



A multi-media GIS-based approach for mapping tourism infrastructure in Owerri, imo state Nigeria

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Abstract

Tourism is a composite of activities, facilities, services and industries that deliver a travel experience. One of the problems often encountered in the tourism industry in Owerri, is lack of data on tourism infrastructure and a quick update and maintenance of available data. Ineffective management of these spatial information also provide a means by which the hotel owners, private and government agencies and even the government loses enormous revenue which would have been used to provide an effective tourism infrastructure in Owerri. Therefore, the aim of this study is to map tourism infrastructure in Owerri Imo State using a multi-media GIS approach with a view of providing a detailed hotel database that will aid tourism development in Owerri, Imo State. Its objectives are to identify the types of tourism Infrastructure in Owerri, Imo State; to determine the spatial distribution of the tourism Infrastructures in Owerri, Imo State; to create a multi-media geospatial database for tourism Infrastructures in Owerri, Imo State and to perform spatial queries for the enhancement and administration of tourism in Owerri, Imo State The methodology involved acquisition of streets, landmarks, hotels and tourism sites from the base map and on ground, georeferencing, digitizing, image classification, multimedia database creation, querying and map production. The results show that Owerri, Nigeria is a well-rounded destination for tourists with strong infrastructure for leisure, hotel, entertainment and religious tourism, with 85.71% of hotels located within 50 meters of the roadside and 61.22% near restaurants, 81.63% within 500 meters of healthcare centers, and 61.22% within 500 meters of shopping malls. The results of the spatial distribution of tourism infrastructure were revealed to be clustered, meaning tourist spots are located close to each other. The results also show that 63.26% of hotels in the city fall within the price range of ₦15,000 to ₦10,000, making them relatively affordable, which can make the city more attractive to a wider range of travelers. It was recommended amongst others that the multi-media GIS database approach be used as a decision support system in tourism infrastructure monitoring and management in Owerri, Imo State.

Keywords: Database; GIS; Infrastructure; Owerri; Tourism

1. Introduction

Tourism is a composite of activities, facilities, services and industries that deliver a travel experience, that is, transportation, accommodation, eating and drinking establishments, entertainment, recreation, historical and cultural experience, destination attractions, shopping and other services available to travellers away from home [1].

Another definition by International Association of Scientific Experts on Tourism (IASSET) sees tourism as the totality of phenomenon arising from the travel and stay of strangers, provided that the stay does not imply the establishment of a permanent residence and is not connected with remunerative activity [2]. Tourism is a major revenue generation sector that has not been fully harnessed in Nigeria. This is because we failed to see the potentials in the tourism industry. [3] proved through research that tourism alone if properly harnessed could earn the nation more than what the nation is currently earning from crude oil. Dubai is a typical example of a city that has explored the potentials of tourism to their

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advantage. The success of tourism in any country depends on the ability of that country to sufficiently develop, manage and market the tourism facilities and activities in that country [4].

Over the years, Nigeria has taken some bold steps to diversify its mono-cultural economy through promotion of tourism. These measures include the adoption of the National Tourism Policy (NTP) in 1990, the birth of the Nigeria Tourism Development Corporation (NTDC) in 1992, the founding of the National Institute for Hospitality and Tourism (NIHOTOUR), in Baganda Kano, and the National Travel Bureau (NTB), a tour operating company of NTDC, the adoption of a tourism master plan and the inauguration of the National Tourism Council with the President as Chairman [4].

The efforts of Government will be a nullity if data about these tourist attractions were not properly captured, stored, updated and presented in a way that potential tourist will understand. The information can only be generated, stored, updated, analyzed and presented by an Information System which is capable of managing spatially referenced data. GIS offers itself as a decision support tool that can enable stakeholders in the tourism industry to ensure speedy and up-to-date production of tourism map, perform queries and analysis on complex and large volume of spatial and non-spatial tourism data [4].

GIS not only provides information on tourist attractions, but it is a database of geographical conditions, transportation, accommodation, ethnic groups of the population and more. GIS produces thematic maps, which can help tourists, understand their destination in a better and detailed manner. GIS application in tourism opens up new avenues and enhances tourist experience. Near accurate details of the area, the tourist wishes to visit can help them enhance their experience and helps them understand the culture and values of the people living in the area. GIS not only helps the tourists but also can help the officials in educating the tourists as well, about the dos and don'ts of certain places, based on the population, the ethnicity or environmental conditions. The development of tourism is inevitable, and GIS is helping tourism take giant strides towards efficient information management and exchange.

Tourism is an activity highly dependent on environmental resources. It is also a phenomenon, which in the event of lack of planning and management is likely to erode its environmental base [4].

Adequate information on tourism facilities is lacking in Owerri while hotel information in Owerri is already available on Google, which can easily be accessed by tourists. However, there are still some limitations, as finding the most updated information is still a herculean task. The vast amounts of information are not only confusing but mostly inaccurate.

In addition, there is lack of quick update and maintenance of the available data. Ineffective management of these spatial information also provide a means by which the hotel owners and even the government loses enormous revenue which would have been used to provide an effective hotel tourism infrastructure which improve the values of tourism in Owerri.

Ayeni [4], analyzed hotels with respect to other spatial data using both single and multiple criteria queries. However, they failed create proper listings of tourism facilities and also check for map accuracy, likewise in [5], where the study demonstrated the usefulness of tourism maps for identifying tourism locations, however they too did not produce a detailed listings of tourism facilities.

The problem of enhancing tourism in Owerri has remained due to the lack of proper listing and identification of hotels, tourism sites and other facilities in terms of tourism potentials. This has made it difficult for Owerri to be a major tourist attraction even though Owerri has enough infrastructure to develop tourism boom. Employment opportunities and revenues that could have been generated from tourism are not being harnessed. An up-to-date tourist map which is the most important ingredient for a sustainable tourism planning is lacking in Owerri. The tourism maps where available are hardly updated with new hotels or new tourism spots, hence the locations of new hotels and other tourist facilities are also not known within the localities where they exist. It is with this that this study sets out to map tourism facilities in Owerri Imo State using a multi-media GIS approach.

2. Methods

2.1. Study Area

Owerri is the capital of Imo State in Nigeria. it has an estimated population of about 1,401,873 as of 2016, and is approximately 100 square kilometers (40 sq mi) in area. Owerri is bordered by the Otamiri River to the east and the Nworie River to the south. It is located between latitudes 5° 20'N and 5° 30'N and longitudes 6° 55'E and 7° 5'N.

The rainy season begins in April and lasts until October, with annual rainfall varying from 1,500mm to 2,200mm (60 to 80 inches). An average annual temperature above 20 °C (68.0 °F) creates an annual relative humidity of 75%. With humidity reaching 90% in the rainy season. The dry season experiences two months of Harmattan from late December to late February. The hottest months are between January and March.

The state has several natural resources including crude oil, natural gas, lead, Calcium Carbonate and zinc. Profitable flora including iroko, mahogany, obeche, bamboo, rubber tree and oil palm. Additionally, white clay, fine sand and limestone are found in the state .

The alluvial soils along the valleys of the rivers are sandy, while the adjoining laterite soils are deeply weathered and grey or reddish in colour, sticky and permeable. The vegetation in the study area (Owerri) is guinea savannah or parkland savannah belt with tall grasses and some trees. The trees which grow in clusters are up to six meters tall, interspersed with grasses which grow up to about three meters. The different types of vegetation are, however, not in their natural luxuriant state owing to the human use of the forest and the resultant derived deciduous and savannah vegetation.

2.2. Methods

2.2.1. Data Requirement

The images and data that were used in this research includes:

- Base Map of Owerri, Imo State
- Digital Globe Imagery of Owerri, Imo State
- Landsat 8 Operational Land Imager
- Coordinates of Hotels, Recreational and Entertainment centres, Banks and Religious centers, in Owerri, Imo State

These data were obtained through field visits peculiar to this study. They include the coordinates of hotels and tourism and as well control points for accuracy assessment which were obtained using handheld GPS and non-spatial (attribute) data describing the characteristics of features on ground will be collected as well.

The secondary datasets needed were obtained from already existing medium. They include:

- Map of the administrative boundary of Owerri which was obtained from the Department of Surveying and Geoinformatics, Nnamdi Azikiwe University, Awka.
- Digital Globe imagery was obtained from www.digitalglobe.com.
- Landsat 8OLI was obtained from www.earthexplorer.usgs.gov.

2.2.2. Processing Techniques

Database design and creation is one of the fundamental processes in every GIS work executed. In this study, the vector conceptual scheme was adopted where point, line and polygon shapes were used to represent entities on scene. For the logical design stage, the relational data model by which data were separated into tables was adopted for each of the entity types.

Conceptual Modelling

This is a representation of human conceptualizing of reality of the entire information content of the database. Here decision on how the view of reality is presented in a simplified manner and to the satisfaction of the information requirement of the project. The Vector data model was employed where available entities were represented as points, lines and polygons objects.

Logical Data Modelling

This is another stage of the database design in which all the real-world entities conceptualized were modelled into the real world using logical design. It is the representation of the conceptual design to reflect the recording of the data in the computer system using a relational database management system (RDBMS).

In this phase, the entities, their attributes and their relationships were represented in a single uniform manner in form of relation in such a way that would be no information loss and at the same time no unnecessary duplication of data. Each table contains items or data called field about some objects. The objects are found along rows and field or attribute values along columns.

Physical Data Modelling

The representation of the data structure in the format of the implementation software is usually done at the beginning of the database creation phase. This involves the translation of the real-world entities into the computer compatible forms of the chosen structuring methods i.e., network, hierarchical and relational. In this study, the relational (table) structuring method was used. In this method, tables consisting of columns (fields) and rows (records) were created to show the relationship between different data. The tables were structured in such a way that they can be linked with one another for connectivity.

Nearest Neighbor Analysis

Nearest neighbor analysis was used to measure the distributions and pattern of the tourism infrastructure to determine whether they are clustered, random or regular. Nearest neighbor analysis was used in this study to test that the distribution of the facilities is regular pattern expected if the locations had been deliberately planned, or random distribution if there were no planning involved with the location of these facilities. The nearest neighbor formula is expected produce a result between 0 and 2.15, where 0 represents clustered, 1 represents random and 2.15 represents uniform distribution. This analysis was done by launching the arc toolbox in ArcGIS Pro:

Structured Query Analysis

Query analysis is a process used in databases which make use of SQL in order to determine how to further optimize queries for performance. Query analysis is an important aspect of query processing as it helps improve overall performance of query processing, which will speed up many database functions and aspects.

SQL queries are generated by applications and users are then sent to a federated database in order to retrieve data from sources. Based on the query statement, the SQL compiler then consults the data source wrapper and the information stored on the global catalog in order to help it process the query. The information it retrieves include the data source, mappings, data and server attributes, nicknames, statistics and more. The query optimizer which facilitates the query analysis is actually part of the SQL compiler process. Through the query optimizer, the compiler develops different plans, alternative strategies that can be used when processing the query. These are called access plans and they might call for the query to be processed by different elements.

The importance of spatial analysis and accuracy testing of any GIS work is dependent on the use of the data and the geographical location and features portrayed. To enhance the quality and trustworthiness of any dataset generated or information presented these procedures are usually undertaken. Spatial analysis is the process of applying analytical techniques to geographically referenced datasets to extract or generate new geographical information. Although the overall analytical technique may be complex, it is usually a combination of simple techniques applied in the appropriate order. GIS query/spatial search combines spatial and non-spatial data from different datasets for spatial analysis operation. Spatial analysis may be used to model simple or complex geographical interactions. It is useful for investigating its suitability, location of features of interest, determining best and shortest routes between two points.

3. Results and discussion

3.1. Mapping the Various Types of Tourism Infrastructure in Owerri, Imo State

From the results, it was revealed that Owerri has a total of 334 tourism infrastructures; the distribution is displayed in Figure 1.

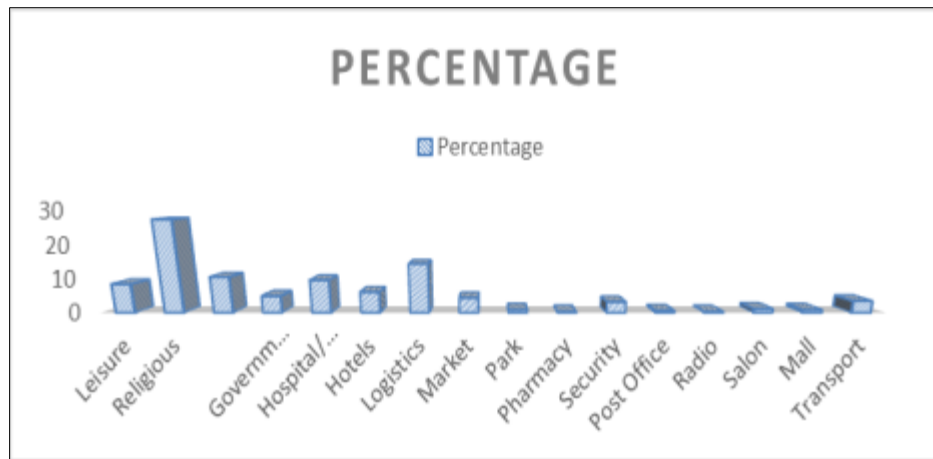


Figure 1 Type of Tourism Infrastructure in Owerri, Imo State

Figure 1 shows that Owerri has a total of 334 tourism infrastructure, which are classified into various hospitality groups. Leisure and Entertainment has the highest coverage at 27.54%, followed by Hotels and Religious centers at 14.67% and 10.78% respectively. Government, Financial, Hospital/Health Care, Filling Stations, Pharmacy, shopping malls, Radio, and Transportation have coverage of 9.88%, 8.68%, 6.29%, 5.09%, 3.29%, 3.59%, 1.20%, and 1.50%, respectively. Salons, Post Office, Security, Park, and Market have a coverage of less than 1% with 0.90%, 0.30%, 0.60%, 0.30% and 0.90% respectively.

Also from figure 1, it is adjusted that Leisure and Entertainment is the most dominant category of tourism infrastructure in Owerri, which indicates that the city caters well to the needs of tourists looking for recreational activities.

Hotels and Religious centers also have a significant presence in the city, indicating that Owerri is well-suited for both leisure and religious tourism.

The presence of Government, Financial, Hospital/Health Care, Filling Stations, Pharmacy, shopping malls, Radio, and Transportation infrastructure suggests that the city is well-equipped to handle a variety of tourists' needs.

Salons, Post Office, Security, Park, and Market have a low presence, this indicates that these types of infrastructures may be an area for improvement in order to better serve tourists in the city. For example, the city may need to focus on developing more parks and open spaces, or increasing the number of post offices and security services. Improving these areas could help to attract more tourists to the city.

Overall, Owerri appears to be a well-rounded and well-equipped destination for tourists, with a strong presence in the leisure and entertainment, and hotels and religious centers categories. However, there is room for improvement in the areas of post office, security, park, and market which could make the city more attractive to tourists.

3.2. Spatial Distribution of Tourism Infrastructure in Owerri Imo State

The spatial distribution of Tourism Infrastructure in Owerri was calculated by employing average nearest neighbour analysis. Average Nearest Neighbor analysis measured the distance between each feature centroid and its nearest neighbor's centroid location. It then averaged all these nearest neighbor distances. If the averaged distance is less than the average for a hypothetical random distribution, the distribution of the features being analyzed is considered clustered. If the averaged distance is greater than a hypothetical random distribution, the features considered dispersed. The average nearest neighbor ratio is calculated as the observed average distance divided by the expected average distance (with expected average distance being based on a hypothetical random distribution with the same number of features covering the same total area).

The results of the analysis indicate that the spatial distribution of Tourism Infrastructure in Owerri is clustered. The observed mean distance of 97.26m is lower than the expected mean distance of 138.38m, which is consistent with a clustered pattern. The nearest neighbor ratio of 0.702847 further supports this conclusion, as a value closer to 1 indicates a more dispersed distribution and a value closer to 0 indicates a more clustered distribution.

The p-value and z-score of 0.000 and -11.511 respectively, provide a statistical assessment of the significance of the observed clustering pattern. The p-value is a measure of the probability that the observed clustering pattern could be the result of random chance, and a p-value of 0.000 indicates that the probability is extremely low. The z-score measures the number of standard deviations away from the mean, a negative z-score indicates that the observed mean is less than the expected mean, which is consistent with a clustered pattern.

Given the p-value of 0.000 at a confidence level of 99%, it can be concluded that there is a less than 1% likelihood that this clustered pattern of Tourism Infrastructure in Owerri could be the result of random chance. This means that the clustering pattern is very unlikely to be due to chance and is likely to be the result of some underlying process, see figure 2

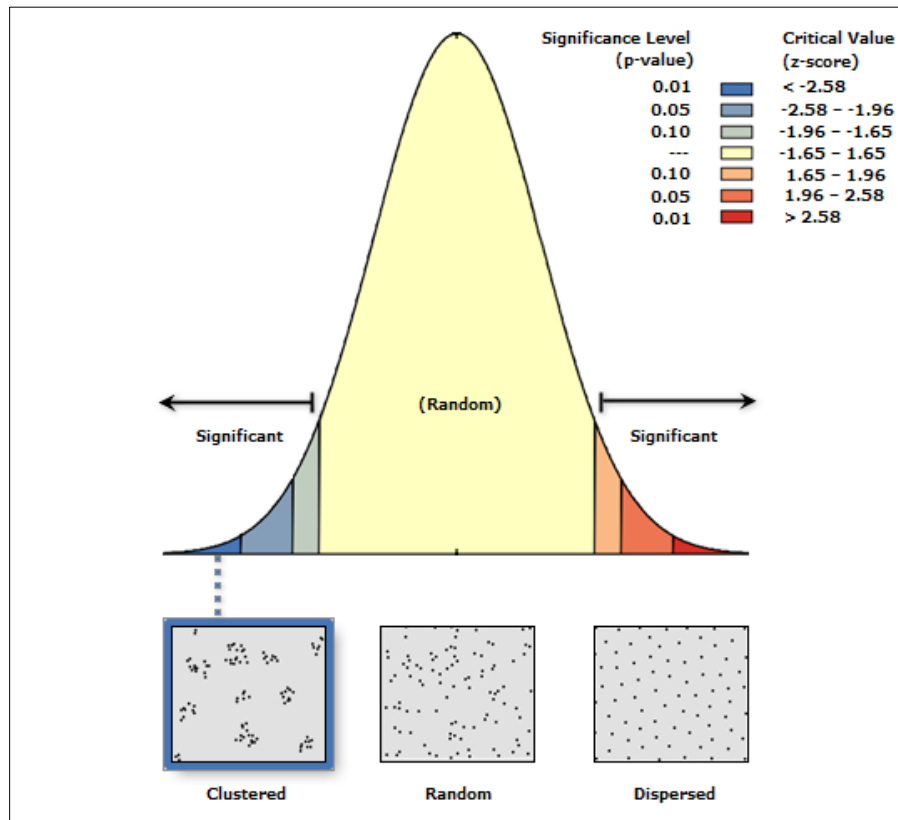


Figure 2 Result of Average Nearest Neighbor Analysis

In summary, the analysis looked at the locations of different types of tourist places in Owerri such as hotels, recreational spots, religious centers and more. It found that these places are mostly located close to each other, instead of being spread evenly across the city. This is known as a clustered pattern.

This is an unusual pattern, and the study found that it is very unlikely to happen by chance. The study also found that the probability that this pattern is just by chance is less than 1%. This means that in Owerri, when you visit one tourist spot, it is more likely that you will find other tourist spots nearby.

It is important to note that this clustering pattern could have a big impact on tourism in Owerri. For instance, this could mean that it is easier for tourists to find and visit multiple tourist spots in a short amount of time, which could make the city more attractive as a tourist destination. On the other hand, it could also lead to a concentration of tourists in certain areas, which could cause issues such as over-crowding and strain on local resources.

3.3. Spatial Query Analysis to Aid in Tourism Administration in Owerri, Imo State

A structured query analysis was performed on a database of tourism-related information in Owerri, Imo State to provide insights that could aid in the proper administration of tourism in the area. The purpose of this analysis is to act as a decision support system that tourists can rely on to improve their experience.

The analysis included several sample queries to determine the location of various types of tourism-related facilities in relation to hotels. These queries were designed to provide insights on how close hotels are to various types of amenities that could be important to tourists. The sample queries include:

- Hotels within 100 meters of Entertainment centers: This query can provide information on how many hotels are located near places where tourists can go for entertainment and recreation.
- Hotels within 500 meters of Restaurants: This query can provide information on how many hotels are located near places where tourists can go to eat.
- Hotels within 500 meters of hospitals/healthcare centers: This query can provide information on how many hotels are located near healthcare facilities in case of emergency.
- Hotels within 500 meters of shopping malls: This query can provide information on how many hotels are located near shopping centers where tourists can buy souvenirs.

Overall, these sample queries were designed to provide insights based on the created database that can aid in tourism administration in Owerri, Imo State. They can help identify areas where there may be a high concentration of hotels, as well as areas where there may be a lack of hotels, which can help in identifying opportunities for development and growth.

3.3.1. Spatial Query to determine hotels within 50m of Roadside

Having hotels close to the road can be important for convenience and ease of access for travelers. It allows for easy transportation to and from the hotel, and can also make it more convenient for guests to explore nearby destinations. The importance of this query is that it reveals an aspect of the hotel distribution in Owerri, which is the proximity of hotels to the roadside. The location of hotels is a key factor in the tourism industry as it can affect tourists' accessibility, convenience, and overall experience.

Proximity to the roadside is important as it allows tourists to have easy access to the hotels and other tourism-related facilities via road transportation, which can enhance the overall experience. Additionally, the location of hotels can also affect the choice of a tourist destination, as tourists tend to prefer locations that are easily accessible.

Therefore, to determine hotels that are within 50m from the roadside, a selection by location was applied as shown in Figure 3.

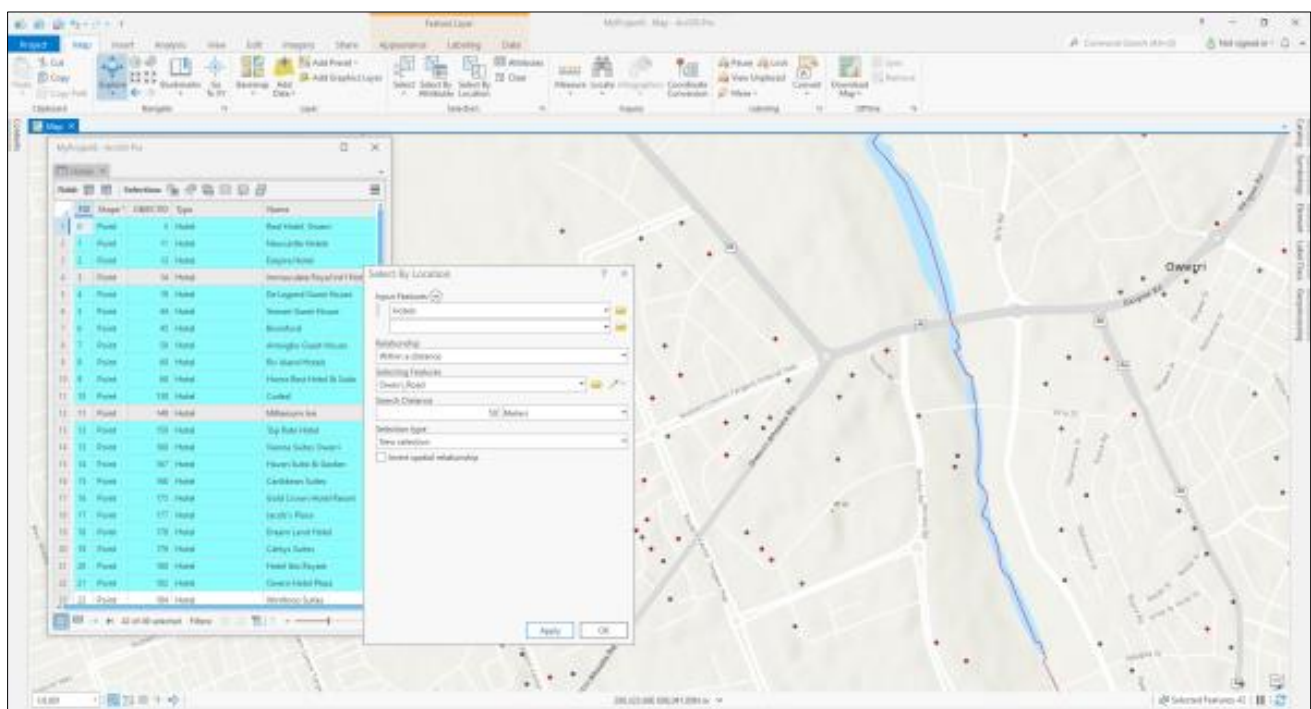


Figure 3 Selection by location to determine hotels within 50m from the road side

The query results show that a large majority of the hotels in Owerri, 85.71% to be precise, are located within 50 meters of the roadside. This suggests that these hotels are easily accessible by car or other forms of road transportation.

This information can provide a number of insights for tourism administration in Owerri. For example, it suggests that the city has a well-developed road infrastructure, which makes it easy for tourists to reach the hotels. Additionally, this proximity to the roadside could make it easier for tourists to explore the city and access other tourism-related facilities.

On the other hand, it is important to note that the hotels located close to the roadside could also be more prone to noise and pollution, which could be a negative factor for some tourists. This concentration could also lead to over-crowding and strain on local resources.

Overall, the query results reveal that the majority of the hotels in Owerri are located close to the roadside, which can provide convenience for tourists. However, if such a case appeal that a tourist does not want to be in any hotel that is 50m within the road side, they can always explore and pick from these hotels (millennium inn, Winthrop Suites, Immaculate Royal International Hotel, Immaculate Garden, Toprate Luxaury, Spanish Kingdom Suites and Shelvac) as they were more that 50m away from the roadside.

3.3.2. Spatial Query to determine hotels within 100m of Entertainment Centers

The query for hotels within 100 meters of Entertainment centers is important for tourism as it can provide insights into the accessibility and convenience of tourism-related facilities for tourists. The proximity of hotels to entertainment centers can affect tourists' overall experience, as it can make it easier for them to access and enjoy recreational activities.

Proximity to entertainment centers can also affect the choice of a tourist destination, as tourists tend to prefer locations that are easily accessible and offer a variety of recreational options. Additionally, the location of hotels in relation to entertainment centers can also affect the economic development of the area, as it can attract more tourists and generate more revenue for the local economy.

Furthermore, the query results can also provide insights into the potential for future development and growth in the tourism industry. For example, if the results show that there is a lack of hotels near entertainment centers, it could indicate an opportunity for new hotel developments in that area. In conclusion, the query results for hotels within 100 meters of Entertainment centers is important for tourism as it can provide insights into the accessibility and convenience of tourism-related facilities for tourists. It can also affect the choice of a tourist destination, economic development, and future development opportunities in the area. Therefore, to determine hotels that are within 100m from Entertainment centers, a selection by location was applied as shown in Figure 4.

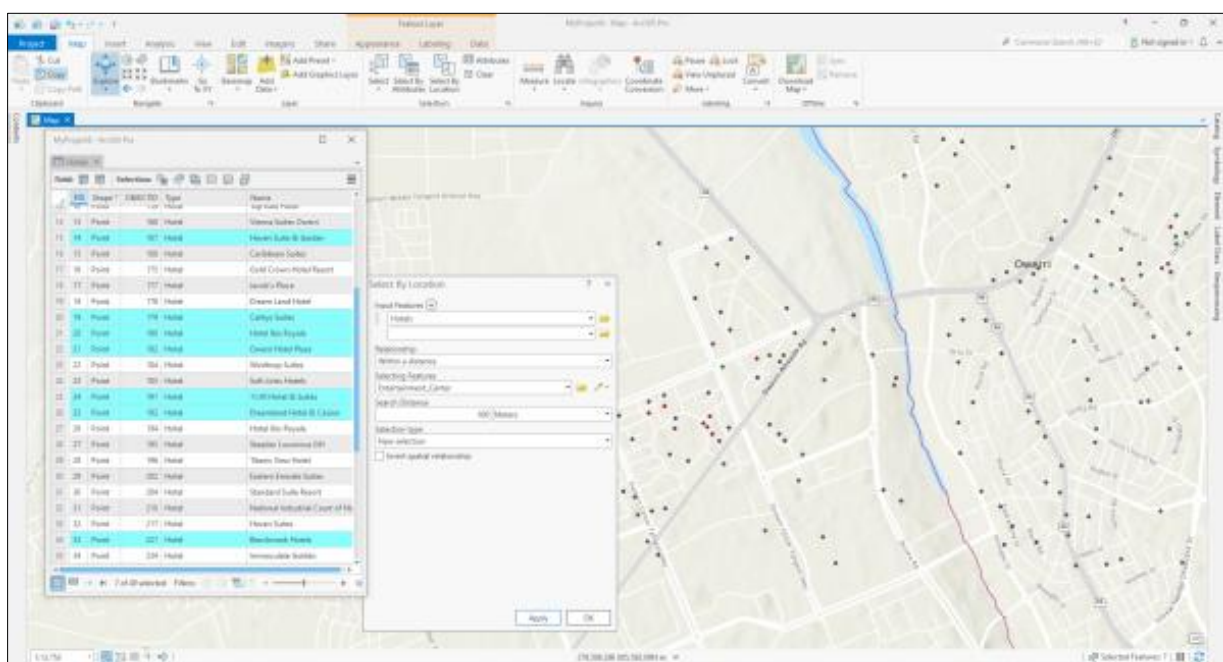


Figure 4 Selection by location to determine hotels within 100m of Entertainment Centers

The results of the query show that only 14.28% of hotels in Owerri are located within 100 meters of entertainment centers. This suggests that a relatively small number of hotels in the city are located close to places where tourists can go for entertainment and recreation.

This information can provide a number of insights for tourism administration in Owerri. For example, it suggests that while the city might have a good number of entertainment centers, the spatial distribution of the hotels might not align well with the entertainment centers, which may make it harder for tourists to access them. This could be a potential area for improvement as it could mean that tourists need to travel further to access these entertainment centers, which could be inconvenient and negatively impact their experience.

Additionally, this low percentage of hotels located near entertainment centers could mean that there is a lack of development in this area, which could lead to less tourism and less economic benefits for the city.

It is important to note that the location of hotels can be influenced by various factors, such as zoning regulations, land use, and accessibility. These factors may have played a role in the relatively low percentage of hotels located near entertainment centers in Owerri. Further research could be done to understand the underlying causes of this pattern and how it might affect tourism in the city.

Overall, the results of the query indicate that only a small percentage of hotels in Owerri are located near entertainment centers, which could be an area for improvement for tourism administration in the city.

3.3.3. Spatial Query to determine hotels within 500m of Restaurants

The query for hotels within 500 meters of Restaurants is important for tourism as it can provide insights into the accessibility and convenience of tourism-related facilities for tourists. The proximity of hotels to restaurants can affect tourists' overall experience, as it can make it easier for them to access food options and enhance their dining experiences.

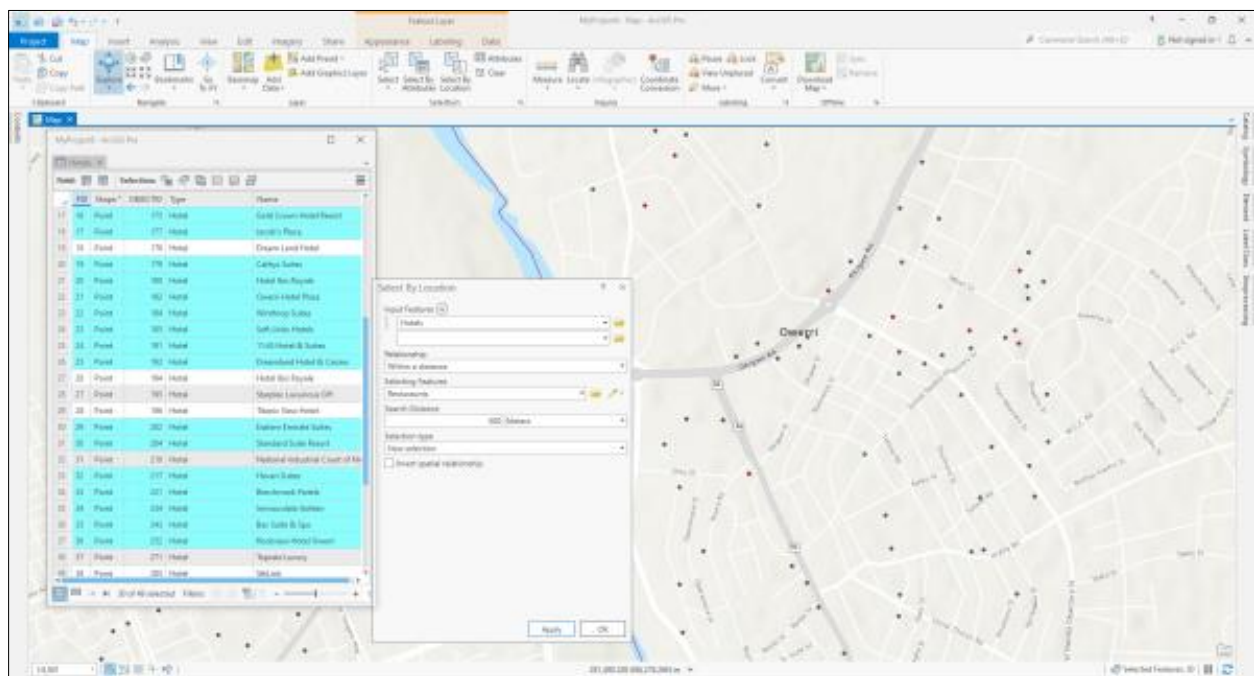


Figure 5 Selection by location to determine hotels within 500m of Restaurants

Proximity to restaurants can also affect the choice of a tourist destination, as tourists tend to prefer locations that are easily accessible and offer a variety of food options. Additionally, the location of hotels in relation to restaurants can also affect the economic development of the area, as it can attract more tourists and generate more revenue for the local economy.

The query results for hotels within 500 meters of Restaurants is important for tourism as it can provide insights into the accessibility and convenience of tourism-related facilities for tourists. It can also affect the choice of a tourist

destination, economic development, and future development opportunities in the area. Therefore, to determine hotels that are within 100m from restaurants, a selection by location was applied as shown in Figure 5.

The results of the query show that 61.22% of hotels in Owerri are located within 500 meters of restaurants. This suggests that a relatively large number of hotels in the city are located close to places where tourists can go to eat.

This information can provide a number of insights for tourism administration in Owerri. For example, it suggests that the city has a well-developed food and dining infrastructure, which makes it easy for tourists to reach the restaurants. Additionally, this proximity to restaurants could make it easier for tourists to find a variety of food options and enhance their dining experiences.

3.3.4. Spatial Query to determine hotels within 500m of Hospitals/Healthcare Centers

The query for hotels within 500 meters of hospitals/healthcare centers is a crucial aspect of the tourism industry, as it highlights the availability and accessibility of healthcare facilities for tourists. This proximity can greatly impact the overall experience of tourists, providing them with quick and easy access to healthcare in case of emergencies, illnesses, or injuries. In case of any emergency tourists should be able to reach the nearest healthcare center within a reasonable time.

The location of hotels in relation to hospitals and healthcare centers can also play a significant role in a tourist's decision-making process when choosing a destination. Tourists tend to prioritize locations that offer easy access to healthcare facilities, as it adds an extra layer of security for their trip. Additionally, it is important for tourist destinations to have well-equipped hospitals and healthcare centers in case of any emergency as it can also help attract more tourists who are looking for safe and well-maintained places to visit. Furthermore, this proximity can also have a positive impact on the local economy as it can attract more tourists and generate more revenue for the area.

The query for hotels within 500 meters of hospitals/healthcare centers is a vital aspect of the tourism industry, it provides crucial information on the accessibility and availability of healthcare facilities for tourists. It also plays a significant role in the decision-making process of tourists, economic development, and potential for future growth opportunities. It is important for tourist destinations to have well-equipped hospitals and healthcare centers as it can help attract more tourists, improve the overall experience and ensure. Therefore, to determine hotels that are within 500m from hospitals/health centers, a selection by location was applied as shown in Figure 6.

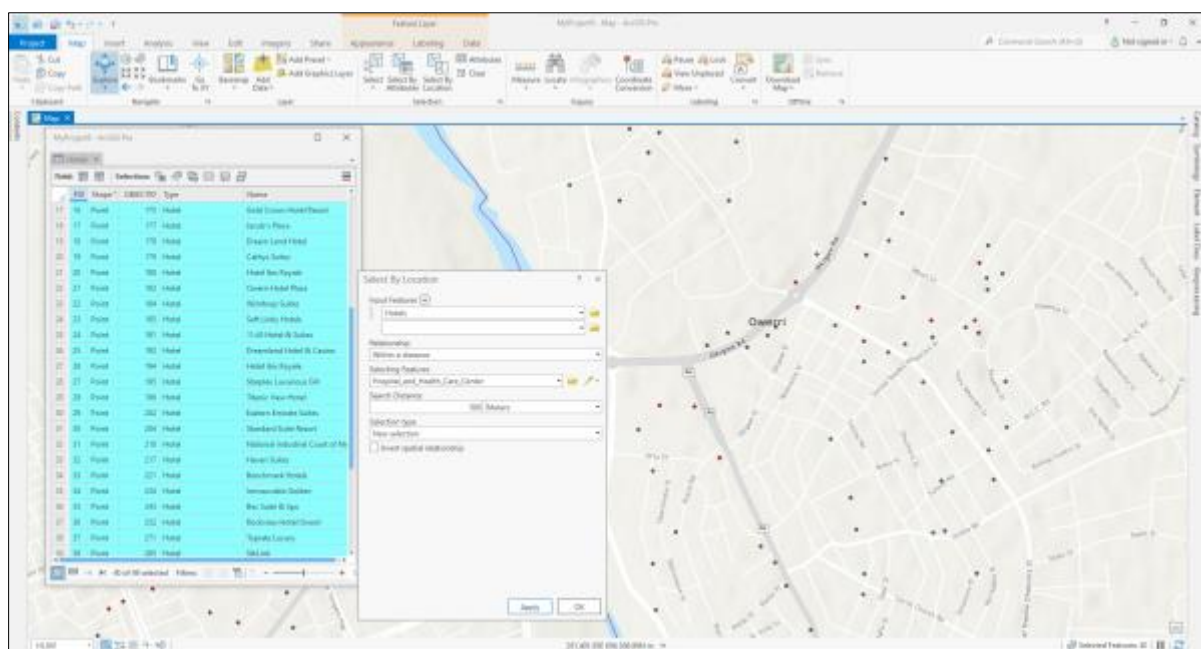


Figure 6 Selection by location to determine hotels within 500m of Hospital/Healthcare Centers

The results of the query show that 81.63% of the hotels in Owerri were within 500m of hospital/healthcare centers, this indicates that majority of the hotels in Owerri are located within 500 meters of hospital/healthcare centers.

Proximity to healthcare centers is an important consideration for both tourists and hotel operators. For tourists, being located near a hospital or healthcare center can provide peace of mind and easy access to medical care in case of emergency or illness. This can be especially important for tourists with pre-existing medical conditions or travelers visiting a foreign country where they may not be familiar with the healthcare system. Additionally, proximity to healthcare centers can also be a factor in attracting business travelers, as they may need to access medical care during their stay.

For hotel operators, proximity to healthcare centers can be a competitive advantage as it can attract guests who value this feature. In a study conducted by the Journal of Travel Medicine, researchers found that proximity to healthcare facilities was one of the top three factors considered by tourists when choosing a hotel. This study also found that tourists are willing to pay a premium for hotels that are located near healthcare centers.

In conclusion, this result suggests that a majority of the hotels in Owerri are located in proximity to healthcare centers, which can provide a competitive advantage for the hotel operators and peace of mind for the tourists.

3.3.5. Spatial Query to determine hotels within 500m of shopping malls

The location of hotels in relation to shopping malls can be a significant factor for many tourists, as it offers them convenient access to a variety of shopping options, dining and other amenities. Tourists who enjoy shopping may prioritize staying in a hotel that is located within close proximity to a shopping mall, so that they can easily access the mall during their stay. This can be especially appealing for tourists who are traveling to a new city and want to make the most of their time by being able to shop and explore different areas without having to travel far.

Moreover, the convenience of having a shopping mall nearby can also save tourists time and money by reducing the need for transportation, which can be especially beneficial for those who are traveling on a budget. Additionally, staying in a hotel near a shopping mall can also provide a sense of safety and security for tourists, as they can be surrounded by a bustling and well-lit area.

Therefore, to determine hotels that are within 500m from shopping malls, a selection by location was applied as shown in Figure 7.

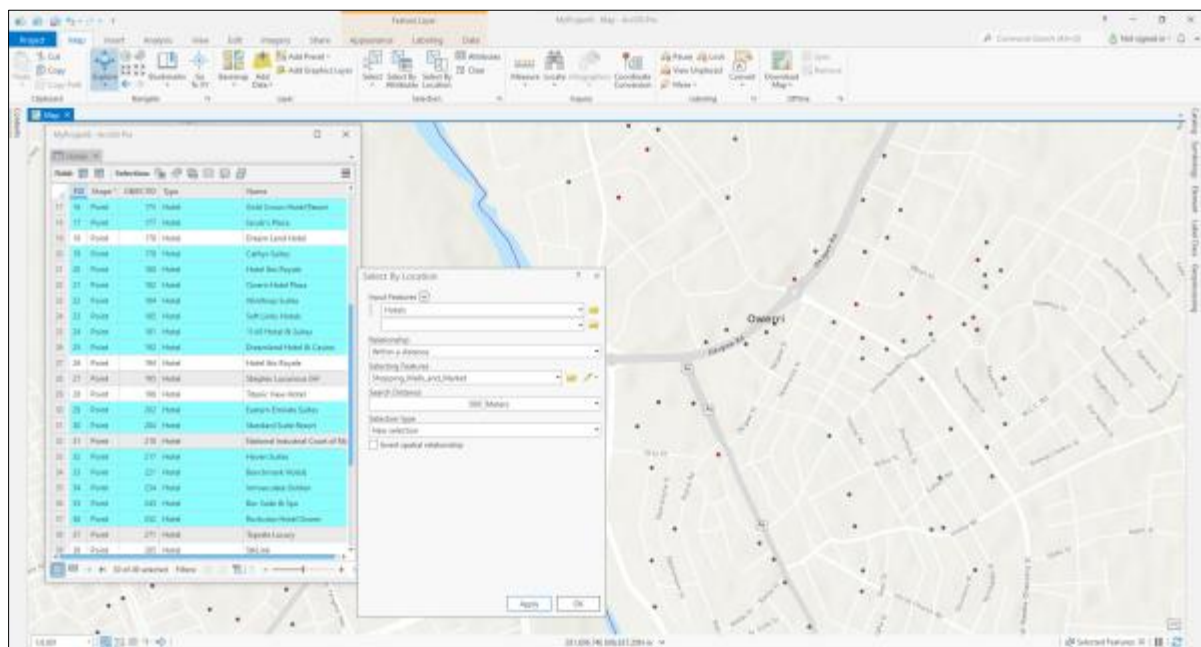


Figure 7 Selection by location to determine hotels within 500m shopping malls

From Figure 7, the data shows that 61.22% of hotels in Owerri are within 500 meters of shopping malls, indicating that a majority of hotels in the area are located close to shopping centers.

The majority of hotels in the area being located near shopping centers suggests that Owerri has a well-developed retail infrastructure which could attract tourists, who are looking for easy access to shopping and entertainment options during their stay. This could also make the area more attractive for business travelers as well as leisure travelers.

Furthermore, since proximity to shopping centers is one of the top factors considered by tourists when choosing a hotel, this could make Owerri more competitive in attracting tourists compared to other destinations in Nigeria. This, in turn, could lead to an increase in tourism and economic benefits for the area.

Additionally, proximity to shopping centers can also be a competitive advantage for hotel operators, as it can attract guests who value this feature and are willing to pay a premium for hotels that are located near shopping centers. This can help hotel operators to increase their revenues and improve their business performance.

3.3.6. Spatial Query to determine hotels with Affordable Price Range

Affordable price range of hotels is considered to be an important factor for tourism because it allows a wider range of travelers to be able to afford to stay in a hotel and enjoy the amenities and services it offers. Affordable prices can make a destination more accessible for budget travelers, families, and students, which can increase the number of tourists visiting the area.

When tourists are looking for a hotel, price is often one of the most important factors they consider. They tend to compare prices and look for deals and discounts. According to a study by the Journal of Travel Research, "price" was found to be the most important factor for travelers when choosing a hotel. This means that tourists are more likely to choose a hotel that fits their budget over one that may have more amenities or is located in a more desirable area.

Additionally, affordable hotel prices can also help to increase the overall number of tourists visiting an area. This can lead to an increase in demand for other tourism-related services such as restaurants, transportation, and attractions, which can boost the local economy.

Hotels with affordable price range play an important role in tourism because they allow a wider range of travelers to be able to afford to stay in a hotel and enjoy the amenities and services it offers and this can help to increase the overall number of tourists visiting an area and boost the local economy. Therefore, to determine hotels that are within the affordable ₦15,000 - ₦10,000 price range, a query was performed using the statement (SELECT * FROM Hotels WHERE "Price" ≤ 15,000' as shown in Figure 8.

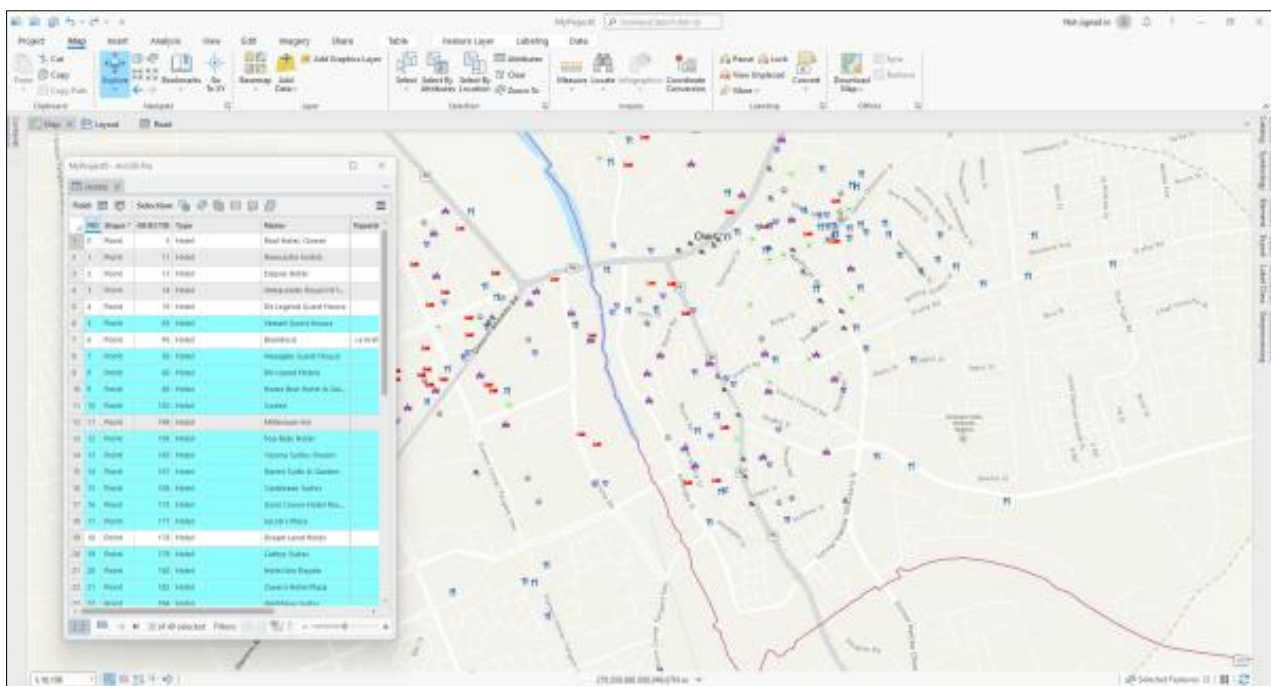


Figure 8 Spatial Query to determine hotels within Affordable Price Range

The query results revealed that 63.26% of hotels in Owerri were in the affordable range of between ₦15,000 to ₦10,000. This indicates that a majority of hotels in Owerri are within the affordable price range of between ₦15,000 to ₦10,000, which can have a significant impact on the tourism industry in the area. This can be seen as a positive factor for tourism in Owerri as it allows a wider range of travelers to be able to afford to stay in a hotel and enjoy the amenities and services it offers.

It is well known that price is often one of the most important factors that tourists consider when choosing a hotel. According to a study by the Journal of Travel Research, "price" was found to be the most important factor for travelers when choosing a hotel. This means that tourists are more likely to choose a hotel that fits their budget over one that may have more amenities or is located in a more desirable area. Therefore, having a majority of hotels in the affordable price range can attract more budget-conscious travelers, which can increase the number of tourists visiting the area.

Furthermore, affordable hotel prices can also help to increase the overall number of tourists visiting Owerri, which can lead to an increase in demand for other tourism-related services such as restaurants, transportation, and attractions, which can boost the local economy. This can have a positive impact not just on the hotel industry but also on other related industries such as food, transportation, and entertainment.

Overall, the fact that a majority of hotels in Owerri are in the affordable price range of between ₦15,000 to ₦10,000 can be considered as a positive factor for the tourism industry in the area as it allows a wider range of travelers to be able to afford to stay in a hotel and enjoy the amenities and services it offers, and also it can help to increase the overall number of tourists visiting Owerri, which can lead to an increase in demand for other tourism-related services, and boost the local economy.

3.4. Multi-Media GIS Hyperlink

Hyperlinks were added during the creation of the multi-media GIS database. Hyperlinks in a multi-media GIS for tourism can provide a rich and interactive experience for users by allowing them to access additional information and resources related to a specific location or feature. This can include photos, videos, historical information, and even virtual tours. Hyperlinks can also connect users to external websites, such as hotel or restaurant reviews, and allow them to make reservations or bookings directly from the GIS. By providing a seamless and intuitive way to access relevant information, hyperlinks can enhance the overall user experience and increase the utility of the GIS for tourism purposes. To demonstrate the role of multi-media GIS database in tourism, a hyperlink query is performed on one of the hotels in Owerri in order to access further the website, online booking, and the hotel pictures. This is shown in figures 9, 10 and 11

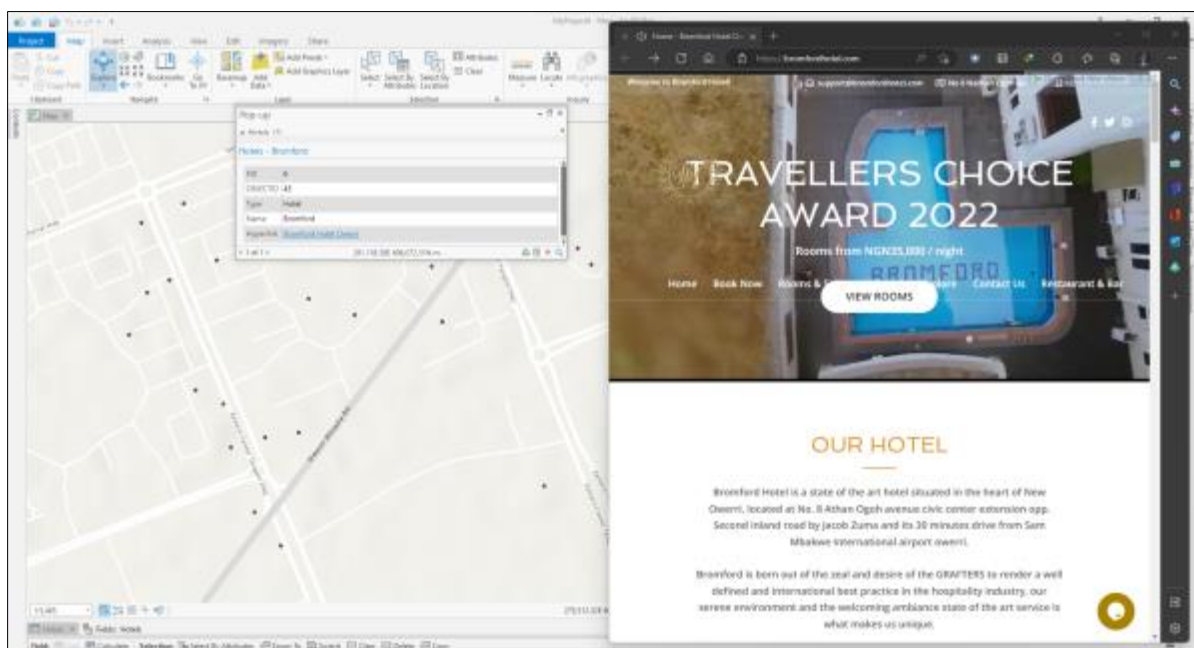


Figure 9 Hyperlink to view Bromford Hotel Owerri Website

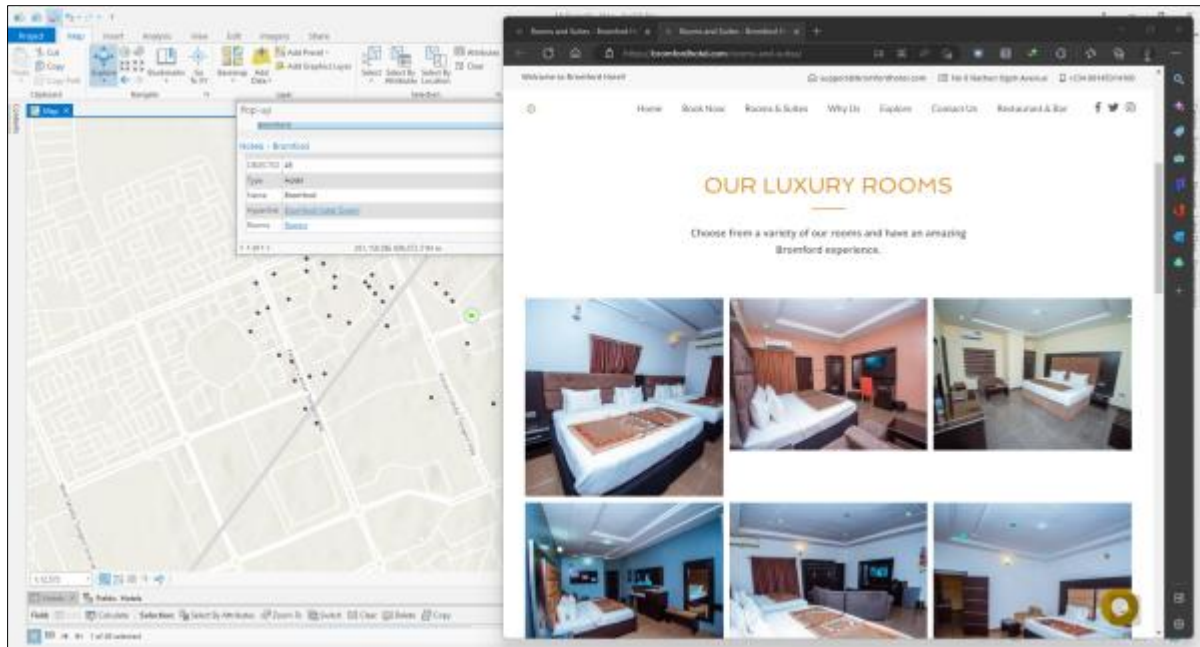


Figure 10 Hyperlink to show Bromford Hotel Owerri Rooms

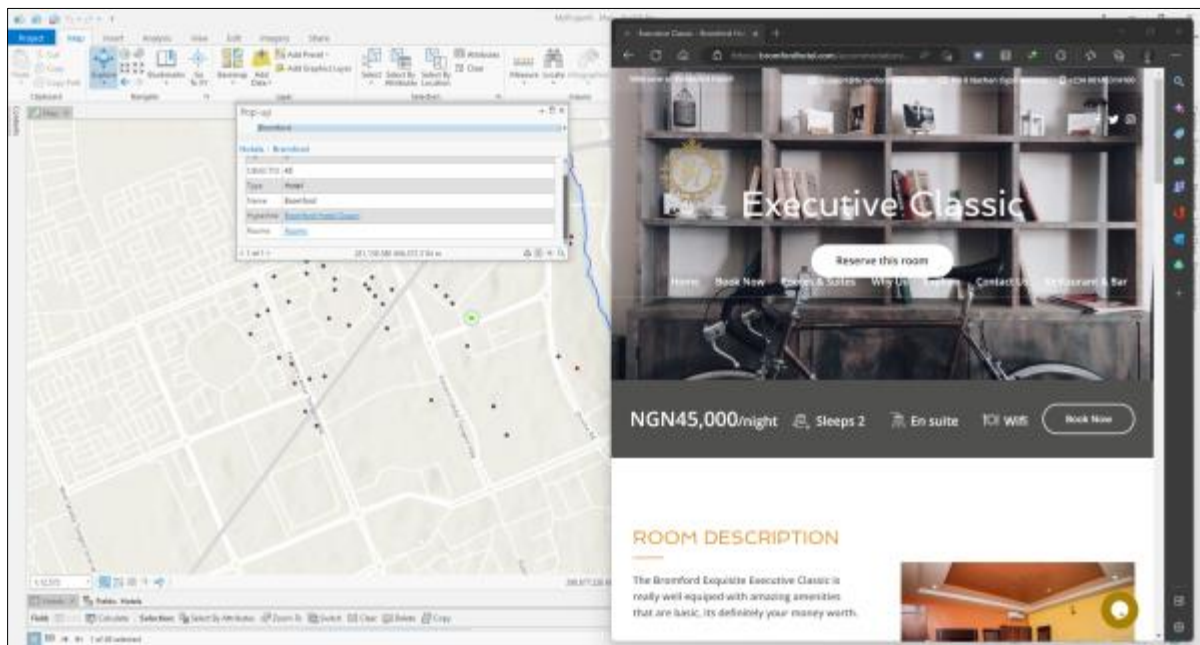


Figure 11 Hyperlink for Booking Bromford Hotel Owerri Rooms

Evidently, as seen in Figure 4.9, 4.10 and 4.11, Hyperlinks are important for tourism in Owerri, as they can provide potential visitors with easy access to information about the area's attractions, accommodations, and events. This can make it easier for people to plan their trips and can also increase the visibility of Owerri as a tourist destination. Additionally, hyperlinks can also help to connect visitors with local businesses and organizations that can provide additional information or services related to tourism. Overall, hyperlinks can be a useful tool for promoting tourism in Owerri and can help to attract more visitors to the area.

4. Conclusion

The study aimed to map tourism infrastructure in Owerri Imo State using a multi-media GIS approach, it showed that Owerri, Nigeria appears to be a well-rounded and well-equipped destination for tourists, with a variety of infrastructure in place to accommodate the needs of travelers. Leisure and entertainment are the most dominant category of tourism in the city, and hotel and religious centers also have a significant presence. However, there is room for improvement in certain areas, such as post office, security, park, and market, which could make the city more attractive to tourists. The spatial distribution of tourism infrastructure in Owerri is clustered, meaning that tourist sites are mostly located close to each other. This could be beneficial for tourists as it allows them to easily move from one spot to another. Additionally, a majority of hotels in Owerri are relatively affordable, with 63.26% falling within the price range of ₦15,000 to ₦10,000, which can make the city more attractive to a wider range of travelers. Overall, the findings suggest that tourism in Owerri has the potential to grow and thrive with some improvements in key areas.

Recommendations

Based on the analysis of tourism infrastructure in Owerri, Nigeria, the following recommendations can be made:

- Encourage the development of more entertainment centers near hotels to enhance the tourist experience.
- Promote the clustering pattern of tourist places in the city as it allows tourists to easily move from one spot to another.
- Develop strategies to maintain the relatively affordable price range of hotels in the city which can make the city more attractive to a wider range of travelers.
- Promote and market the city as a destination for leisure, religious and hotel tourism to attract more tourists and enhance the tourism industry.
- Develop comprehensive tourism management plan to ensure the city's infrastructure is well-suited for various types of tourism and to continuously improve the tourist experience in the city.
- The multi-media database approach used in this study is recommended as a decision support system in tourism infrastructure monitoring and management in Owerri, Imo State.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest regarding the research, authorship and publication of this paper.

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