# Application of Geographical Information System (GIS) Technology to Tourism Management in Ile-Ife, Osun State, Nigeria.

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## ABSTRACT

Osun State of Nigeria is highly endowed with tourism resources and potentials. These tourism resources and potentials are located in the nooks and crannies of the state. However, larger numbers of these tourist centers are located in Ile-Ife, the cradle of the Yoruba race.

These resources have been greatly under-utilized as a result of lack of information. Even where information is available, it is very scanty, obsolete, and devoid of proper records to ensure any meaningful management. This paper demonstrates the use of Geographical Information System (GIS) technology to tourism management using Ile-Ife as a pilot study. A major strength of this paper is the use of GIS techniques to create awareness of the existence of the tourist attraction centers to the prospective visitors.

The base map of the study area was scanned, georeferenced, and all features were digitized layer by layer using ILIWIS 3.2 version software. Map layers were exported from ILIWIS 3.2 version to ArcView GIS 3.2a software for the creation, integration, manipulation and visualization of cartographic database. Spatial database was designed and created by conceptualizing the realities relating to Tourist centres into vector model. The model was implemented with a relational database structure. The results of the GIS analysis were presented in the form of tables and derived maps.

(Keywords: tourism, management, database, Geographic Information System, prospective visitors)

## INTRODUCTION

Tourism is a service industry that takes care of visitors when they are away from home. Also, tourism is defined as sum of the phenomenon and relationships arising from the interaction of tourist and host communities in the process of attracting and hosting these tourists, and other visitors (Fadahunsi, 2003). This definition shows that tourism is interactive in nature. There are basically three broad types of tourism. They are; Cultural, Ecological and Religious (Aremu, 2001).

**Cultural tourism:** Implies people traveling to another destination to enjoy what other cultures provide in entertainment or activity (e.g. annual Orisa Ogiyan Festival at Ejigbo in Osun State, Nigeria).

**Ecological tourism** (Ecotourism): It involves visiting natural sites not grossly altered by human activity or intervention (e.g. Borgu Forest Reserves).

**Religious tourism**: Implies mass movement of people, with a view to visiting places of worship or ritual offerings (e.g. Olojo Festval in Ile-Ife) (Adesina, 2003).

Furthermore, Middleton (2000) classifies Tourism as follows: Inbound Tourism, Outbound Tourism, and Domestic Tourism.

**Inbound Tourism**: International visitors, traveling as visitors to other countries.

**Outbound Tourism**: Residents of a country, traveling as visitors to other countries.

**Domestic Tourism**: Residents visiting destination within their own country's boundaries.

## Economic Importance of Tourism

According to Germany Tourism Development, (2001), in 2001, the number of jobs in the international Tourism industry was 200 million worldwide. According to forecasts by the World Travel and Tourism Council this figure is expected to increase by 25 % to 250 million jobs by 2015. Sales are also predicted to increase from 4.1 billion US dollars in 2001 to 8.6 billion US dollars in 2015. Worldwide international arrivals are expected to increase by 46 % to 1 billion in the year 2015. Tourism not only remains an important economic factor, it is also the number one growth sector in the quest for achieving a leading economy.

In order to develop its tourism industry, a country must decide on a campaign of internal and external promotion, and must pay strict attention to the development of its own tourist facilities like hotel accommodation and transport, aside from the tourist sites. External promotion often means developing the image of country abroad by stressing its attractions. The tourism information must then be relayed to the public, making them of the attractions and the feasibility of travel (Aboyeji and Odedare, 2000).

However, tourism has a major revenue generation sector has not been fully tapped in Nigeria. This is because we failed to see the potentials in the tourist industry. It has been proved through research that tourism alone if property harnessed could earn the nation more than what the nation is currently earning from the crude oil (Adedunrin, 2000).

## THE NEED FOR GEOGRAPHICAL INFORMATION SYSTEM FOR MANAGING TOURIST INDUSTRY

Geographic Information Systems (GIS) are computer systems that records, stores, and analyzes information about the features that make up the earth's surface (Fadahunsi, 2010). It is a computerized system for capturing, storing, checking, integrating, manipulating, analyzing and displaying data which are spatially referenced to the earth (Kufoniyi, 1999). An ideal GIS defines spatial relationships among all data elements, in term of how linear features are connected, how areas are bounded, which areas are contiguous, etc.

A GIS is a special type of information system where space, location and its attributes constitute the crucial points of reference. Essentially, it may be defined as “a computer assisted system for digital storage of maps, along with tabular data associated with map features, that permit the user to produce customized maps, perform specialized database queries, analyze complex relationships, apply models, and assist in decision making’’. GIS gives expression to spatial data and hence represent mechanisms for handling spatial digital data. In a local government system, GIS becomes useful when it is possible to collect and assemble data over very small area units that carry significant interpretations for spatial development (Ayeni, 2005).

A typical GIS supports the management of spatially referenced resources. This is why Cowen (1990) defines it as decision support system involving the integration of spatially referenced data for decision making in a problem-solving environment. By this, it can be inferred that GIS is seen as a decision support tool, which has hardware, software, spatial database and procedure and expertise as its components.

Using GIS as decision-making tool, it is possible for resources managers to perform queries and analysis on complex and large volume of spatial and non-spatial data. These operations are usually more cost effective, accurate and faster than manual analysis, especially in situations where large volume of diverse data is involved.

The amount of data captured, stored and displayed determines the levels of awareness of the tourist attractions. The information can only be generated, well-packaged and presented by an information system which is known to be computerized system for creating, storing, manipulating and communicating information that are spatially referenced (Ayeni, 1999).

In any GIS application, there are three main interrelated subsystems, these are data acquisition, database management and information presentation subsystems.

The data acquisition subsystem consists of appropriate hardware, software and procedure for collecting and/or processing spatial data using automated land surveying, analytical/digital photogrammetry, remote sensing, manual digitizing, and/or scanning methods. The database management subsystem deals with the

storage, manipulation, analysis and retrieval of data acquired, using relevant hardware, software and procedure. And, the information presentation subsystem is concerned with the visualization and reporting of information in graphic and/or alphanumeric form using appropriate hardware and software components of the system (Kufoniyi, 1998).

Among the benefits of using GIS to manage Tourist centers in the study area are to create awareness of these tourist centers, to improve the management methodology of the tourism industry and effectiveness in the policy and decision making by the government.

## AIM AND OBJECTIVES

The aim of this study is to demonstrate how GIS technology can be used to manage Tourist centers using Ile-Ife as pilot study. The specific objectives are:

a. To make an inventory of existing Tourist infrastructures in Ile-Ife; and

b. To provide awareness of the existence of Tourist centers in Ile-Ife to the prospective visitors.

## THE STUDY AREA

Ile-Ife, the study area, is renowned as the cradle of Yoruba and an ancient artistic culture. Ile-Ife is located in Osun State of South-Western part of Nigeria. The Town has two Local Government Areas, namely, Ife Central and Ife East Local Government Areas. The town is situated on the tropical rainforest belt. The city lies between Latitudes $7^0$ 15'N and $7^0$ 31'N and Longitudes $4^0$ 30'E and $4^0$ 45'E. Ile-Ife has a humid tropical climate with wet season between March–October and dry season between November-February. The study area covers about 22.96km$^2$. It is situated on elevation of about 270m above mean sea level.

Ile-Ife is a network of interrelated group with different socio-economic targets. Initially, Ile-Ife was a kingdom believed to be the ancestral home of the Yorubas, hence they refer to Ile-Ife as the cradle of Yoruba race (Fabunmi, 1985). Ile Ife has many Tourist attractions, some of them are: Ife Museum, Oranmiyan Staff, Olokun Grove, Yemoo Grove, Obalufon Shrine Oduduwa Shrine and Olurogbo Shrine

## METHODOLOGY

### Hardware and Software

The hardware that were employed for this study are: Pentium IV computer with 20 Gigabyte hard disk, 256-megabyte random access memory with 733 mega Hertz clock speed, 15 inches monitor, Hp Deskjet D2300 printer and A3 scanner while the software used are ILIWS 3.2a and ArcView GIS 3.2a version (Sun, 1999). ILIWS 3.2a was for data capture while ArcView was for data analysis and presentation.

### Data Acquisition

A tourist map of the study area was used. In order to give a picture of the identified Tourist Centers in the study area, a hand held Global Positioning System (GPS) receiver was used to obtain coordinates of all the newly identified Tourist Centers. At the same time, attribute data such as type, owner, tourist name location and specific attraction of each of the Tourist Centers were obtained from Curators of the centers.

### Creation of Spatial Database

The Tourist Centers GIS database was structured to follow a relational database model format. The core of the database, the spatial component, was developed using ILWIS software while ArcView GIS software was used as a front-end development platform for enhance cartographic presentation and visualization. The summary of the procedure followed in the development of the spatial database included the following:

a. Acquisition of the map of Ile-Ife.

b. Field checking to determine the reliability of the map.

c. Converting of the analogue map into digital format by scanning, georeferencing and digitizing.

d. Editing to remove errors.

e. Cartographic presentation.

In order to provide enhanced cartographic representation, the digital map was further developed using ArcView GIS software. Labels and suitable graphic symbols were assigned to the various features for easy categorization, identification and visualization. Finally, composite digital maps were produced.

## DATA ANALYSIS AND RESULTS

The databases created (Tables 1 and 2) were subjected to a number of spatial queries and analysis to assess the effectiveness of the GIS technology as a tool for managing Tourism industry. These queries and analysis would be useful for decision makers in performing their day-to-day management of Tourism industry in the study area.

**Table 1:** Database of Ile-Ife Tourist Centers.

| TYPE | OWNER | TOURIST NAME | LOCATION | SPECIFIC ATTRACTIONS | LOCAL GOVERNMENT |
|---|---|---|---|---|---|
| Natural | FGN | OAU Natural History Museum | OAU Campus | Archaeological artefacts | Ife Central |
| Religion | Community | Obalufon shrine | Obalufon Road | Obalufon Shrine | Ife Central |
| Natural | FGN | Ife Museum | Enuwa | Archaeological artefacts | Ife East |
| Cultural | Community | Oranmiyan Staff | Moopa Area | Oranmiyan Staff and Grove | Ife East |
| Religion | Community | Ijugbe Shrine | Famia Road | Ijugbe Shrine | Ife East |
| Religion | Community | Oduduwa shrine | Oduduwa Street | Oduduwa Grove and Shrine | Ife Central |
| Cultural | Community | Elesu post hero pavement | Eleyele Area | Elesu pavement | Ife Central |
| Cultural | Community | Yemo post hero pavement | Ilesa Road | Yemo pavement | Ife East |
| Cultural | Community | Yemo pottery museum | Ilesa Road | Objects made of clay | Ife East |
| Cultural | Private | Suberu carving workshop | Ilesa Road | Ancient Art works | Ife East |
| Religion | Community | Orafe shrine | Ayegbaju Area | Orafe shrine | Ife East |
| Religion | Community | Esu Ilare shrine | Ilare Area | Esu Ilare Shrine | Ife Central |

*Source: Author's Field Survey (January, 2010)*

**Table 2:** Database of some Hotels in Ile-Ife.

| NAME | NO OF ROOMS | MINIMUM COST/ROOM | MAXIMUM COST/ROOM | TELEPNONE | *GENERATOR* | *AIR CONDITIONER* | LOCATION ADDRESS | LOCAL GOVERNMENT |
|---|---|---|---|---|---|---|---|---|
| Diganga Hotel | 70 | 1200 | 5000 | Yes | Yes | Yes | Along Ibadan Road. | Ife Central |
| Conference Centre | 69 | 1500 | 8000 | Yes | Yes | Yes | OAU Campus | Ife Central |
| Mayfair Hotel | 25 | 1800 | 5250 | Yes | Yes | Yes | NITEL Road, Mafair Area | Ife Central |
| Hilton Hotel | 14 | 1760 | 4710 | Yes | Yes | Yes | NITEL Road, Mafair Area | Ife Central |
| Women Hostel | 25 | 500 | 750 | No | No | No | Along Ede Road | Ife Central |
| Celebration Hotel | 20 | 1750 | 2750 | Yes | Yes | Yes | Eleyele Road | Ife Central |
| Motel Royal | 25 | 1200 | 4500 | No | No | No | Along Ede Road | Ife Central |
| Trans Hotel | 30 | 1200 | 4750 | Yes | Yes | No | Off Ibadan Road | Ife Central |

*Source: Author's Field Survey (January, 2010)*

Five examples of information that can be derived from spatial database created for these tourist centers are discussed in the Table 3 and Maps 1, 2, 3, and 4. For example, to select the hotels whose rooms are greater than 25 and whose average cost per room is less than 3000 Naira. The result of the query is in the forms Table 3 and Map1. ArcView GIS 3.2 version software was used for these spatial queries and analysis.

Table 3 shows the result of query by building multiple query conditions in one query expression. The expression used is:

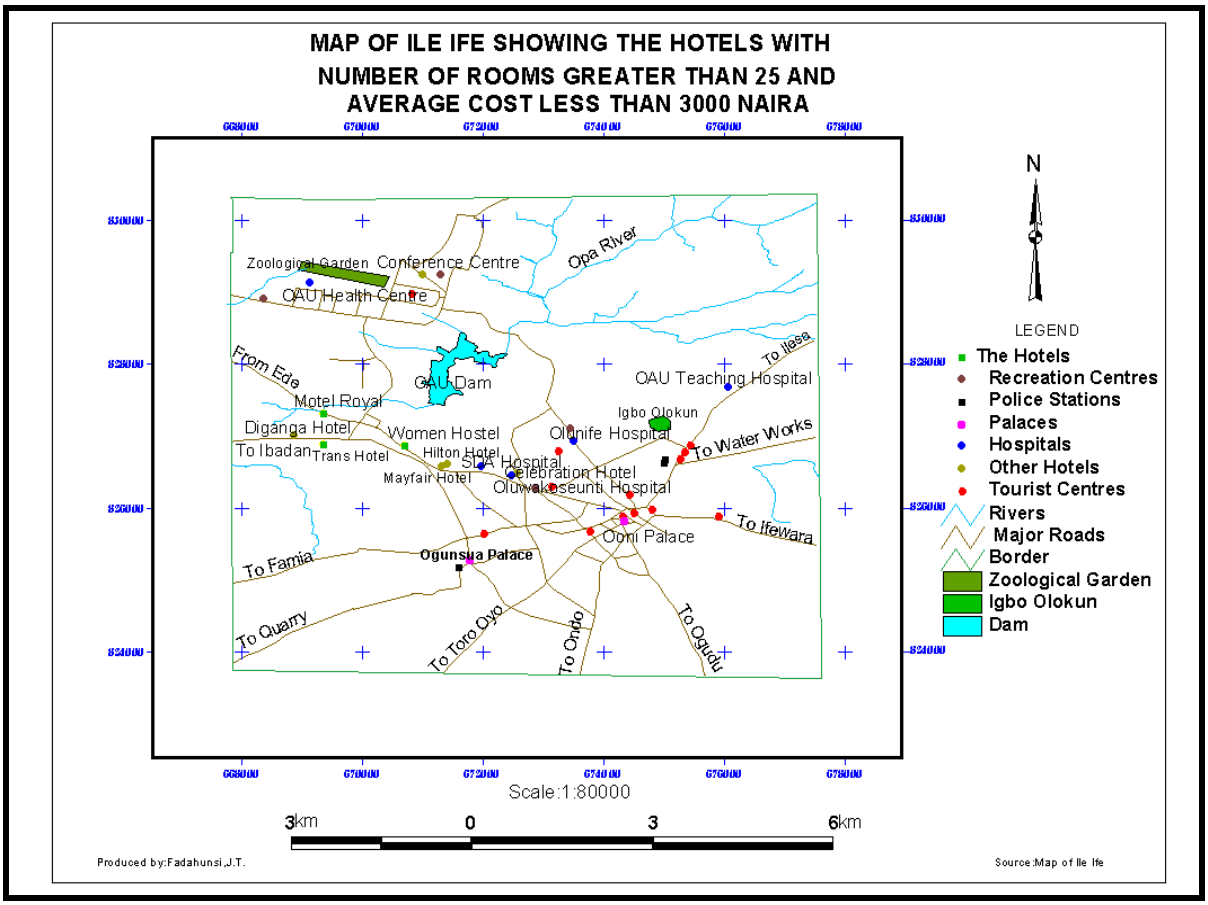
([No_room]>25) and ([AvCost/rm] <3000).

This type of expression is called *Boolean operation.*

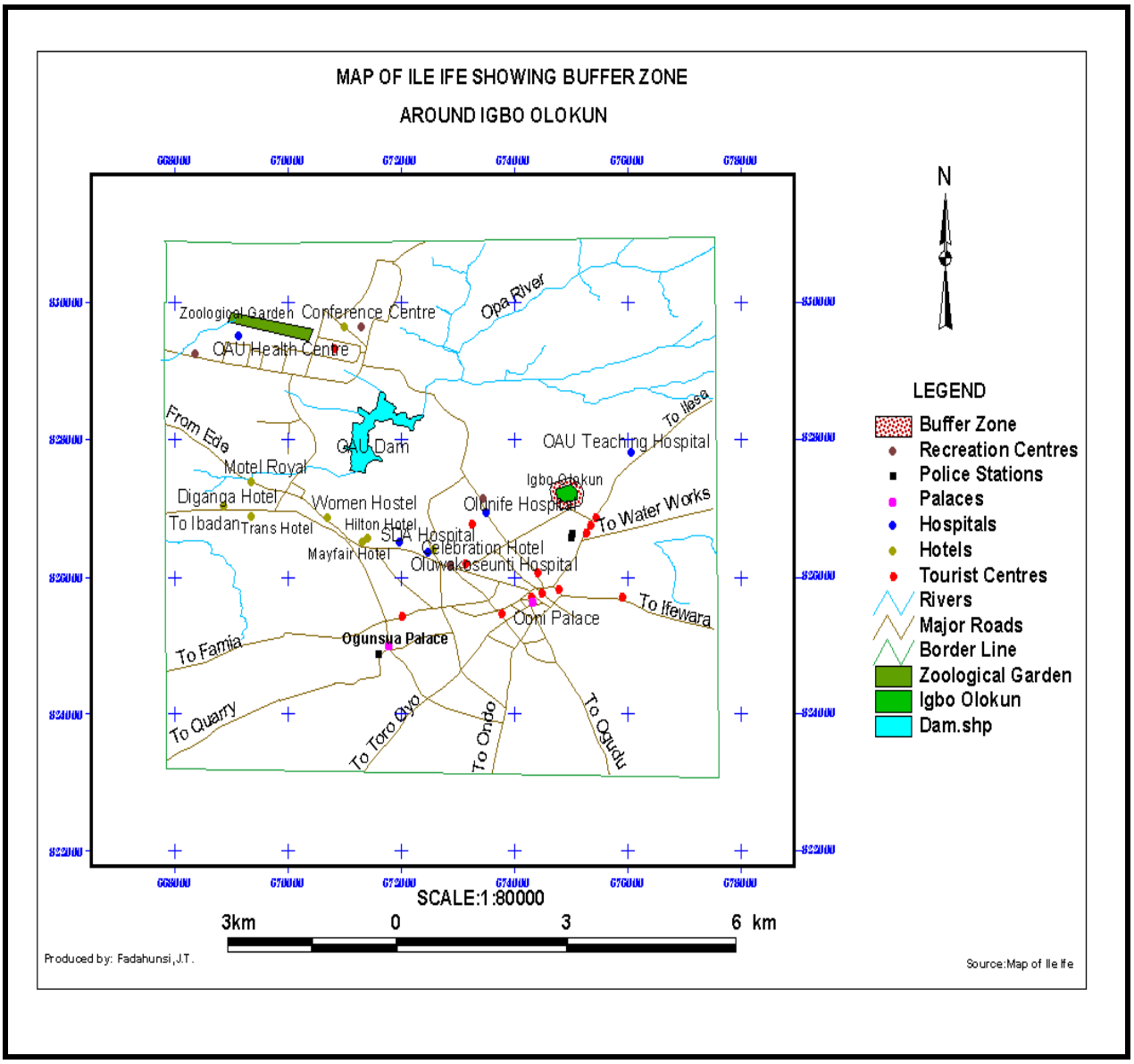
**Table 3:** Hotels with more than 25 rooms and Cost per Room not more 3000 Naira/Night.

ttributes of Ife hotels.shp

| Ife hotels | No_room | Micost_m | Macost_m | AvCost/rm | Tel | Genset | A_c | Address |
|---|---|---|---|---|---|---|---|---|
| Diganga_hotel | 70 | 1200 | 5000 | 3100 | | Yes | Yes | NITEL Road,Lagere Area |
| Conference Centre | 69 | 1500 | 8000 | 4750 | | Yes | Yes | OAU Campus |
| Mayfair_Hotel | 25 | 1800 | 5250 | 3525 | | Yes | Yes | Along Ibadan Road |
| Hilton | 14 | 1760 | 4710 | 3235 | | Yes | Yes | NITEL Road,Lagere Area |
| Women_Hostel | 25 | 500 | 750 | 625 | | No | No | Along Ede Road |
| Celebration_Hotel | 20 | 1750 | 2750 | 2250 | | Yes | Yes | Eleyele Road |
| Motel_Royal | 25 | 1200 | 4500 | 2850 | | No | No | Along Ede Road |
| Trans_Hotel | 30 | 1200 | 4750 | 2975 | | Yes | No | Off Ibadan Road |



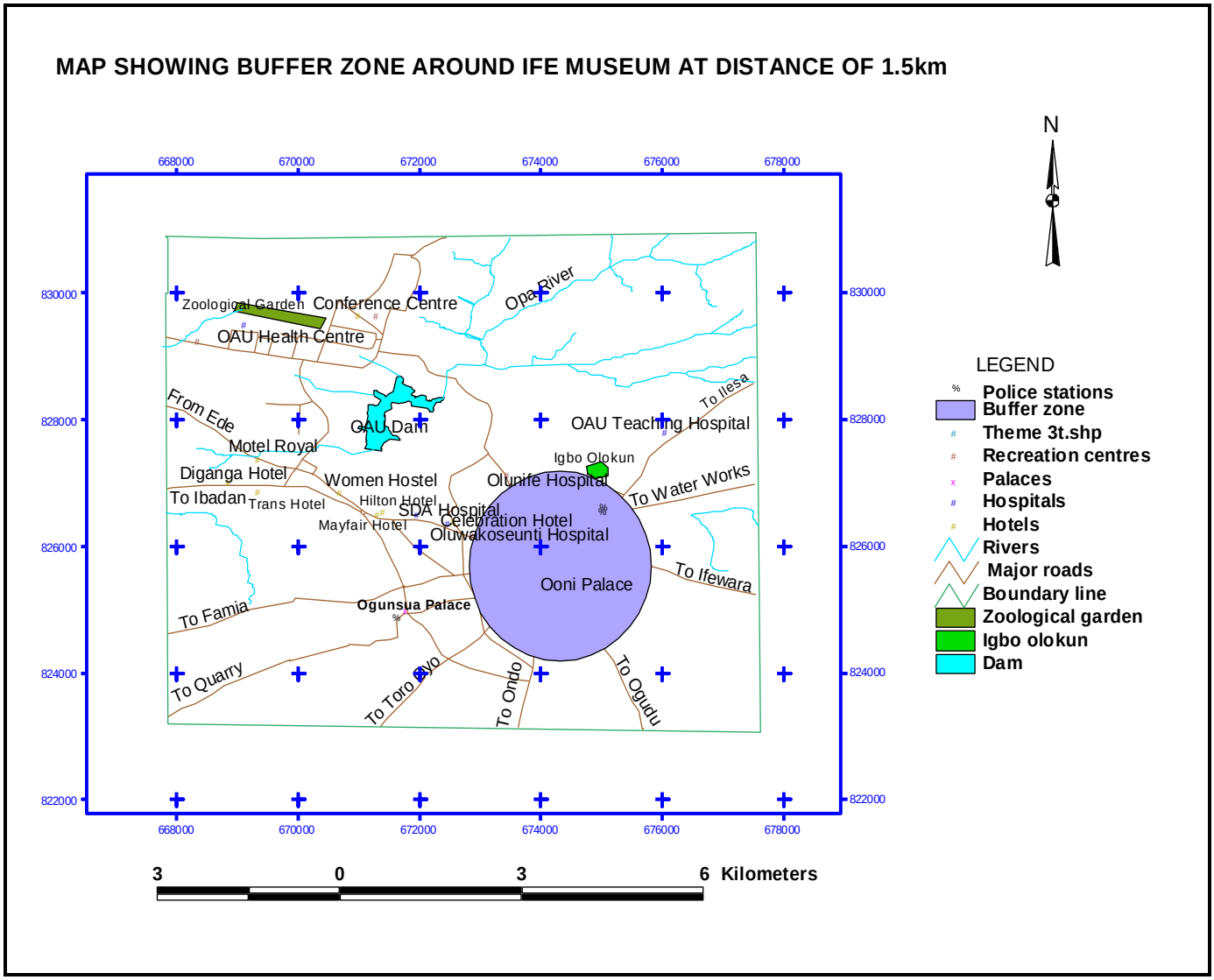

**Map 1:** Hotels with more than 25 Rooms and Cost per Room not more 3000 Naira/Night.




**Map 2:** Buffer Zone around Igbo Olokun.

Map 1: At glance the prospective visitors would be able to know the number of hotels with more than 25 rooms and cost per room not more 3000 Naira/night.

Map 2: This map shows buffer zone around Igbo Olokun. The map is a summary of analysis of area of influence of the forest in relation to other topographical features like settlements. As a decision support measure in addressing the problem of encroaching Olokun forest, as well as the problem of settlement expansion towards the Forest, a 100m buffer zone was created round the forest to assess the proximity of the settlements to the forest.



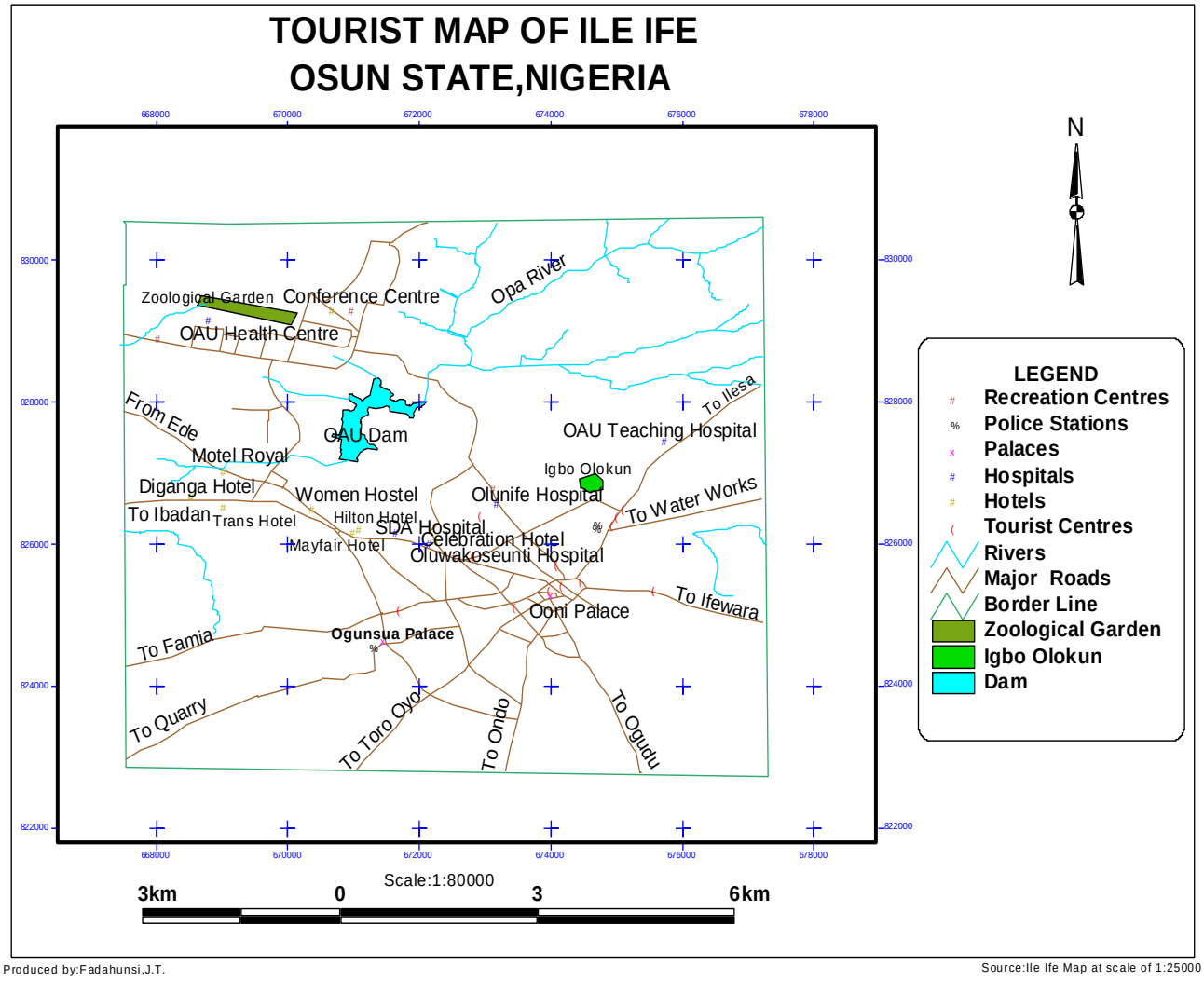

**Map 3:** Buffer Zone around Ife Museum at 1.5km.

Map 3: Buffering around Ile Ife Museum: Security is very important in tourism industry. No tourist would like to visit any Tourist attraction where security is not guaranteed. In order to demonstrate this, buffer zone is drawn around Ife Museum to show the Police stations that are within 1.5km radius. The result of buffering is shown as Map 3. From the map two Police stations are within 1.5km radius.

Map 4 shows the Tourist Map of Ile Ife. The map is very good for the prospective tourists to have first hand overview into all existing tourists' centers in Ile-Ife.

## CONCLUSION AND RECOMMENDATIONS

Tourism is a highly complex activity and thus requires tools that aid in effective decision making to come to terms with the competing economic, social and environmental demands of sustainable development. Application of GIS in managing Tourism industry illustrates that GIS is a strong and effective tool that can aid Tourism management and decision-making.




**Map 4:** Tourist Map of Ile-Ife.

The power of GIS lies not only in the ability to visualize spatial relationship, but also beyond the space to a holistic view of the world with its many interconnected components and complex relationships (Giles, 2002).

From the examples of the spatial queries and analysis, it can be deduced that these queries and analysis have not only demonstrated the potentials of GIS Technology in Tourism industry management, but have shown that geo-spatial system is effective and indispensable in managing spatially referenced resources. Therefore if the authorities concerned must benefit from their rich cultural heritage and natural endowments, they should move from the realm of beautiful dances of the music like- *bata, sekere, dundun, gangan, aguda,* etc. that are only seen at the cultural festivals and the occasions, to attracting hard currencies to the purse of the authorities concerned. This is only possible if authorities concerned can articulate what they have that can interest others in away or system that is capable of displaying or exchanging in the format adaptable to the technology of time-information technology, such information about these Tourist centers can be put on Web site. If these Tourists centers were put on Web site, the accessibility to relevant information would be easy.

In general, it is hereby recommended that for us to move our Culture and Tourism sub-sectors to the level that will contribute to our national economy, better management of tourism industry through computerized geo spatial system is not only necessity but also a must.

GIS provided the means to draw together diverse data sets, analyze and present the results to the user in a manner which could be rapidly assimilated for decision making.

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