Developing a GIS Platform for Tourism marketing and promotion In Nigeria: Case Study Of Bauchi State

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Abstract: — Tourism has been noted to be one of the important sectors of the Nigerian economy. Tourism is a highly complex activity which requires tools that aid in an effective decision-making to come to terms with the competing economic, social and environmental demands of sustainable development. Geographic Information System (GIS) is one of such tools. GIS being an information system that is capable of answering questions about where facilities and resources are located represents enormous benefits to the tourism sector of any economy. The power of GIS lies not only in the ability to visualize spatial relationships, but also beyond the space to the holistic view of the world with its many interconnected components and complex relationships. The use of GIS technology could assist Bauchi State government as well as the Nigerian government with better planning of tourism infrastructure, location and dissemination of such infrastructure, production of better quality maps showing tourists sites abound in the country because of the dynamic capability of GIS tools to incorporate changes that occur over time to its database. A GIS database for tourism in Bauchi State was created using some selected roads, tourist attractions and facilities with the aid of base maps and GPS. This paper presents the significant role that GIS can play in tourism development in Bauchi State if a complete database for tourism in the State is designed and developed.

Keyword: --- GIS, Tourism, Bauchi, Nigeria

I. INTRODUCTION

Tourism is one of the major sources of revenue generation with ample opportunities of creating jobs for both skills and unskills labours. The industry is people-service-oriented in scope in the world today and catalyst for foreign exchange earnings in many countries like United States of America (U.SA.), United Kingdom (UK), Germany, China, and Austria while African countries like Tanzania, Kenya and Zimbabwe have approximately 80% tourists coming into their countries primarily for wildlife (Graham-Douglas, 2008). International tourist arrivals reached a record of 982million, an increase of 4.6% in 2010, while receipts grew by 3.8% to US$1.030billion (£740bn) (UNWTO, 2011). Tourism is now the greener pastures most developing countries have focused attention to due to its enormous benefits like infrastructural development, job creation, conservation of environment etc. (Okonkwo and Odum, 2010). In Nigeria, it is an important sector that has not fully developed, though; it is one of the country's fastest growing industries (Oladipo, 2010). Recently, it is contributing about 3% of Nigeria GDP (Nigeria Tourism Master Plan, 2006).

Tourism has historically been dependent on the character of the destination, including attractions, beaches and resorts. It is a complex activity that requires the availability of certain parameters (e.g. accessible road networks, standard accommodation facilities, attractions etc) and information on potential and existing attraction sites. Information on these parameters and attraction sites can be gathered, processed, organized and stored using tools such as Global Positioning System (GPS), Geographic Information System (GIS) coupled with remote sensing. After gathering the needed data about a destination, the data must be stored in a retrievable form to enhance tourism, and this can be achieved with the aid of GIS.

Geographic Information Systems (GIS) is one of the most remarkable technologic innovations in tourism planning and decision making. "Both GIS and tourism share a common characteristic, that is, both cross the boundaries of disciplines and application areas. GIS has been applied in many fields including geography, forestry, and urban development and planning, and environmental studies. Similarly, tourism has been a subject of interest to geographers, economists, business, environmental planners, anthropologists, and archeologists" (Avdimiotis and Christou, 2002:1). This makes the potential applications of GIS in tourism significant.

Moreover, maps have been known to play vital roles in identifying and locating tourist attractions. GIS however provides the facility to extract different sets of information (e.g. tourist attractions, hotels and their distances from one another, roads, settlements, vegetation, land use data, changes in tourism resources) from a map and use them as required (Fajuyigbe, Balogun and Obembe, 2007) because of the dynamic capability of GIS tools to incorporate changes that occur over time to its database.

Tourist maps in Nigeria are not easily seen or available, where available it is lacking in comprehension, accuracy and up-to date geo-referencing (Olabintan and Ajirotutu, 2012). This paper presents the practical use of GIS to process, organise, store and disseminate already captured data on tourist attraction sites to enhance tourism development in Nigeria with special emphasis on Bauchi State where few attractions were mapped and used in preparing a thematic layer.

What is GIS?

According to Fellaman et al (2008) GIS is "both an integrated software package for handling, processing, and analyzing geographical data and a computer database in which any piece of information is attributed to a precise geographic location. They further explained that a GIS database can be seen as a set of discrete informational overlays lined by reference to a basic locational grid of latitude and longitude.

What is Tourism?

Tourism is the movement of person(s) (tourist(s)) from one socio-cultural background to another with the main intention of engaging in recreation and adventure. There are two main types of tourism namely domestic tourism (residents of a country travelling within their country. A Nigeria from Sokoto travels to Obudu Cattle Ranch in Calabar) and international tourism connotes nationals of a country travelling to another country for instance Nigerians travelling to Spain.

Looking for a comprehensive definition of tourism is elusive, because the definition is marred with a lot of bias, each definition is given based on the authors level of biasness and each generation and epoch defines it based on its usefulness and perception while the interdisciplinary nature of the concept makes the definition more complex (Marguba, 2001 and Odum 2011). Any attempt to define tourism is an all but impossible task (Holloway, 2006). Although Okpoko et al (2008) succinctly identified five notable characteristics of most tourism definitions namely:

There are various kinds/forms of tourism namely: cultural tourism, religious tourism, business tourism, sports tourism, ecotourism, humane tourism, responsible tourism etc. Tourism is an activity highly depended on environmental resources. It is also a phenomenon, which in the event of lack of proper planning and management is likely to erode its environmental base, hence, the strength of tourism planning and decision making can be enhanced with GIS applications, which provide a toolbox of techniques and technologies of different applications to the achievement of sustainable tourism planning development.

Tourism cannot thrive without accurate and reliable information about a destination which will be the main element that will draw tourists/visitors. A tourist/visitor cannot visit a destination he/she has little or no knowledge about. Therefore, there are a whole lot of questions to ask about tourism data e.g. what kinds of tourist attractions are there in a place and their locations? Where are tourists coming from? What attraction do they visit most? What time of the year do they normally come? What types of hotels are in the destinations? The distance between hotels and attractions, is the attractions developed like having lodging and restaurants facilities, etc? All these questions can be gathered, uploaded with the aid of GIS and can be accessed by tourists and updated by tourism planners. Table 2 shows some tourism related issues and GIS applications.

II. LITERATURE REVIEW

The use of GIS in tourism studies has being minimal though GIS technology has been in tourism related literature over the years (Gunn and Larsen, 1988). Some scholars are of the view that its application has been limited to recreational facility inventory; visitor impact assessment; tourism-based land management, recreation-wildlife conflicts, mapping wilderness perceptions (Nedovic-Budic et al 1999; Feick and Hall, 2000; Nepal, 1999; Caver, 1995 in Wayne, 2003).

GIS has been applied in designing and development of tourism destinations in Zlatibor (Cajetina) and Zlatar (Novavaros) areas of Serbia (Jovanovic and Ngegus, 2008); while Avdimiotis and Christous (2002) used GIS to establish or measure the carrying capacities of the Muncipality of Chalkidiki, Greece. According to them the carrying capacity can be defined as the maximum number of tourists that can be accommodated in a specific area (place of reception) of tourists) without causing any desirable alteration in the natural-economic and social environment of the host community. Seker et al (2002) applied GIS to support planning activities for tourism in the Manavgat region located in southern coast of Turkey, and focused on the analysis, decision making and management using GIS technique.

In Nigeria, Fadahunsi (2010) portrayed the importance of GIS and tourism management using it to create awareness of the existence of the tourist attraction centres to the prospective visitors in Osun State. In a related study, Omitogun and Oyinloye (2008) worked on Osogbo grove in Osun State with the aid of remote sensing and GIS in order to get the sacred grove registered on the World Tourist Map. Similarly, Ayeni (2006) developed a user-friendly Multimedia GIS database which constitutes a great resource for producing various tourist maps of Nigeria and for educational institutions offering courses in tourism in Nigeria. Fajuyigbe et al (2007) developed a web-based Geographical Information System (GIS) for Tourism in Oyo State, Nigeria and their project revealed that presenting tourism information in GIS in a computer environment and the internet would offer an unparallel platform for the management and promotion of the tourism industry in Oyo State.

III.   STUDY AREA

Nigeria is located within Latitudes 4° and 14°N, and Longitudes 3° and 15°E. It is bordered by the Republic of Benin in the west, Chad and Cameroon in the east, Lake Chad in the northeast, Niger in the north and has a coast that lies on the Gulf of Guinea in the south. Nigeria has a land area of 910770 Sq.Km. Some notable geographical features in Nigeria include the Mambilla Plateau, Biu plateau, Adamawa highlands, Jos Plateau, Obudu Plateau, the Niger River, River Benue and Niger Delta. Bauchi state is one of the north east destinations

bordering Jos-Kano, Jigawa-Gombe. The state is endowed with enormous tourism resources and potentials that appeal peoples' mind for holidaying and other events. The state has a favorable climatic weather condition with a vegetation cover of Guinea savannah capable of promoting Eco-Tourism. Bauchi state is heterogeneous in nature with rich cultural diversity which signifies unity and peace of the country

IV.   METHODOLOGY

The researcher shall adopt qualitative approach and descriptive method where questionnaires will be administered to elicit cogent and relevant data for work. The application will be built to leverage on Google maps infrastructure and overloading relevant contents of the tourists location based on their GPS coordinates. The software development tools to building the platform include Google maps API, PHP, MySQL, HTML5, CSS3 and JavaScript.

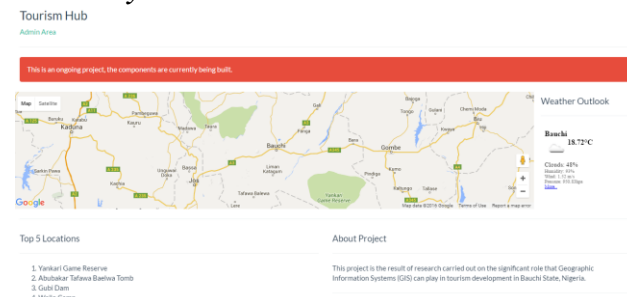### 4.1   Creating GIS database for tourist attraction sites

GIS makes use of two data elements spatial and attribute data. Spatial data is referred to as a known location (established longitude and latitude coordinates) on the surface of the Earth. The spatial data elements comprises of using of exact standard geographical frame of reference such as latitude and longitude, and using surrogates spatial references like postcode while the attribute data show statistical and non-location data (e.g. images, texts) associated with a spatial entity (Jovanovic and Njegus, 2008:263). The Database for these tourism (attractions) data was created using the co-ordinates of their geographical locations in Bauchi State. The spatial data were developed using Google Earth (web mapping application) and Google Maps.

In building the system, MySQL database system was chosen as the default database system to hold location data and other relevant information. PHP (PHP: Hypertext Preprocessor) was used as the application programming language to process all data and present the result.

In order to augment all collected data with live Maps and also the relevant location information, Google Maps API (http://maps.google.com) was used to provide

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maps, driving information and relevant information about the tourist locations stored in the system and their environs. openweathermap.org's API was also integrated to provide relevant weather information, including temperature, humidity, Wind and pressure.

4.2 Procedure for the development of the GIS database System

A demo of the system is currently hosted at **http://gistourism.abuango.net** with live content, a screenshot is shown above.

The Role of GIS in Tourism

GIS in tourism is advantageous to both tourists and for the tourism development authorities. These advantages are outlined below;

1. GIS gives detailed and enriched information about a tourist destination

A GIS database would give intending tourist enlightenment and enriched information of his/her destination of choice as well as the various cultural and natural attractions therein. Moreover GIS data/information will assist tourist in making comparative analysis to know areas to visit. This is possible once the GIS database (showing tourism attractions and facilities) is linked to the Bauchi State website.

2. GIS Applications helps in Tourism Planning and Decision Making Process

Tourism development is a complex phenomenon, because stakeholders have to face challenges like other competitive economic, social and environmental requirements of sustainable development. Environmental exploration, impact assessments and simulation are vital to tourism development, and GIS can assist in auditing environmental conditions, assess the suitability of an area/location for any proposed tourism development, taking cognizance of conflicting interests and modeling

relationships (Bahaire and Elliot-white, 1999:159). GIS gives room for comparative study of land use options and other environmental resources e.g. there are areas that might have a good attraction but it may not be developed rather will be more useful in other activities like agriculture or industrial sites. A complete GIS database will help Bauchi State Authority weigh their options of either investing in tourism or other alternatives like farming.

3. Creation of Inventory and data base for tourism experts, tourists and different stakeholders

GIS application helps in performing numerous tasks in tourism planning and development. First is creating resource inventory, area designation and map overlay, comparative land use and impact analysis, community participation, data integration and management etc. Its application can provide different types of information and maps which can be of enormous benefits to Nigeria Tourism Development Co-operation (NTDC), travel agencies, tour operators in Nigeria for easy planning and allocation of resources.

4. Monitoring of trends, events and movements and adaptive to change

During festival periods like Limza Cultural Festival, Gimaya Cultural Festival (boi) fishing festivals, Durbar, boat regatta, New Yam festival, the popular Calabar festival etc. Tourism planners and Nigeria Tourism Development Co-operations (NTDC) can use GIS technology to monitor such big events. This will assist in the area of indicating the population size, the pattern of movements, and impacts of tourists on the environment. Once a GIS database has been created, it can be updated easily by adding new features to already existing ones. For example, trend analysis can be done using GIS tools to monitor changes over the years. GIS can provide a set of tools, which can be used for tourism planning and development. Also, GIS tools can equally be employed to monitor the movement of animals in game reserves and National parks, especially animals that are going into extinction. Similarly, the trend of cultural festivals (e.g. New Yam festivals, Ofala Festival, Mmanwu) in Bauchi State can be monitored and analyse with using GIS.

VI. CHALLENGES OF GIS IN TOURISM IN NIGERIA

- Human resource - tourism development and practice is still relatively new in this part of the world, while government is yet to pay adequate attention needed to develop the sector. The number of tertiary institution offering tourism and GIS courses is still low. This creates a big gap in creating the man power needed to drive the industry. Similarly, GIS training in Nigeria is still very low due to lack of expertise and the newness of the technology in the country.

- Non acceptance of technological advancement/ ignorance of the current trends of events - some Nigerians are sluggish in changing from the traditional/primitive ways of data collection and analysis; they still prefer the manual method of using their drawing boards, pens, tracing sheets, makers, T-square etc. While some prefer their analogue method where data are acquired and store in boxes in the office and manually retrieved when the need arises, some are of ignorant of the current trends of events (the use of GIS technology). Most tourism units and departments in Nigeria, still prefer manual/traditional method of data collection especially in the area of inventory probably due to the financial gains as a result of going to site (duty allowances) than learning the GIS and that is easy and fast; giving answers in seconds and minutes.

- Poor public awareness- the knowledge, benefits and functions of GIS is not known beyond tertiary institutions that offer GIS as a course of study. Fadahunsi (2010) added that "many see GIS as a "beyond-the-reach" technology, while some mystify it; this has kept many from grasping the immense opportunity and power it gives especially in decision making". Therefore, one may ask, how many tourism departments, ministry and parastatal have the knowledge of this GIS?

VII. RECOMMENDATIONS

There is urgent need to critically look into potentials of application of GIS in the tourism industry of Bauchi state and Nigeria at large. Other countries of the world and multinationals are benefitting from this technology. Example, Hertz Corporation is using the technologies of geographic information systems, global positioning satellites (GPS), and electronic route guidance software in its Hertz Never Lostsm system. When a traveler picks up a Hertz NeverLostsm equipped rental car, he or she can punch in the address of a hotel and receive computer-generated voice instructions and video display of the directions (Cook et al, 2006).

Institutions of higher learning are to take the lead in the integration of GIS into various courses with special interest in archaeology (including geography) and tourism studies with the aim of making tourism in Nigeria meet up with international standards (Olukole, 2007). It will also equip Nigerian graduates to compete favorably with their peers all over the world, and we equally advocate for establishment of GIS centers in all the thirty-six States of the federation.

It is highly recommended that the application of GIS in tourism in Nigeria should be diversified (it should involve other attractions like the National parks, Game reserve, protected areas, caves, waterfalls etc). It should not be on only cultural attractions and this will help to re-direct the tourist pressure on these cultural tourism (especially fishing festivals, Calabar carnival, and Abuja carnival, New yam festival) areas to avoid exceeding some destination's carrying capacity which will lead to environmental degradation.

VIII. CONCLUSION

Tourism has been noted as one of the world's largest, fast and rapid growing sector with a contribution of 10% to global GDP, creating employment for 200 million people. The importance of GIS to tourism cannot be overemphasized. It is beneficial to both tourist operators and tourists themselves. Its ability to add changes in an existing destination makes it appealing to marketers while changes brought by tourist activities/tourism related activities can be monitored with GIS thereby ensuring sustainability because such changes can bemonitored and remedied if it is detrimental. GIS being an information system that is capable of answering questions about where facilities and resources are located presents enormous benefits. Until recently, the use of GIS in Nigeria has been limited to oil fields, hydroelectric

power, national forest and agriculture among others at the expense of other projects like tourism and archaeological projects. NTDC is yet to make good use of suchfacility. This is seen in the dearth of a comprehensive and detailed map of tourist attractions in the country.

Bauchi State is one of the States in the Eastern Region with numerous tourist attractions yawning for development. GIS is a vital tool that can be explored by the State to develop its tourism potentials and expand its tourism market. It gives accurate location of distances between one attraction to the other, road networks, hotels, distance between hotels and attractions etc. If a tourist is armed with detailed information about a destination it might increase his/her appeal to such a destination. A look at Fig.2 shows a GIS platform with few tourism attractions and hotels in the State which a tourist can use to know what is obtainable and other attributes of his destination.

Therefore, the application of GIS in tourism is recommended because of the easiness and fastness in identifying tourist sites and attractions with accompanied details so that Nigeria will have a comprehensive map of what they have in each State, Local Government Area and Town.

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