ecotourism sites' major benefits were the conservation of natural resources, the development of the community for educational purposes, and other areas.

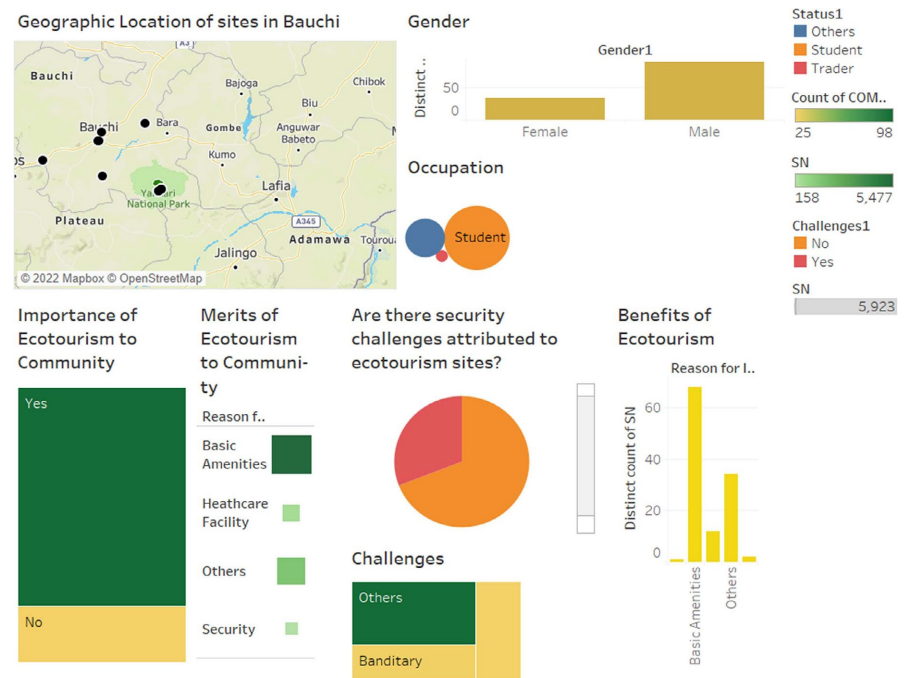


Figure 4. Bauchi state ecotourism community dashboard.

### Bauchi Official

As identified in the Kano community data, only men were interviewed for data capture for the Bauchi officials. In terms of publicity, social media and the distribution of brochures were the primary modes of awareness about the ecotourism sites in Bauchi. In terms of monthly income, over 60% of the ecotourism sites generated between N500,000 - N1,000,000 with the remaining ecotourism sites generating 0 - N500,000. The results for management quality suggest that the ecotourism sites are properly maintained, 6 out of the 8 respondents gave positive

feedback. Regarding the average influx of tourists, results show an influx of 0% - 50% accounting for the inflow of tourists to the ecotourism sites. The ecotourism sites have created enough buzz, with 7 out of 8 respondents indicating awareness. As identified with the respondents from the community, 6 out of 8 respondents identified that the road network quality to the ecotourism sites is good. Transportation costs to the ecotourism sites were identified as cheap with only 2 respondents indicating high transportation costs. Similar to the transportation cost identified with the cultural beliefs, as 75% (Figure 5) the respondents indicated that cultural beliefs were not a barrier to the ecotourism sites in Bauchi. Finally, all the officials indicated that insecurity was not a challenge to the ecotourism sites.

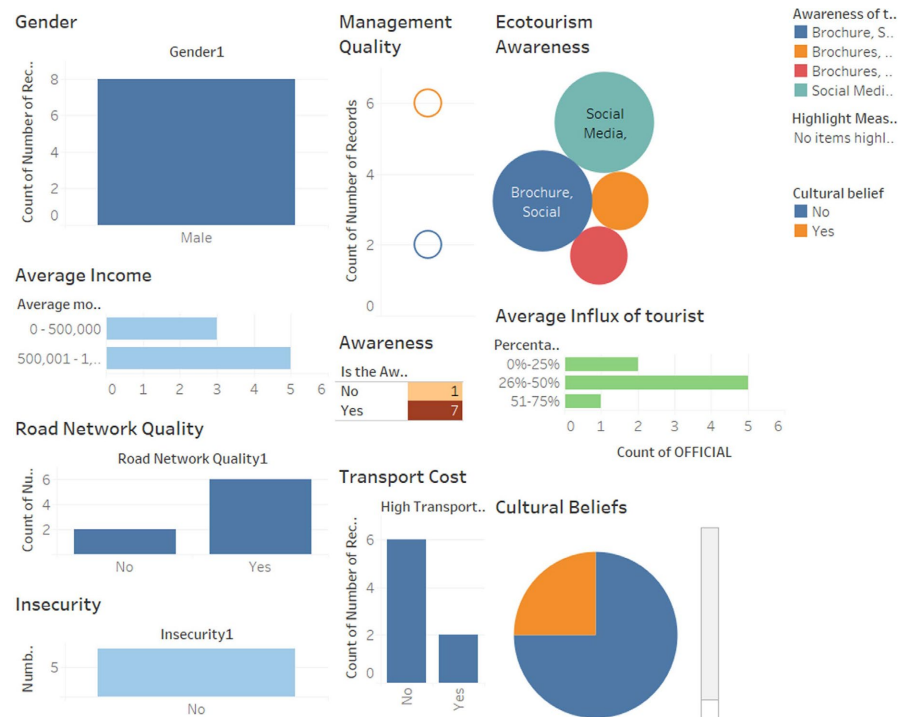


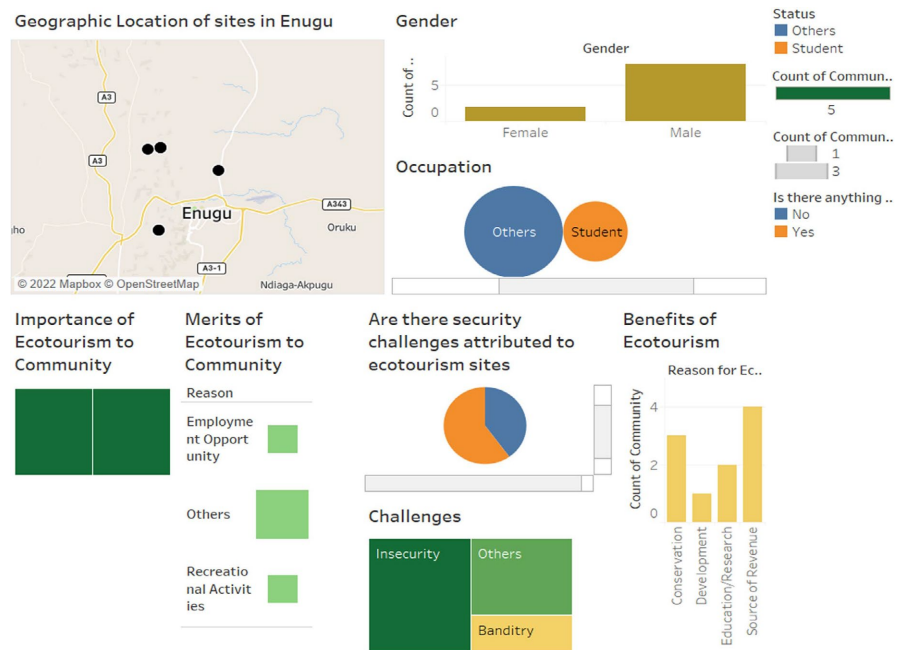
Figure 5. Bauchi state ecotourism official dashboard.

### Enugu Community

From the four ecotourism sites visited in Enugu, 20% of the respondent were female, while 80% were male. The occupations of the respondents were split into students and others. The importance of ecotourism showed that 50% of the respondents agreed that it is important with the other 50% having a different opinion (see Figure 6). As identified in most communities, security challenges which were indicated by 6 out of 10 respondents were insecurity, banditry, and other vices identified as the causes. Finally, the benefits of ecotourism sites to the community included conservation, development, education, and provision of a source of income to the community.

### Enugu Official

Of the eight officials interviewed at the ecotourism sites in Enugu, 2 were female while six were male. Awareness of ecotourism sites was usually disseminated



**Figure 6.** Enugu state ecotourism community dashboard.

using brochures, websites, and other means of communication. The average monthly income of the ecotourism sites was between N0 - N500,000 with all officials were of the opinion that the management quality of the sites was good. The influx of tourists ranges from 0% - 75% of its capacity, with 50% of the officials stating an influx of 51% - 75% as shown in **Figure 7**. The officials generally agreed that the ecotourism sites created adequate awareness. The road network to the ecotourism sites was regarded as good by 5 out of the 8 officials, however, they all agreed that the transportation cost was high. Cultural beliefs were not a hindering factor to the ecotourism sites; however, security challenges were identified by all officials as a limiting factor.

*Jigawa Community*

From the two ecotourism sites visited in Jigawa, 80% of the respondents were male, while 20% were female. The occupation of the respondents fell under other categories and 80% of them are of the opinion that the ecotourism sites are important to the community. Those that identified the importance of ecotourism noted the provision of basic amenities, and the provision of security as the major merits of the sites. Despite the provision of security as identified by some of the respondents, 60% of the respondents are of the opinion that there are security challenges attributed to ecotourism sites, while 40% were of the opinion that there are no security challenges (**Figure 8**). The security challenges identified were banditry, kidnapping, and other vices. Finally, the benefits of ecotourism to infrastructure include education, development, conservation, and source of income.

*Jigawa Official*

Four officials were interviewed from the two ecotourism sites visited in Jigawa with 3 males and 1 female. In terms of awareness created for the ecotourism sites,

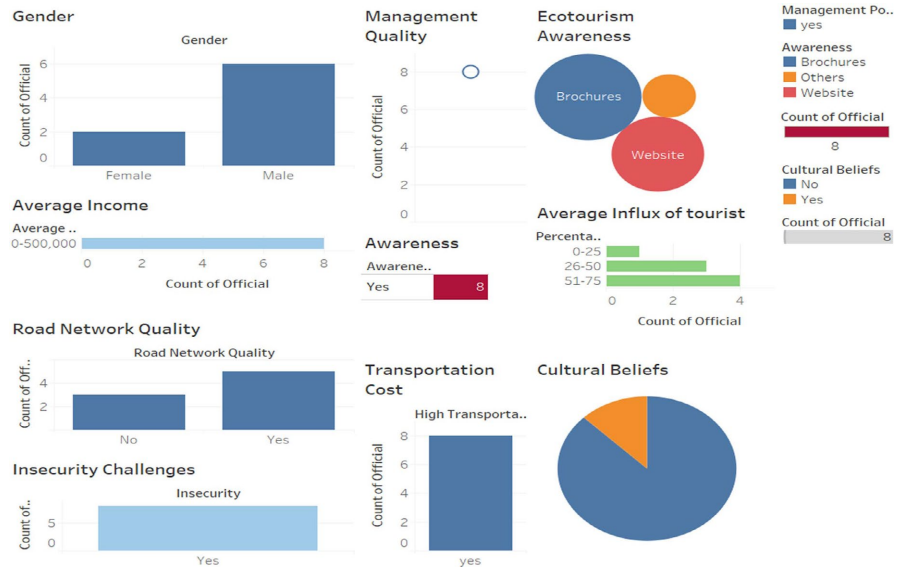


Figure 7. Enugu state ecotourism official dashboard.

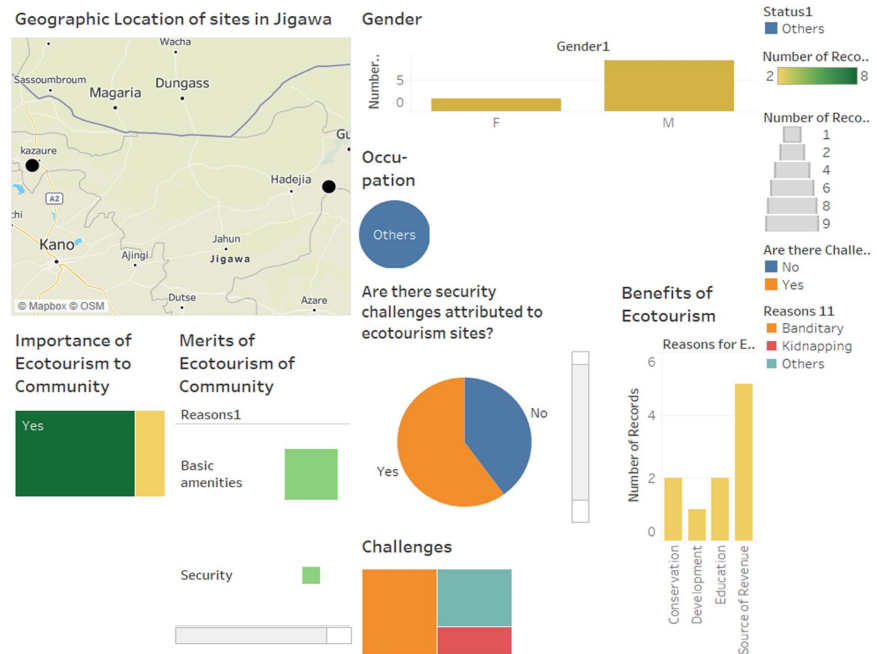


Figure 8. Jigawa state ecotourism community dashboard.

the use of websites, brochures, and a combination of both was identified as the main means of disseminating information about the site. The average monthly income of ecotourism sites ranged from N0 - N1,000,000 for both sites and 75% of the respondents are of the opinion that the management quality of the ecotourism sites is good. The average influx of tourists varied, with 50% of the respondents were of the opinion that the site only attracts 25% - 50% of its capacity whereas, the other half stated that 50% - 70% and 75% - 100% account for the average influx respectively (Figure 9). Exactly 75% of the respondents do not believe that inadequate

awareness of the ecotourism sites is on the ground, supporting that more awareness ought to be created. Road network was categorized as unsuited by 3 out of the 4 respondents, however, the cost of transportation was not high by the same number of respondents. Cultural belief regarding the ecotourism sites was not identified as a challenge. The opinion of the respondents was split regarding the security challenges at the ecotourism sites.

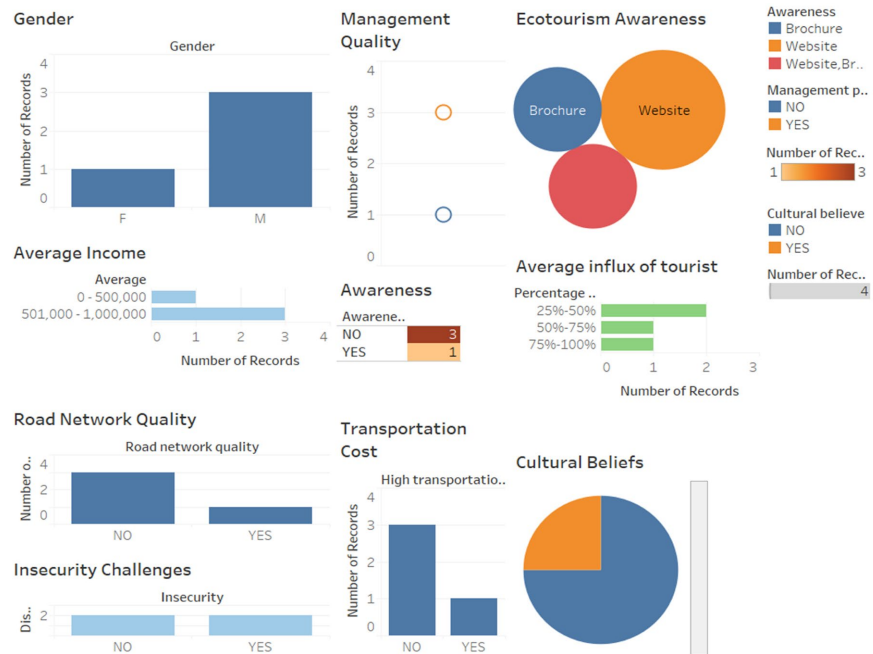


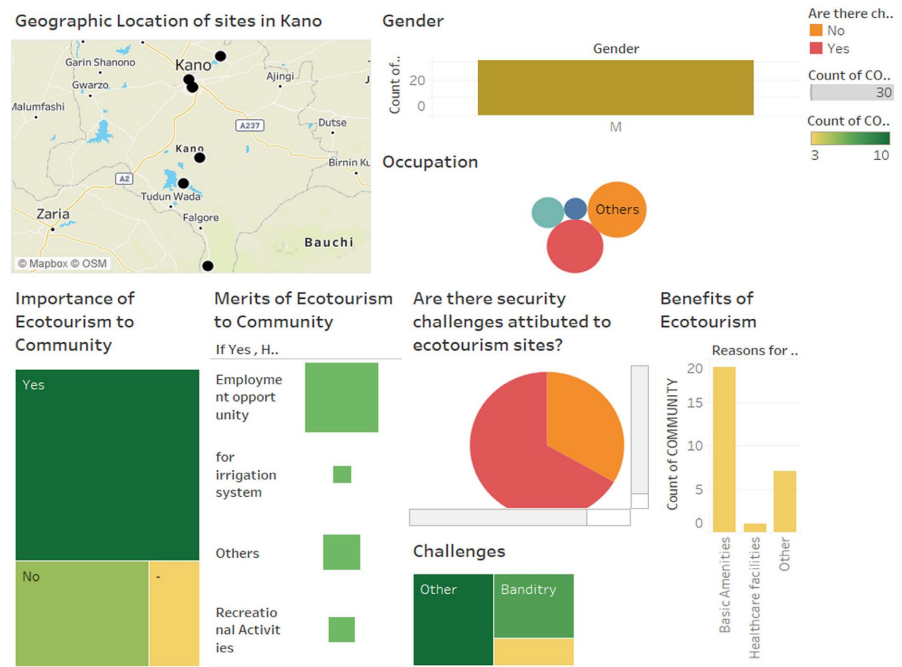
Figure 9. Jigawa state ecotourism official dashboard.

### 3.2. Kano Community

From the ecotourism sites visited in Kano, all the 30 respondents interviewed were male. A total of 20 out of the 30 respondents, representing 66.6%, stated that the ecotourism sites were important to the community. The occupation of the respondents varied, with students and other professions accounting for over 80% (Figure 10) of the occupation. Exactly 8 out of the 20 respondents identified the importance of ecotourism in Kano to include: the provision of employment, the creation of irrigation systems, and the availability of recreational activities, which accounted for the advantages of the ecotourism sites to the community. In terms of the security challenges, two third of the respondents attested to the fact that the ecotourism sites brought about security challenges particularly relating to banditry and kidnapping. Finally, the study showed that the provision of basic amenities to the community was a major benefit enjoyed by the community.

#### *Kano Official*

For the Kano official, three women were represented out of 14 respondents as opposed to the community. From the mode of creating awareness, the use of websites and brochures dominated the dissemination of information about the



**Figure 10.** Kano state ecotourism community dashboard.

ecotourism sites. In terms of the average monthly revenue, no information was obtained from the respondents. In terms of the management quality of the ecotourism sites, over 60% of officials stated that the management of the sites was good. In terms of average influx of tourists, officials reported low patronage with over 50% stating 26% - 50% influx based on the capacity reporting awareness of ecotourism sites, while 50% of the officials indicated that the ecotourism sites were getting the required attention, with the remain indicating that more is needed to be done. Similar results were discovered when assessing the quality of road networks, with 50% of the respondents saying more needs to be done to improve the road network, and the other half content with the current state of the roads. Cultural beliefs did not seem to be a major issue with the ecotourism sites, as 10 out of the 14 respondents indicated that it was not an issue. Finally, in terms of security, 9 out of the 14 respondents stated that insecurity was a major challenge at the ecotourism sites (Figure 11).

#### *Lagos Community*

Two ecotourism sites were visited and a total of 4 females and 7 males were interviewed. The occupations of the respondents were classed under traders and others. The opinions on the importance of ecotourism to the community were split, while 6 respondents stated that ecotourism was important, 5 respondents had opposing view. The 6 respondents indicated the importance of ecotourism sites to include creation of basic amenities, healthcare facilities, security, and others. Regarding the security challenges attributed to ecotourism sites, 63% of the respondent's identified banditry, kidnapping, and similar vices as major threats to the host communities. Finally, the provision of education and source of revenue were identified as major benefits of ecotourism (Figure 12).

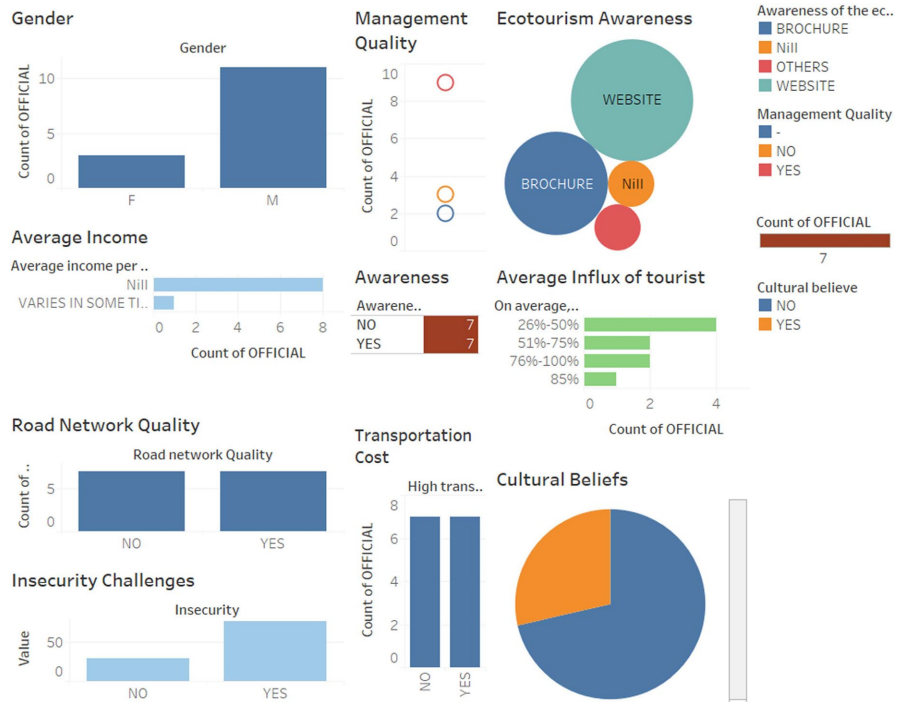


Figure 11. Kano state ecotourism official dashboard.

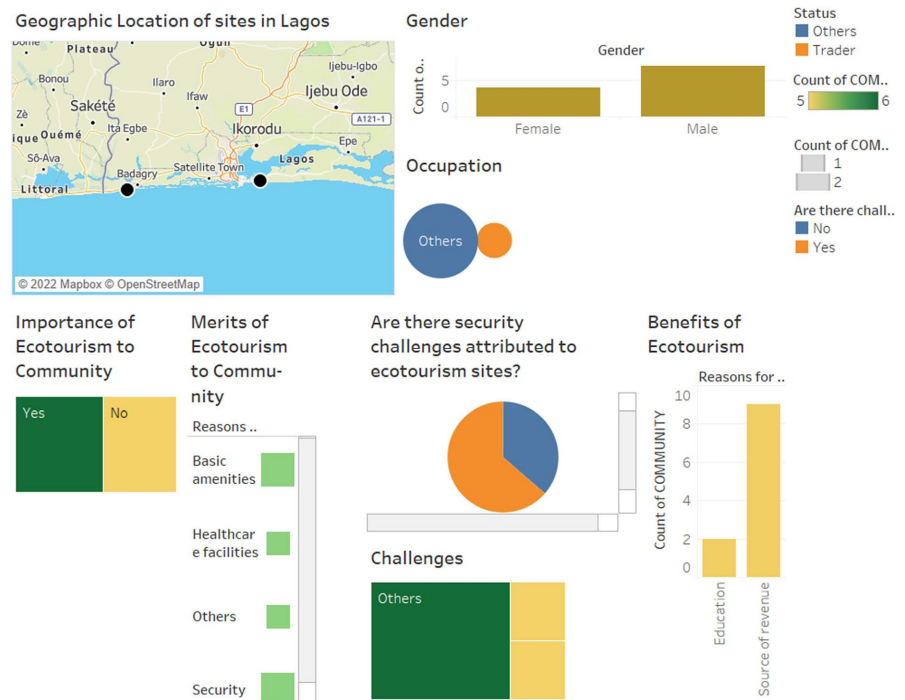


Figure 12. Lagos state ecotourism community dashboard.

### Lagos Officials

Only two officials working at the two ecotourism sites were interviewed in Lagos, accounting for one male and one female. The mode of creating awareness involved the use of brochures, websites, and social media for both ecotourism sites.

The average income generated from both sites on a monthly basis range between N1,000,000 - N5,000,000. The quality of the management was adequate, however, the influx of tourists only met 26% - 50% capacity of the ecotourism sites. Also, awareness of the sites is still lacking in this report, as both respondents stated the need to create more awareness. The road network quality and cost of transportation were identified as poor and high respectively. Likewise, insecurity was identified as a major issue by the officials (Figure 13).

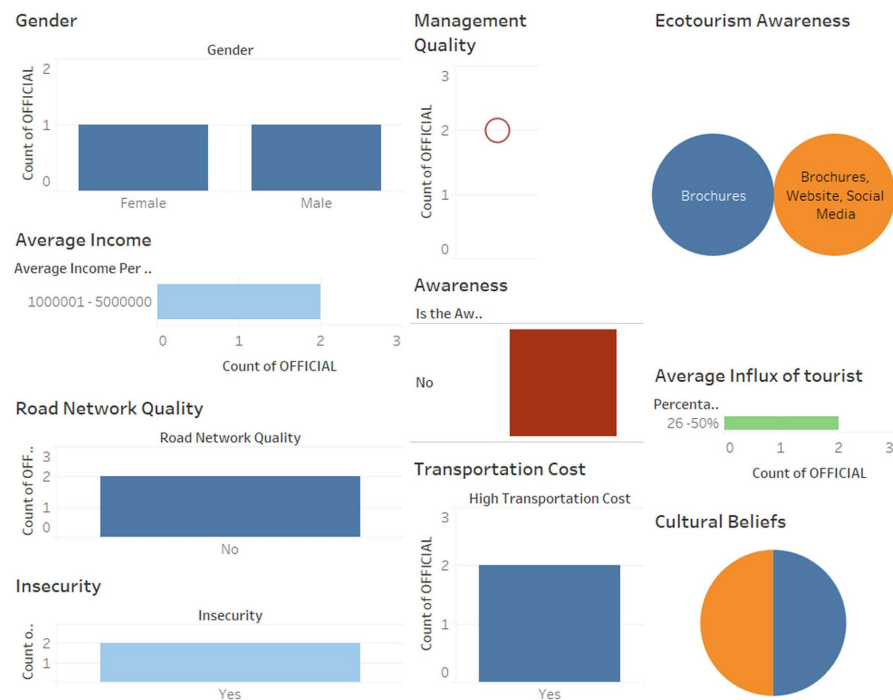


Figure 13. Lagos state ecotourism official dashboard.

### Oyo Community

From the five ecotourism sites visited in Oyo state, the male gender dominated those interviewed, accounting for 70% of the respondents. The occupation of respondents were civil servants, students, researchers, and other professionals not captured in the questionnaire. Contrary to ecotourism sites found in other states, 62% of the respondents were of the opinion that the ecotourism sites were not beneficial to the community. Those that identified the ecotourism sites as important said it was majorly for creating employment opportunities. In terms of security, 4 in 5 respondents were of the view that there are no security challenges attributed to the ecotourism sites. Of the 20% that differ in their opinion, banditry and general insecurity were the main challenges. In terms of the benefits of ecotourism, the respondents identified the development of the community, education, research, and source of revenue as the main beneficiaries (see Figure 14).

### Oyo Official

Exactly 20 official respondents were interviewed out of which, 7 were females while 13 were males. The ecotourism awareness method was usually through

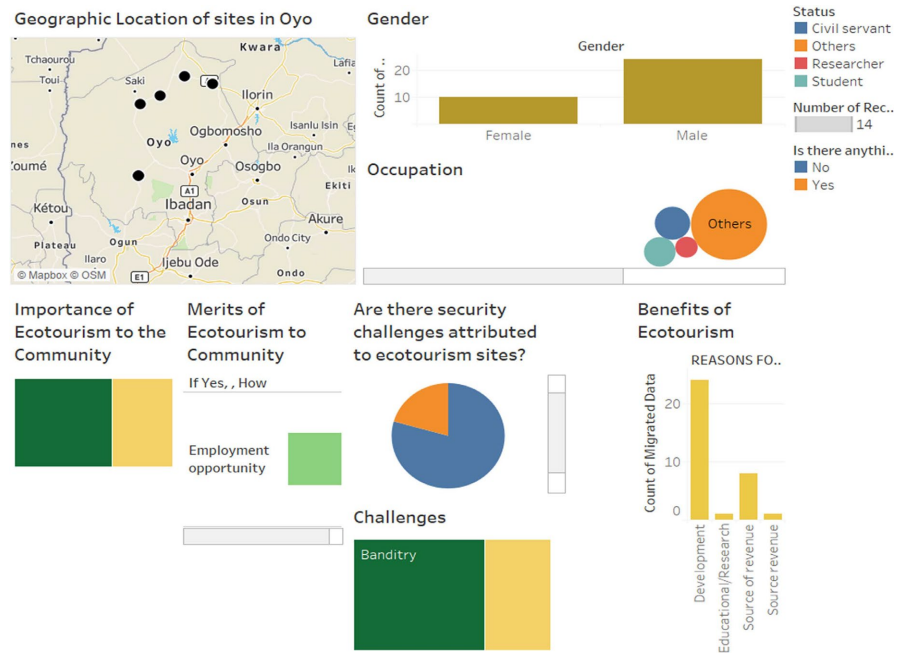


Figure 14. Oyo state ecotourism community dashboard.

brochures, websites, and other means of disseminating information not captured in the questionnaire. The average monthly revenue falls into two categories, with 12 of the officials stating N0 - N500,000, while the other 8 stated N500,000 - N1,000,000 as the monthly income. In terms of management quality, 70% were of the opinion that the management quality of the ecotourism sites is good. On the influx of tourists recorded, 40% of the officials were of the opinion that the ecotourism sites use less than 25% of their capacity, while 50% stated that the ecotourism sites influx was 50% and above (Figure 15). In terms of awareness, 70% of the officials were of the opinion that there is adequate awareness of the sites. Identical results were obtained in terms of road network quality and transportation costs, as 12 officials stated that road network quality was poor, however, the cost of transportation was low. Cultural beliefs were not identified as an issue by 85% of the respondents, though, 19 out of the 20 interviewed stated that insecurity was a major challenge.

*Plateau Community*

From the six ecotourism sites visited in Plateau State, 42% of those interviewed were women, while 58% were men. The occupational status of those who were interviewed was mainly students, traders, and civil servants. In terms of the importance of the ecotourism sites to the community, 70% of the respondents stated that they were not important to the community. Of the 30% that found the ecotourism sites important, the main reasons were the provision of healthcare and security. Regarding the security challenges attributed to ecotourism sites, 77% of the respondent indicated that there were no security challenges as a result of ecotourism sites, while others indicated that security challenges exist that could be linked to banditry, kidnapping, and other vices as shown in Figure 16. Finally,

in the terms of the benefit of the ecotourism sites, the host communities identified the development of the community as the most beneficial outcome of the ecotourism site.

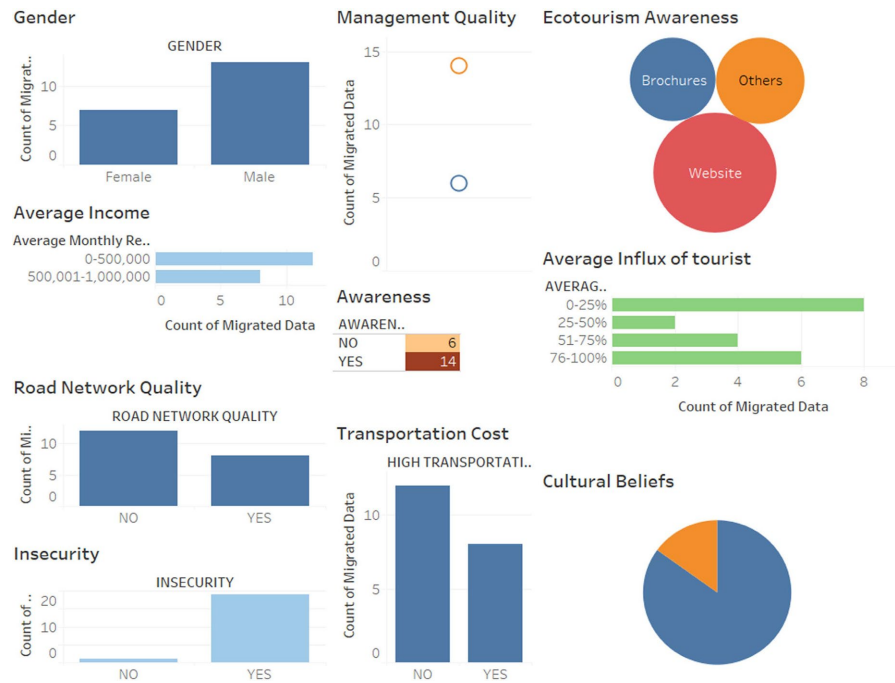


Figure 15. Oyo state ecotourism official dashboard.

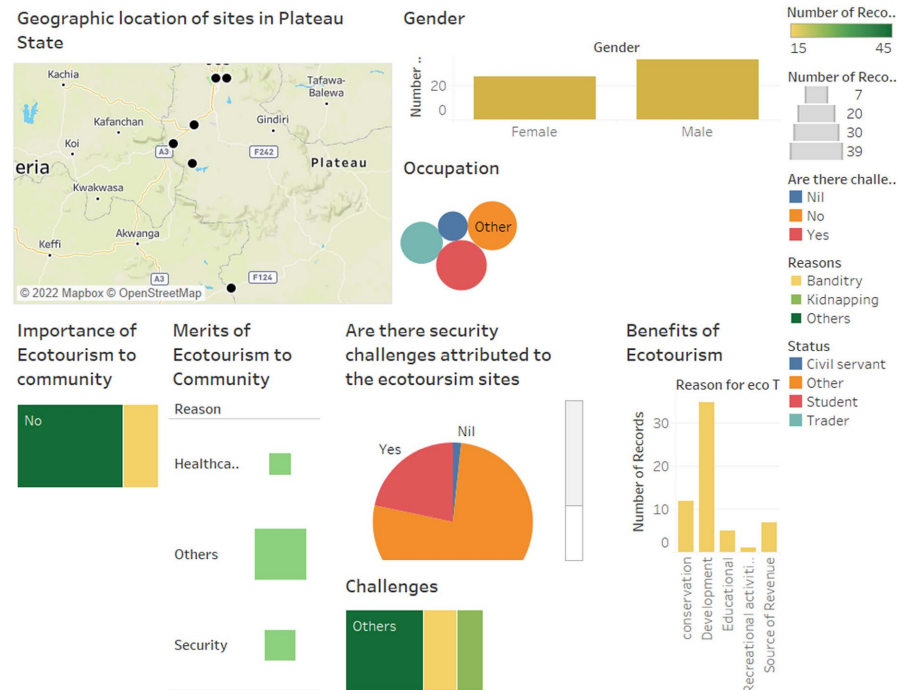


Figure 16. Plateau state ecotourism community dashboard.

Plateau Official

Both genders were represented when collecting information on the ecotourism sites, with 14 out of the 20 registered as men. The distribution of brochures was the main way awareness is created about the ecotourism sites; traditional media and websites also indicated ways in which awareness was created. The monthly average income generated for the ecotourism sites between N0 - N500,000 and N 500,001 - N1,000,000. Exactly 85% of the official respondents indicated that the management quality of the ecotourism sites was good while 15% stated that there was a need to improve the management quality. The average influx of tourists indicated that 70% of the interaction with the officials showed that 20% of the influx of tourists is based on their capacity ranging from 25% - 75%, and 80% stated that tourists were aware of ecotourism sites. In terms of road network quality and transportation cost, 80% of the officials indicated that the access road to the ecotourism sites was good. However, 60% of the officials considered the transportation cost to the sites to be high (Figure 17). Attribution of cultural beliefs to the sites showed that 9 out of the 20 respondents believe that cultural beliefs have strong ties with the ecotourism site, whereas the other 55% did not think so. Security challenges were a major challenge identified by the officials with 85% indicating security challenges linked to the ecotourism sites.



Figure 17. Plateau state ecotourism official dashboard.

#### 4. Conclusion

The study identified so many factors that hinder the potential of ecotourism, which include but are not limited to gender issues in the management, maintenance of the ecotourism sites, inclusion of government in the daily affairs of the ecotourism sites, security challenges, lack of access road, poor and inadequate publicity for awareness creation, etc. In order to be a geometric increase in the income/revenue

generated annually and provision of employment by the ecotourism sector, the identified factors must be addressed. The study has succeeded in creating a geodatabase for the existing ecotourism sites visited and information about them can now be viewed from the Tableau dashboard online.

### Conflicts of Interest

The authors declare no conflicts of interest.

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