

Multimedia GIS for the Management of Educational Facilities in Lagos Mainland, Nigeria.

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SUMMARY

Events, assets and facilities are all location bound. For centuries, maps have been the major source for depicting land related information. The management of resources for sustainable development has spurred new ways and technology for planning and development. Geographic Information System, a computerized tool that consists of (computerised) map, a database of descriptive information (attributes), and a set of software that performs complex spatial operations, is one of the new technologies available for management of resources. Using GIS, management and allocation of resources through the effective use of shared data can provide a better service through efficient and effective decision-making. Multimedia GIS integrates different types of data which include: maps, alphanumeric information, photographs, texts and graphics, video and sound. Some of these data types are traditionally used within GIS. The inclusion of photographs, video and sound can improve the GIS performance turning it to a more realistic tool for spatial analysis Education is the bedrock of the development of any nation. In Nigeria, the management of educational facilities is facing a lot of challenges. The population growth in Nigeria towns and cities has outpaced the management capacity of various sectors of the Nigerian society. There is therefore the need for a more effective management approach to face the current challenges. The Geographic Information System provides solution to these management problems. Since majority of information and decision in all educational institutions are land based, the Geographic Information System (GIS) becomes a very useful management tool. More accurate and effective decision will be enhanced by a multimedia. The multimedia GIS database allows the user to see any problem in a perspective that is very close to reality.

This paper intends to establish the importance of GIS in accurate decision making for the effective management of educational facilities. Multimedia GIS for the management of educational facilities in public primary schools in Lagos Mainland local government area of Lagos state Nigeria is discussed. Results from this research project demonstrating easy and quick access to information are displayed. In the results, accurate decision can be taken that will facilitate easy management of educational facilities. The paper also contains the relevance of the Multimedia GIS Database of primary schools to appropriate government agencies in Nigeria. It is demonstrated in this paper that GIS is a very important tool in the management of educational facilities. This paper is highly significant in Nigeria and many other third world countries where management of educational facilities are done manually and therefore slow and inaccurate. Advanced countries of the world where GIS is yet to be adopted as a tool for management of educational facilities will find this paper highly relevant. In the last part of this paper are some recommendations and conclusion.

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1. INTRODUCTION

Many definitions exist for GIS, some of these definitions seems to restrict GIS to a particular application. Meanwhile, Worboys (1995), defines Geographic Information System (GIS) as “a computer-based information system that enables capture, modeling, manipulation, retrieval, analysis and presentation of geographically referenced data”.

First, GIS are related to other database applications, but with an important difference – information is linked to a spatial reference. Other databases may contain locational information (such as street addresses, codes etc.), but a GIS database uses geo-references as the primary means of storing and accessing information.

Second, GIS integrates technology. Whereas other technologies might be used only to analyse aerial photographs and satellite images, to create statistical models, or to draft maps, these capabilities are all offered together in GIS.

Third, GIS, with its array of functions, should be viewed as a process rather than as merely software or hardware GIS for making decisions. The way in which data is entered, stored, and analysed within a GIS must determine way information will be used for a specific research or decision making task. To see GIS as merely software or hardware system is to miss the crucial role it can play in a comprehensive decision making process.

2. MULTIMEDIA GIS

Multimedia GIS integrates different types of data which include: maps, alphanumeric information, photographs, texts and graphics, video and sound. Some of these data types are traditionally used within GIS. The inclusion of photographs, video and sound can improve the GIS performance turning it to a more realistic tool for spatial analysis. Photographs, video and sound can be used in GIS in different contexts: illustration purposes; as a source of information; to enrich the visualisation of some GIS operations; to support the definition of the criteria to be used in spatial analysis; to support the implementation of models within GIS; to help in the evaluation of some GIS results.

3. PUBLIC PRIMARY SCHOOLS IN NIGERIA

“Since the introduction of western education in 1842, regions, states and federal government of Nigeria have shown keen interest in education. Government began to take a hand in the running of primary education with the first education ordinance for Lagos and Gold Coast in 1882” (Eya 2000). The management of primary education in Nigeria has been moving from

one body to another. The federal government is the principal financier and controller of primary education. However, the reintroduction of the National Primary Education Commission (NPEC) through Decree No. 96 of 1993, along with the structure of State Primary Education Board (SPEB) and Local Government Education Authorities (LGEAs), make these bodies responsible for the management and fund allocation in the primary school sub-section. This was previously managed by the local government councils. The duties of the Local Government Education Authority (NPEC) includes the following: establishment of primary-schools, maintains and supervises the activities of all the public primary schools, appoints, deploys, transfer, promote and discipline staff of the Board, compute and maintain all staff records of service; monitor and act on staff productivity, attitude, welfare and capacity building of staff, paying salaries and emoluments as well as other remunerations of staff of the Primary Education Board.

Universal Basic Education (UBE) programme was introduced on 30th September, 1999. It is a policy reform measure of the Federal Government of Nigeria, aimed at rectifying distortions in the basic education. UBE is conceived to embrace formal, compulsory education up to age 15. According to the implementation Guidelines for the UBE programme, the specific objectives of the programme are:

- Developing in the entire citizenry a strong consciousness for Education and a strong commitment to the vigorous promotion.
- The provision of free universal basic education for every Nigeria child of school-going age.
- Reducing drastically the incidence of dropout from the formal school system (through improved relevance, quality, and efficiency).
- Catering for the learning needs of young persons who, for one reason or another, have had to interrupt their schooling through appropriate forms of complementary approaches to the provision and promotion of basic education.
- Ensuring the acquisition of the appropriate level of literacy, numeracy, manipulative, communicative and life skills as well as the ethical, moral, and civic values needed for laying a solid foundation for life-long learning.

The current roles of both NPEC and UBE demand quick and accurate decision making. None of these agencies or any other agency in Nigeria uses GIS. Therefore most of their responsibilities are discharged using other tools that may be deemed fit. These other tools are however not adequate enough to justify quick and accurate discharge of these responsibilities.

4. MULTIMEDIA GIS DATABASE FOR PUBLIC PRIMARY SCHOOLS LAGOS MAINLAND LOCAL GOVERNMENT

4.1 Data Sources And Acquisition

The data acquired and used for the project were obtained from the following sources.

- (a) Lagos Mainland Local Planning Authority;
The street map of Lagos Mainland Local Government.

- (b) Lagos State Information Service Unit (LISSU):
The coordinates used for the georeferencing.
- (c) Lagos State Primary Education Board (SPEB);
Directory of Public Primary Schools in Lagos Mainland Local Government
- (d) National Population Commission, Lagos State Headquarters:
Population figures of the Local Government area where population of school age children were obtained.
- (e) Lagos Mainland Local Government Headquarters;
General information about Lagos the local government.
- (f) Independent National Electoral Commission, Lagos:
Electoral wards in the local government

4.2 Field Work

The execution of this project involves some fieldwork. This Include:

- (i) GPS Recordings: All the schools in Lagos Mainland Local Government were coordinated using **GPS GARMIN 12**. The GPS has accuracy of 5 meters. This makes it appropriate enough for the purpose of coordinating the schools since only their locations on the local government map is required.
- (ii) Photographs, audio and video information were done on some selected schools with due permission from relevant authorities.
- (iii) Acquisition of data as contained in 4.1 also forms part of the field work.

4.3 Hardware Selection

Hardware selection for this project was the one made available by the department of surveying and geoinformatics of the University of Lagos and they include the following:

- A compaq professional workstation AP550
- 21 inch monitor
- Standard windows XP keyboard, mouse and other devices
- Hewlett packard scanjet 6100C
- Hewlett packard laser printer 1100c
- Hewlett packard A0 plotter series 540
- Uninterrupted Power Supply (UPS) devices

4.4 Software Selection

Many softwares have been produced for the execution of GIS. For the purpose of this project, the softwares used are:

- Auto CAD
- Arc view 3.1

- Visio 2000
- Ulead Video Studio 5
- Multimedia Studio Pro 5 Video Edition
- Microsoft Windows media Player
- ULEAD Video Studio Version 5.0

4.5 Data Conversion

The map data obtained for the project was analogue and must be converted to digital format. The online/onscreen digitisation method was used for this project. The map was therefore scanned and digitized using Auto CAD.

4.6 Georeferencing

Four UTM coordinates were used to georeference the scanned map in Auto CAD. These four coordinates were obtained from the Lagos State Survey Department, they are:

- (a) 542709.808, 72066.970
- (b) 542429.143, 716431.682
- (c) 541118.277, 716371.410
- (d) 541140.805, 720340.105

Having georeferenced and ensured that the locations of the coordinates were done with maximum care, the real digitizing was carried out.

4.7 Attribute Creation In Arcview

The on-screen digitizing method was used in order to get a vectorised map of the local government. This map was imported from AutoCAD to Arcview. Each of the layers in the AutoCAD format became a theme in Arcview. The following themes are available among others: Major roads, Streets, Schools, Ward, Locality, Water body, Canal, Marshy areas etc. For each of these themes, the arcview created attribute tables. More fields were added to the attribute table to contain all the attributes already available. These data were entered into the table that links each of the themes.

4.8 Multimedia Hotlinking

The greatest challenge is to develop a multimedia GIS Database by integrating different types of data such as **text data**, **graphical data** (maps, graphs), **picture data** (still and moving pictures) and **sound data**. A video, Photograph and sound recordings of some selected schools were done. Multimedia Studio Pro 5 Video Edition and Microsoft Windows media Player were used in this research project to convert recorded sound to wave files. Video clips directly recorded by the Digital Video Camera were downloaded using ULEAD Video Studio Version 5.0 with a Firewire 1394 adapter, into the Pentium IV 2.4GHz computer equipped with a Microphone where the relational database was created. Video clips with sound were compressed and hot-linked with the other types of data in ArcView GIS environment using ArcView Script files thereby creating a multimedia GIS database for primary schools in

Lagos Mainland local Government of Lagos state. Still pictures from a Digital Camera were similarly hot-linked with public primary schools' map.

4.9 Data Query

Queries are carried out in one of the four ways mentioned below:

Identifying Features: The identify tool available on the tool bar can be used to identify a particular feature with its attributes displayed.

Select Feature Method: A particular feature can be selected using the select feature tool.

Finding Features with Particular Attribute: Click on the theme that contains the features, another click on the find button, a dialog box appears where the name of the feature is typed.

Using Query Expression: Using the Query builder button, query expression can be formed which will find a particular feature on the map.

Sample queries are included in this paper from where accurate decisions can be taken on the schools. More fascinating are the video and sound information about these schools. These covers more details and offer more explanation about the schools.

5. PRESENTATION OF RESULTS.

The results presented are the different types of queries performed on the database. These results can help decision makers to take accurate decisions.

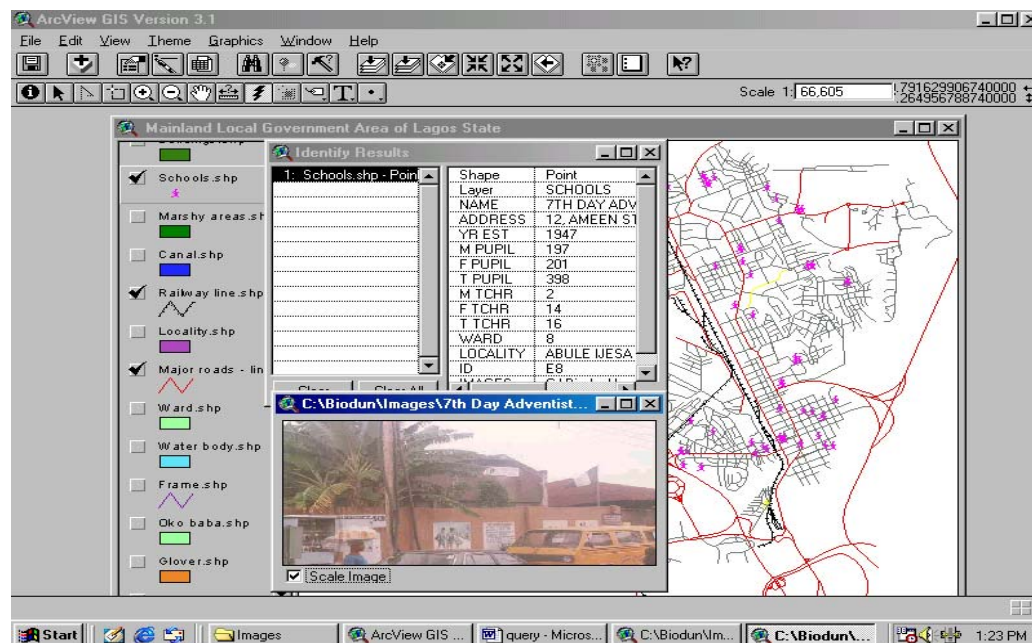


Fig. 1

Fig. 1 displays the result of query on one of the schools located in Lagos mainland local government. The result demonstrates the ability of GIS to display the map showing the location of the school, useful information about the school and a display of the photograph of the school. In this query, information about the name, address, year of establishment, number of male pupil, number of female pupil, number of teachers (male and female), the electoral ward, enumeration locality, the photograph and location of this particular school are available. Therefore, it becomes very easy to arrive at a very accurate decision about this school.

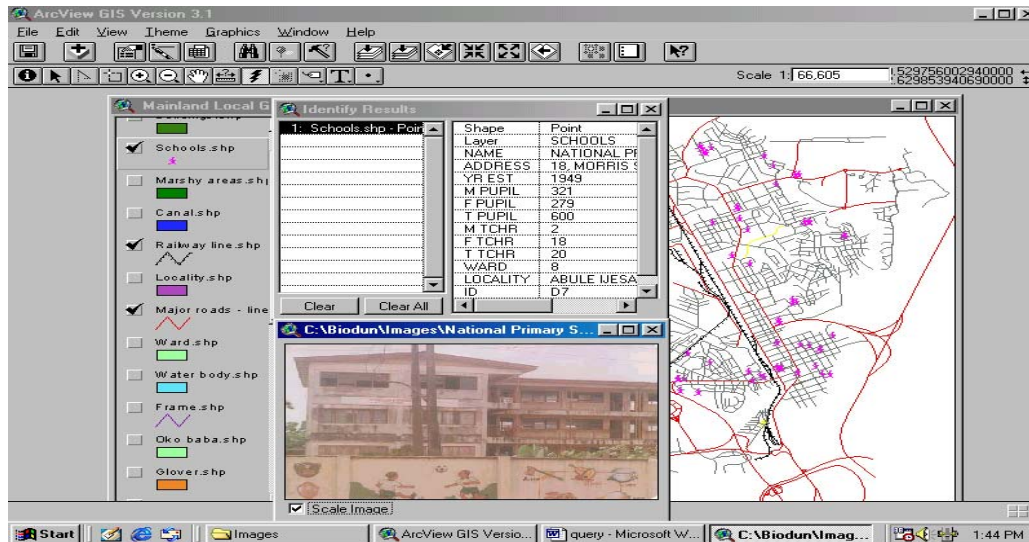


Fig. 2

Figure 2 displays information about another school within the same locality. This will allow for comparison between two or more schools. Figure 3 below displays the enumeration boundaries used for census in the local government.

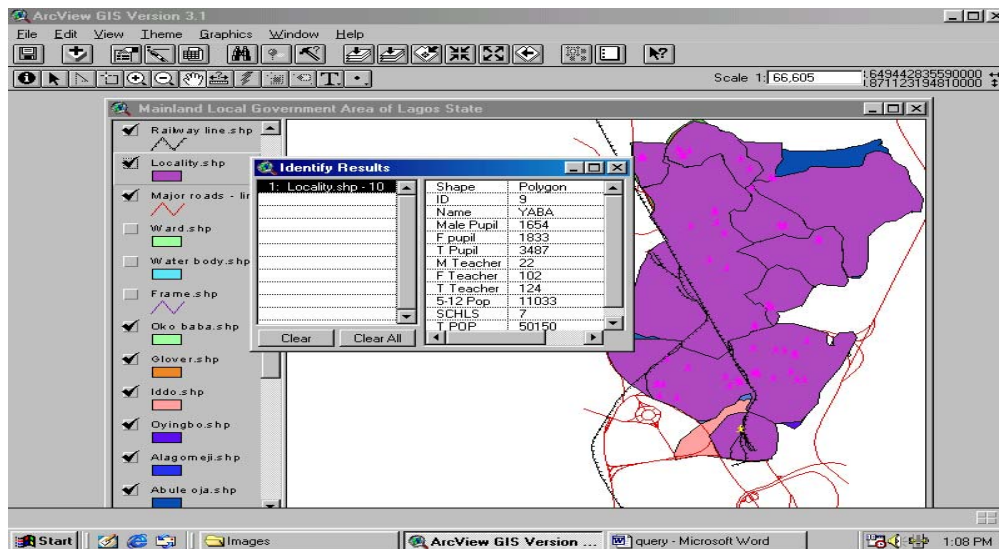


Fig 3

It is possible from figure 3 to find out how many schools are in a particular enumeration locality. Other information includes the total number of pupils, total number of teachers, total number of children and the total population in the locality. This information is very useful to find out the population of the children within the locality and the actual number of pupils in the schools.

Figure 4 below is a display of the electoral wards in the local government.

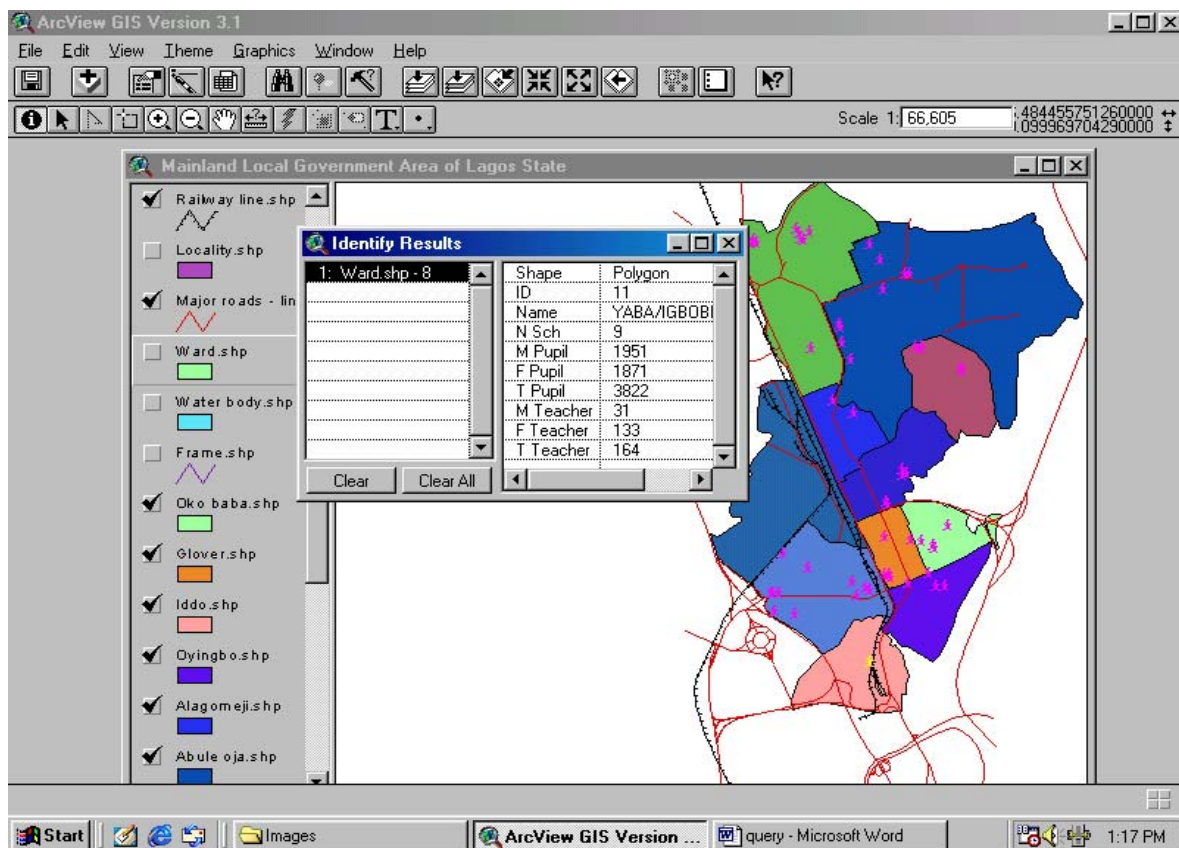


Fig. 4

Figure 4 is a query that allows a decision to be taken within an electoral ward. This is very important in this era of democracy where decisions are taken based on political boundaries.

Figure 5 displays the schools with no playing ground or opportunity to share with a neighbouring school.

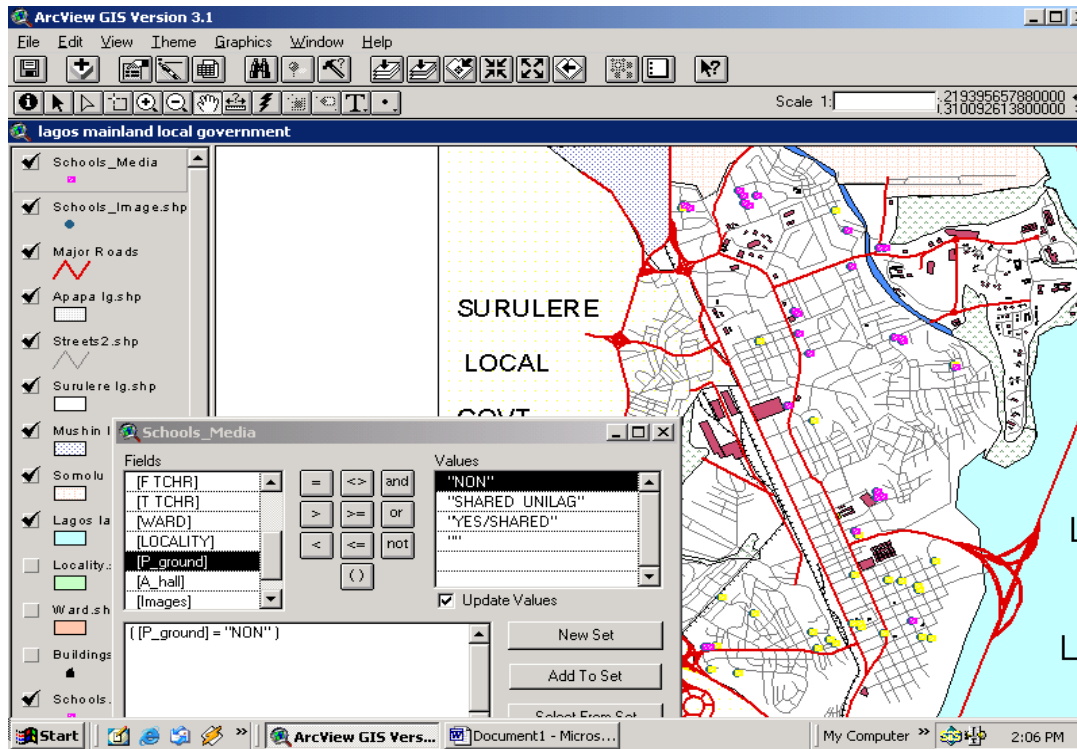


Fig. 5

Decision makers can use the multiple information available in one query to answer many questions relating to facilities in the schools.

DATA ANALYSIS USING CHARTS AND TABLES

Information provided in this work can also be used for a graphical analysis of the data. For example, table 1 below shows the number of schools available in each ward. Figure 7 is the pie chart of the information represented in table 1.

TABLE 1 SHOWING THE NUMBER OF SCHOOLS IN EACH WARD

ID	NAME	SCHOOL
1	OTTO/IDDO	1
2	APAPA ROAD AND ENVIRONS	13
3	OLALEYE VILLAGE	0
4	MAKOKO/EBUTE METTA	5
5	OYINGBO/EBUTE METTA	4
6	GLOVER/EBUTMETTA	7
7	OKO BABA	3
8	OYADIRAN ESTATE/AOJA	12
9	ALAGOMEJI	3
10	IWAYA	5
11	YABA/IGBOBI SABE	9

Figure 6 below is a chart showing the number of schools in each ward based on the data in table 2.

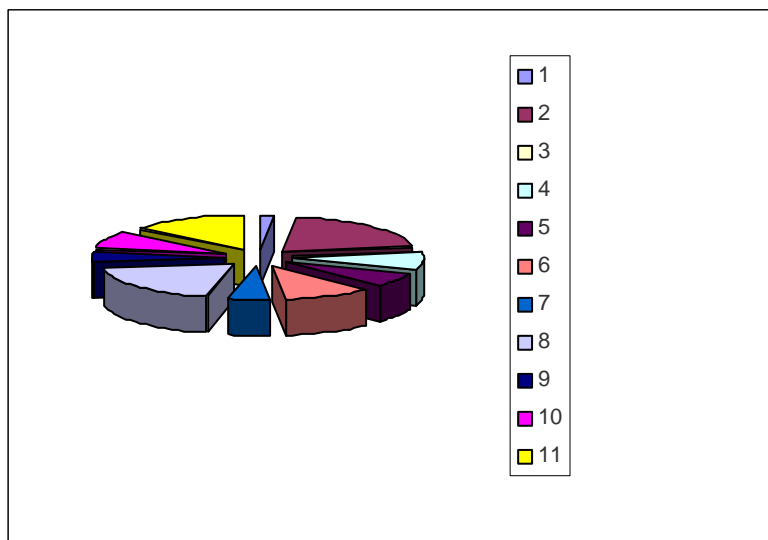


Fig. 6

6. RELEVANCE OF MULTIMEDIA GIS OF PUBLIC PRIMARY SCHOOLS TO GOVERNMENT AGENCIES

Detailed information about public primary schools will be contained in a well-designed Multimedia GIS database. With this, quick and accurate decisions about primary schools in a Local government could be taken. This same project carried out in all the Local Government of a state and made available to the state will help state governments in taken appropriate decisions regarding the schools. The problem of government not being able to identify the difficulties facing each school or abnormal distribution of facilities to the schools will be eliminated since decision makers do not have to travel to where the schools are located before decisions are taken.

6.1 Relevance To National Primary Education Commission (NPEC)

The National Primary Education Commission (NPEC) is a World Bank-assisted Nigeria Primary Education Project aims at assisting the Government of Nigeria to improve the quality of the sub sector through the supply of instructional materials, upgrading of infrastructural facilities, enhancing teachers' competence, facilitating school management, inspection, planning and data gathering. This is being achieved by involving stakeholders at all levels in the process of primary school improvement (Francis 1998). These roles can however be more quickly and accurately discharged using a Multimedia GIS as a tool.

6.2 Relevance To Universal Basic Education Programme (UBE)

The Universal Basic Education (UBE) programme, which was initiated by President Olusegun Obasanjo's administration in 1999. Its objectives are clearly stated in section 3.0 of this paper. UBE will benefit a lot from a multimedia GIS database of primary schools. Since UBE advocates for a compulsory free education up to the Junior Secondary School level for all Nigerians, this suggests that UBE will need information about primary and secondary schools in all the local governments of the federation. It will also require the population of children that should be in the school. This figure compared with the present data in the primary school will supply information on adequacy or otherwise of the present primary schools. Multimedia GIS database of primary schools will provide all information that may be needed for all primary schools located in each Local Government of the federation.

6.3 Relevance To State And Local Governments

The State and Local governments are involved in overseeing and supervising all primary schools in its area. They are involved directly or indirectly, in financing, establishment and control of all primary schools located within their jurisdiction. Detailed information about these schools will be contained in a well-designed Multimedia GIS database. With this, they will be able to take quick and accurate decisions. It will be more interesting if the multimedia GIS database is linked in a local or wide area network within the state or the local government. This means that any ministry or department in need of any information can access these information in their various offices in whatever format it may be desired. The

Governor of a state or Chairman of a Local Government can use such information for decision-making even in the course of a meeting. A multimedia GIS is very interesting because it presents information very close to reality, hence, an individual who has little or no knowledge of mathematical or statistical analysis of data can even take accurate decisions. This advantage makes it an adequate tool for all decision makers especially in the government circle.

7. CONCLUSION

The Multimedia GIS database of primary schools will answer these and some other questions: How many more schools will be needed to cater for other children who are out of school? How many more teachers will be employed? Where must the schools be located? What renovation or expansion is needed in the existing primary schools?

Answer to all the questions above will be very useful not only for the successful implementation of NPEC and UBE programmes, but for other government agencies, parastatals and private sectors whose assignment deals directly or indirectly with the administration of primary schools.

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