



APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM IN THE DOCUMENTATION OF SETTLEMENT PATTERN OF IMERI, IJEBU-MUSHIN OGUN STATE NIGERIA

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ABSTRACT

The aim of the study was to demonstrate how Geographic Information System (GIS) can be used to document settlement pattern of Imeri, Ijebu-mushin Ogun State Nigeria. The method of data collection was through the collection of information gathered on the site with the use of Geographic Information System, Global Positioning System, and questionnaires and oral interview method. The research was carried out in Imeri Ogun state Nigeria. Information was derived from Imeri, a secondary village settlement in Ogun State. The results indicate that, 2% of the building is used for commercial purposes, while 4% of the buildings are dilapidated. 5% of the building in Imeri is not yet completed as at the time of carrying out this research, 5% is used for both residential and commercial purposes and another 5% is used for religious purpose. 79% of the buildings are used for residential purposes and this percentage ranks highest regarding the use of building in Imeri. Also, 2% of the buildings are constructed with wood, while 5% are made of mud and not with plaster, 12% are made of concrete and also not with plaster, 18% of the buildings are made of concrete and are plastered while, 63% of the buildings are made of mud and are plastered. Therefore, it is recommended that GPS should be used often as a powerful technological tool that could help a lot in knowing the settlement pattern of a large area and ways to help a particular community when needed.

Keywords; GIS, settlement pattern, GPS, mapping, documentation

INTRODUCTION

Geographic information system (GIS) is a set of computer tools for making and analyzing spatial information (Bolstad 2005). While all the fundamentals of spatial analysis method pre-date computer applications, the advantage of GIS is its ability to compute thousands of complex spatial relationships from data, something impossible with traditional map. GIS software can help researcher see the contingent effect of many factors over space and time, which gives it a big advantage over static map (Bolstad 2005). Scale is also less of an issue because

one can analyze different type of spatial data for example (artifact distribution at a single site alongside the indivisibility of sites). GIS is computer software that links geographic information (where things are) with descriptive information (what things are). Unlike paper map, where what you see is what you get, GIS can present many layers of different information. A GIS based map is not much more difficult than to use a paper map. As on the paper map, there are dots or points that represent features such as roads, and small areas that represent features such as lakes. All this information; where the point

is located, how long the road is, and even how many square miles a lake occupies is stored as layers in digital format as a pattern of ones and zeros in the computer. The aim of the study points out how GIS can be used to document settlement pattern. Information was derived from Imeri a secondary village settlement in Ogun state. The study considered the use of GPS in mapping of site and GIS in the; documentation of the site, site definition, space utilization.

MATERIALS AND METHODS

Study Area

The study area Imeri is located in Ijebu Mushin, Ijebu East Local Government Ogun

State (Fig1). Ogun state is in the south-western geographical zone Nigeria with Abeokuta as the capital. Created in 1976 (online Nigeria.com), it borders Lagos state to the south, Oyo and Osun state to the north, Ondo state to the east and the republic of Benin to the west.

Imeri falls within the Eastern part of the Dahoney basin. Imeri is a village in Ijebu mushin which is Ijebu East local government of Ogun state. It can be accessed through the Saganmu – Benin express way when coming from Lagos. The study area lies between latitude N 6° 30' 0" and Longitude E 2° 49' 0".

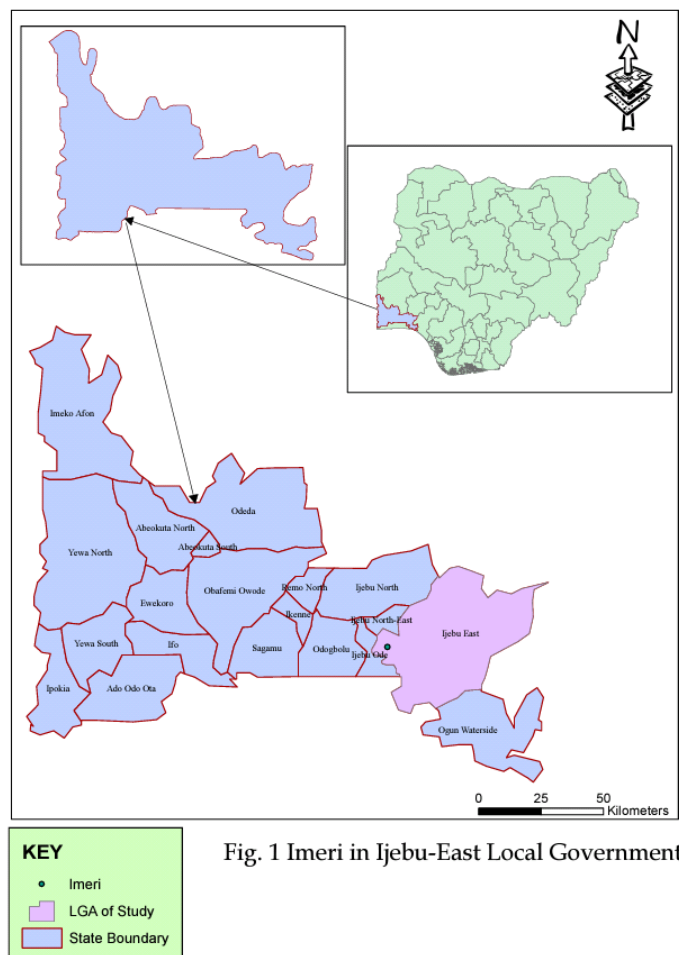


Fig. 1 Imeri in Ijebu-East Local Government

Figure 1: Map of Imeri in Ijebu-East Local Government, Ogun state and Nigeria

The climate of Ogun state follows the tropical pattern with the raining season starting about March and ending in November followed by the dry season. The mean annual rainfall varies from 128 cm in the southern part of the State to 105 cm in the northern areas. The average monthly temperature ranges from 23°C in July to 32 °C in February. The northern part of the state is mainly of derived savannah vegetation, while the central part falls in the rain forest belt. The southern part of the state has mangrove swamp.

The geological formation consists of sand stone which is sometimes reddish. The topography of Imeri town is an undulating one, it is made up of hills and valley, most of the road in the town is not even, this can be one of the reasons why their houses are arranged in a liner pattern. Imeri town is drained by a number of rivers, such as “odo bambomo” and “odo yemoji. “odo yemoji” is divided into “yemoji kekere” and “yemoju nla”. The people of Imeri are predominantly farmers who engage in various agricultural activities, the farmers produce crop such as cassava, plantain, banana, melon, okro, pepper, bitter kola etc (Seun Oloja imeri 2016). The produce of cassava is used by the women of the village to make *garri*, *fufu* and starch but they most produce *garri*. Women who do not produce *garri* in the village are either traders or they engage in other vocational occupation such as tailoring the most predominate occupation is farming and hunting.

History has it that there are about four different small villages make up Imeri, these villages are, Ipako, Ipodo, Idigbaja, and Imeri, all of these other three towns except Imeri is not extinct, and all the occupants of the village are now relocated to Imeri, this relocation was fostered by the construction of the express road. When this relocation took place most of the resident rebuilt their houses, while some rebuilt and patched mud houses with concrete other built a new house

made entirely of concrete leaving the mud house to fall. The authority of Imeri is in three heirs, they have the *baale* who is the first in command, they have the second in command (ikeji ilu), and also the third in command (iketa ilu). The other villages that surround Imeri include Idare, Ijebu Imushin, Igbaga Imeri is a village where the major occupation or economic activity is farming, the farm produce includes cassava, plantain, banana, and melon, most of the farming is done by the men, the women do not really get involve with farming but engaged in the processing of the *garri* from the cassava.

Experimental Design

A Simple random sampling was used for the study where samples taken represent the target population.

Data Collection and Analysis

Information was gathered on this site with the use of GIS, GPS, and questionnaires and oral interview method. The research was carried out in Imeri Ogun state Nigeria

The Geographic Information Science (GIS)

A geographic information system or geographical information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data. With regard to the analysis of the data obtained on the site with GPS device, the data was imported into the Google earth for digitization. ArcGIS 10.3 was used for the purpose of the analyze. The resultant imagery from Google Earth in a ‘kml’ format was imported into Arcmap 10.3 where the digitization was perfected, and various analyses were carried out on the data. The features were represented on a GIS map format, the coordinate of the features was imputed, data were converted from degrees to meter using geographic measurement system, with this the measurement of easting and nothing values were gotten. The buildings

were analyzed as point features while the roads were analyzed as line features. After this, the digitalized imagery was saved as a shape file in 'kml' format for further analysis in a GIS environment.

The global positioning system

The global positioning system is a satellites-based navigation system made up of a network of 24 satellites laced into orbit by the by the US department of defense. Essentially the GPS receiver compares the time a signal was transmitted by a satellite to the time it was received. The data for the inner extent of Imeri was gotten from the use of GPS. The coordinates of all the buildings and structures in Imeri were taken using the GPS. The GPS was switched on and allowed to receive signals from the satellite with a minimum position error of 8 to 10 meters called triangulation. The GPS receiver is then locked into the signal of a minimum of five satellites in other to be able to calculate the 3Dposition (latitude, longitude and altitude). The four corners of the houses where mapped and the dimensional measurement of the houses was also taken. Basically, when using the GPS once the position has been located the GPS unit calculates other information.

RESULTS

The aim of the study points out how GIS can be used to document settlement pattern. With regard to the analysis of the data obtained on the site with GPS device, the data was imported into the Google earth for digitization, ArcGIS 10.3 was used for analysis. The resultant imagery from Google Earth in a 'kml' format was imported into Arcmap 10.3 where the digitization was perfected, and various analyses were carried out on the data. Buildings were analyzed as point features while the roads were analyzed as line features. After this, the digitalized imagery was saved as a shape file in 'kml' format for further analysis in a GIS environment. In all 43 building and a borehole facility were mapped, and the attribute table of the data was built (Table 1) using information collected from the field using parameters such as type of building, building use, number of rooms and population residing in each of the buildings. Each of the parameters was then employed in performing statistical analyses of the data by plotting of pie chart and bar chart for the purpose of explaining what the data stands for. Results of statistical analyses from the data are shown below (Figures 4,5,6 and 7)

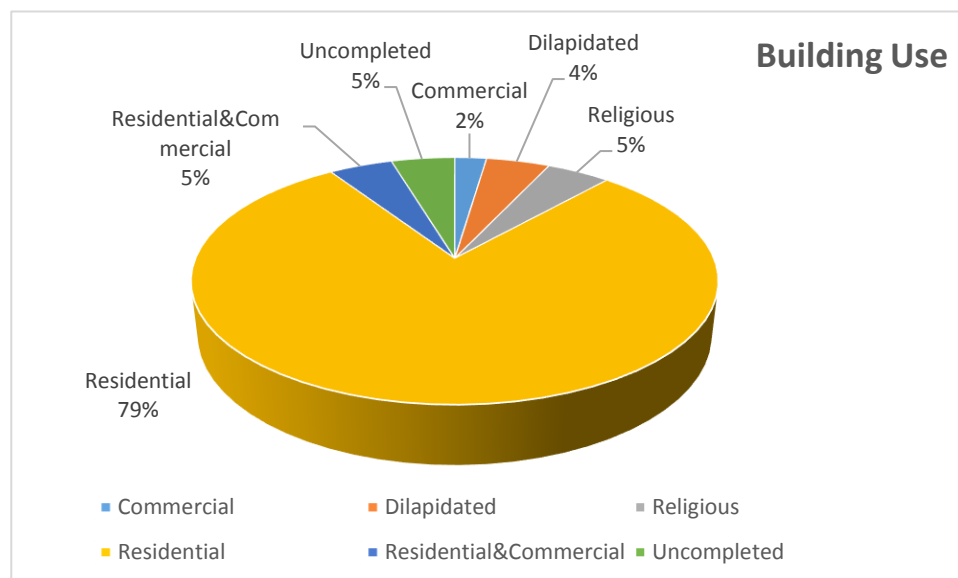


Figure 2: Pie chart for building use of Imeri

With respect to building use, analysis fig4 shows that 2% of the building is used for commercial purposes, while 4% of the buildings are dilapidated. 5% of the building in Imeri is not yet completed as at the time of carrying out this research, 5% is used for both

residential and commercial purposes and another 5% is used for religious purpose. 79% of the buildings are used for residential purposes and this percentage ranks highest regarding the use of building in Imeri.

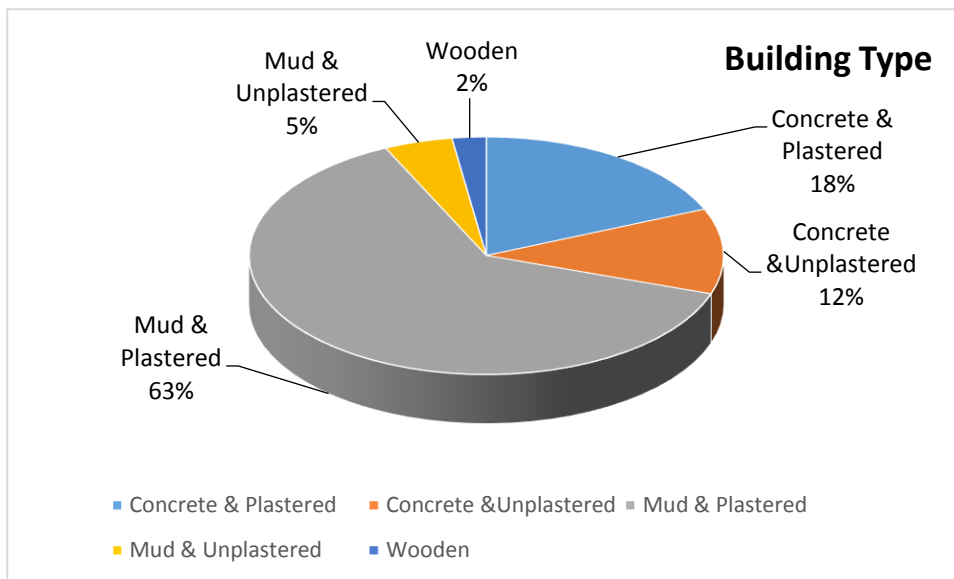


Figure 3: Pie chart for building type of Imeri

With respect to the building type 2% of the buildings are constructed with wood, while 5% are made of mud and unplasterd, 12% are made of concrete and also unplasterd, 18% of the buildings are made of concrete and are

plastered while, 63% of the buildings are made of mud and are plastered. (fig5). Fig 6 and 7 show the number of rooms and human population.

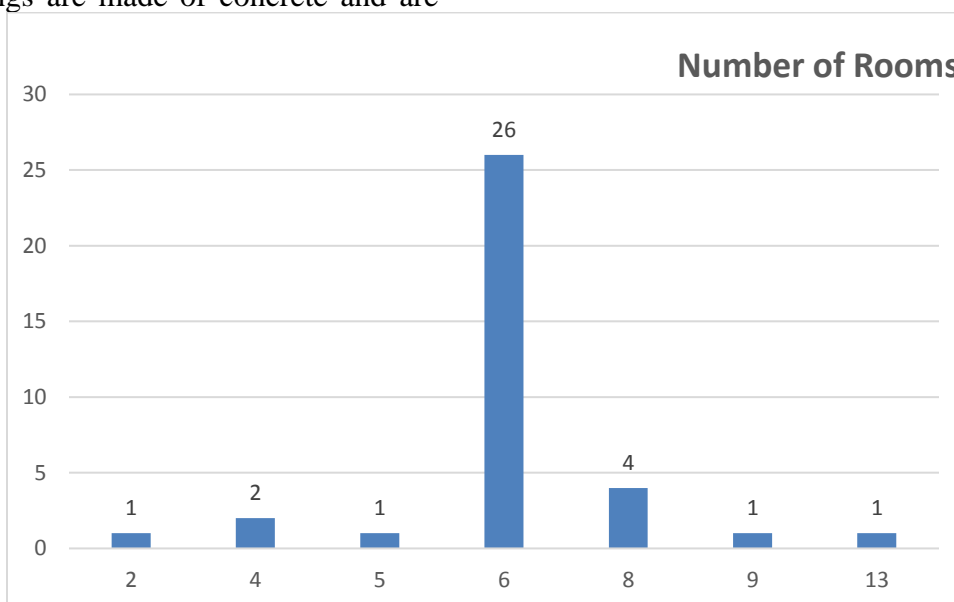


Figure 4: Bar chart for number of rooms in the houses at Imeri

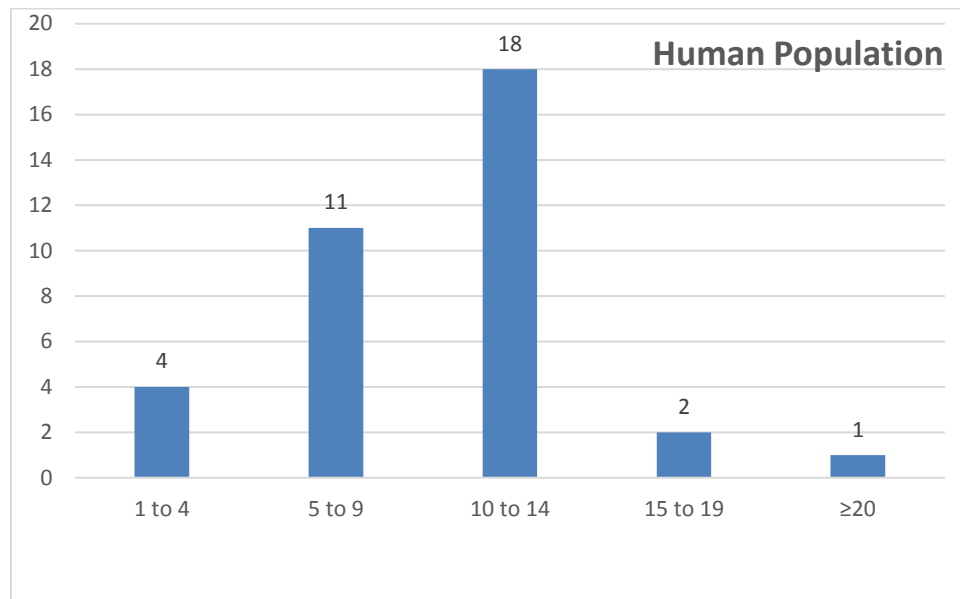


Figure 5: Bar chart for human population at Imeri

DISCUSSION

As regard vegetation study in the settlement, the samples were taken to the department of Botany, University of Ibadan for identification. Some of the plants were identified by their local names and botanical names. At Imeri, small plots of lands are cultivated for planting of vegetables and pepper. Bigger plots of land are cultivated at the peripheral of the settlement; this is where most of the big plantation farming activities takes place. Cash crops such as oil palm and kola were cultivated, food crop such as cassava, cocoyam, plantain and melon (Egusi) and also cultivated in very large number. Also, it was at the outer part of the settlement that activities such as farm poultry, bitumen site and lumbering site are located. This activity is however an indicator of the adaptive pattern of man on the environment as rightly noted by Allen (2000). As a result, the occupants of the settlement are practicing both nearby and distance farming. Table 2 shows the list of plants at Imeri

At this “micro settlement” level of analysis, the most frequently studied kind of feature is the dwelling. A number of scholars have examined the potential determinant for house

form. Bruce. G. Trigger’s list of such factors include subsistence regime (whether the society is sedentary or migratory), climate, available building materials, family structure, wealth, ideology, security and style. Although several of these factors are related to environmental variable, several has to do with social system of the culture being studied, for example societies in which people live in extended families, with several generations of a family residing together, would have house structure than those with nuclear families. Other building besides dwelling may be examined at this level; craft-production, buildings and shrine are among other specific functional categories that may be identified. Robert *et al.*, (1979).

At the site investigated, it was noted that social-cultural factor holds a paramount position in the settlement pattern of the site. This can be observed by the clustered settlement which is a common characteristic of most Yoruba groups, this is believed to hold family ties and make it stronger. The population of each household ranges from 5 to 10 (including children). Based on the shape of the building only one particular shape is predominant which is rectangular or square shaped. Although the houses are few in number, some are big while others are

small which is dependent on the size of the rooms in the house, the number of rooms in the house ranges from 6 to maximum of 8, only the story building house in the village has 13 rooms in it. There are rooms which face each other popularly called “face me I face you”. The spatial distribution of the buildings in Imeri settlement site is liner. A group of building that is formed in long line some follow a transport route, such as road, river or canal though some form due to physical restrictions, such as coastline, mountain, hills and valley. The pattern, structure, spatial distribution and number of rooms in the houses are not determined by any particular factor. The only obvious factors can be money and being more exposed to urbanization.

Graves are either attached or detached to the buildings. The attached grave to buildings is common in Yoruba land, where traditionally the dead are buried close to the house because of their belief that the spirit of the dead lives on amongst them. They sometimes appeal to their dead in times of trouble, the refuse mound is located within the settlement. This reduces the stress of travelling a long distance to dump their refuse. The refuse mound composed of domestic waste materials such as food and garbage, also industrial wastes such as peel of cassava and waste from cassava fermentation industry.

Much information could not be gathered from the bitumen industry because workers were not available to give much information. But according to oral information from the

villagers and our tour guide, information gathered is that the site has been there a long time but the government just realized not too long ago, people from the village and outskirts of the village come to work on the site. The industry is located almost outskirts of the village in between farms. The realization of this site by the government might serve as a form industrialization that would bring job opportunity to the village, but it might also serve as a threat for the villagers in the nearest future this is because they might be asked to vacate their present settlement.

CONCLUSION

The spatial distribution of the houses in Imeri reflected typical Yoruba land settlement. The popular Yoruba land use where the houses are built close to each other to foster closer family ties and bound. The presence of the bitumen site in Imeri could have both positive and negative effect on the residents in the nearest future, it could bring about positive effect by expansion of the village into a more bigger place and if the government decide to turn the bitumen site to a big business and company that would be an avenue for job opportunity especially for members of the community. However, the expansion of the village and expansion of the bitumen site to a big company might bring about health hazard for the inhabitants, dark dirty some from the industries would lead to great health hazard. Most importantly expansion of road, settlement, building of drainage system, and even pulling down of buildings is destruction of archaeological site and destruction of human resource and heritage.

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