GEOGRAPHIC INFORMATION SYSTEM (GIS) APPROACH IN MAPPING THE DISTRIBUTION AND MANAGEMENT OF SCHOOLS IN BAUCHI STATE

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ABSTRACT

Adopting a modern method of facilities management such as Geographic Information System (GIS) will improve the quality of teaching and learning. This study was carried out to map out and evaluate the facilities in the schools within Dass local government area of Bauchi state. The position of schools were observed and recorded using a hand held Global Positioning system (GPS), questionnaires were administered to all schools, collected and analyzed. Analogue map of the study area (Dass) was converted to a digital format through scanning and digitization and subsequently geo-referenced. The positions of school were plotted and database created based on the attribute information collated. Thus, this study sees to how GIS system is applied in distribution and management of schools in Dass Local Government Area of Bauchi state. Data from the field were processed, analyzed, summarized and queried using AutoCAD 2000i, and Arc view GIS 3.2a software. A digital map showing the strategic geographical distributions (locations) of the various schools was finally produced and printed out as a product for presentation. The main discovery was that the schools in Dass are not evenly distributed and there are few schools as compared to the increasing population. And also, the schools lack the various social and infrastructural facilities as well as equipments.

Keywords: Geographic Information System (GIS), Global Positioning System (GPS), Analogue, Geo-referenced.

INTRODUCTION

GIS can be regarded as a subset of Geographic Information Technology (GIT). Information as used here refers to a data element of some kinds that is useful for a particular application such as decision-making process. Information is the knowledge about something. If data can be related to a particular text, this is then information.

Information Technology (IT) refers to a combination of computer, communication, and process technologies.

The standard committee of UK Associations of Geographic Information (AGI) defines GIS as ''A system for handling data which is directly or indirectly referenced to the Earth. It may be used for capturing, storing, validating, manipulating, analyzing, displaying or managing such data. It is normally considered to involve spatially referenced computer database appropriate software. A primary function of a GIS is its ability to integrate data from variety of sources.'' A GIS is a computer based tools for mapping and analyzing geographic phenomenon that exist, and events that occurs on the earth. Borrough,(1986). GIS technology integrates common database operation such as query and statistical analysis with the unique visualization and geographic analysis benefit offered by maps. These abilities distinguished GIS from other information system and make it available to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies.

As a result of its positive effect on the environment, education has become the instrument for measuring the economic growth of a Nation. Education is also one of the most powerful weapons for sustainable growth and development of any Nation. And for a Nation to achieve such development there is the need to apply the knowledge of Geographical Information system (GIS) since it is one of the most powerful information system that can manage spatial information.

Geographical Information system (GIS) is applied in the distribution and management of schools which include monitoring of all facilities such as school buildings (classrooms, library, laboratories, hostels, toilets, bathrooms, dining halls etc) including human and resources, which are put in to optimal use. To ensure effective distribution, utilization and management of such facilities in the schools, GIS helps, to establish and suggest useful modalities in their distribution and management through map production and creation of a comprehensive database.

COMPONENTS OF GIS

An operational GIS also has a series of components that combines to form the system. These components are critical to a successful GIS.

1. HARDWARE: This includes the computer system on which the GIS operates. Today, GIS software runs on a wide range of hardware types, from centralized computer services to desktop computers used in stand-alone or networked configuration.

2. SOFTWARE: These provide the functions and tools needed to store, analyze and display geographic information.

3. DATA: Perhaps, the most important component of GIS is the data. Geographic data related tabular data can be collected in-house, compiled to custom specification and requirements, or occasionally purchased from a commercial data provider. A GIS can integrate spatial data with other

existing data sources, often stored in a corporate DBMS. The integration of spatial data and tabular data stored in a DBMS is the key functionality offered by GIS.

4. PEOPLE: GIS technology is of limited value without the people who manage the system and develop plans for applying it to real World problem. GIS users' ranges from technical specialist who uses it to help them perform their everyday work. The identification of GIS specialist versus end users is often critical to the proper implementation of GIS technology.

5. METHOD: A successful GIS operates according to a well -design implementation plan and business rules which are the models and operating practices unique to each organization.

STATEMENT OF THE PROBLEM

Base on information obtained from the Local Education Authority (L.E.A) Department of Dass Local Government council, and the Ministry of Education there is no comprehensive digital map showing geographical distributions (location) of both public and private schools in the entire Local Government Area.

AIM

The main aim of this paper is to examine the relevance of Geographical Information System application Schools management in Dass, Dass, L.G.A, Bauchi State, Nigeria.

RESEARCH QUESTIONS

This project tries to answer some of the following questions at the end of the research, the questions are:

1. Are the schools in Dass LGA evenly distributed?
2. Are the facilities needed for learning and teaching available in all the schools?
3. Are the available facilities evenly distributed among the schools in the area?

METHOD USED TO ACCOMPLISH THE STUDY

*   **DATA CAPTURE:** GPS instrument is used to obtain the spatial data (coordinates) of the schools, while questionnaires were administered for the attribute data. See appendix.
*   **SCANNING:** This involves the conversion of the analogue paper map of the study area in to a digital raster format.
*   **GEO-REFERENCING:** This refers to the process of referencing various points on the map/ image to its exact location as on the earth surface by plotting the coordinates of the points identified on the ground unto the digital scanned map.
*   **ON-SCREEN DIGITIZNG:** This is the process of conversion of the scanned digital raster map layer by layer to a vector format using CAD overlay.

- **PLOTTING:** Points whose coordinates were captured using the GPS are plotted unto the geo-referenced digital image in the computer using COGO (Coordinate Geometry)
- **CREATION OF DATABASE: A**ttribute table and the database containing information's about the schools is created using ArcView software.
- **CREATION OF LAYOUT :** This is the final process of map presentation either as a soft coy (on the computer screen, projector, or in other storage devices such as CDs flash drives, etc) or in a hard copy (on paper, leather, cloth, etc)

LOCATION OF THE PROJECT SITE
Dass LGA is situated in the southern senatorial district of Bauchi state and lies between longitudes $9^0\,20^1$ to $9^0\,38^1$ East of the prime meridian and latitude $9^0\,50^1$ to $10^0\,08^1$ North of the equator. It is about 45km away from the state capital (Bauchi). Lie south-west of the state capital.

SIGNIFICANCE OF THE STUDY
GIS has come up with modalities that enhance the efficiency of facilities distribution and management in organizations and the idea of application of GIS in distribution and management of facilities has given a wide acceptance both as a matter of policy and principles in organizational resource management.
The project is to draw the attention of those concerned with facilities distribution and management to realize the significance of GIS as an effective tool in facility distribution and management which in turn enhancing teaching and learning in schools.

CONCLUSION
With referenced to the statement of problem earlier mentioned, it can be seen that the research has been able to address most of the problems. By producing a digital map showing the geographical distributions,(locations) of all the schools, and a database containing useful information about the schools in Dass L.GA.
Thus, to a greater extent, it can be said that the aim of this research work has not been defeated. Thus, it shows that GIS is a strong tool for the management of facilities. The main discovery of this research was that the schools in Dass are not evenly distributed and there are few schools as compared to the increasing population. And also, the schools lack the various social and infrastructural facilities as well as equipments.

RECOMMENDATION
Inspired by the overall achievement attained by this study, it had its short coming and as such, it is recommended that this research be reviewed in subsequence years.
It is our hope that this research will greatly enhance and also improve the distribution and management of schools facilities in both public and private Secondary school in Dass L.G.A.

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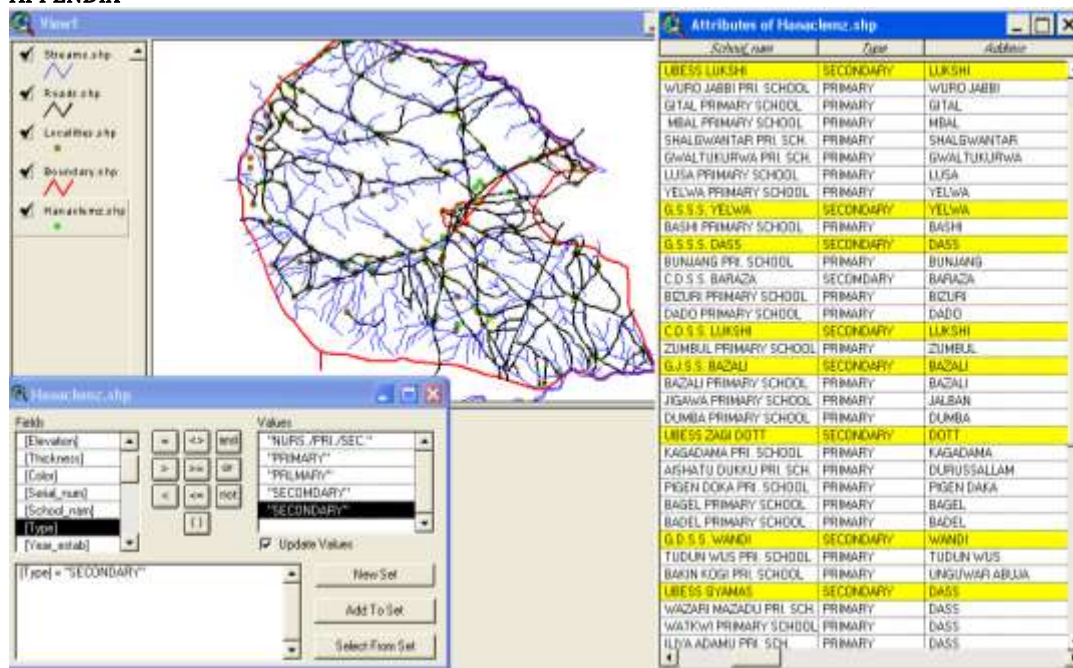
APPENDIX

FIG. 1. A QUERY BY ATTRIBUTE SHOWING THE SECONDARY SCHOOLS IN DASS L.G.A.

PROCEDURE:
- Click on the QUERY BUILDER in the tool box
- Double click on the TYPE in the field box
- Click on equal to sign (=).
- Double click "SECONDARY" in the value box.
- Click on NEW SET.

The secondary schools are automatically highlighted (yellow), as well as its location on the Map, as shown in the figure above
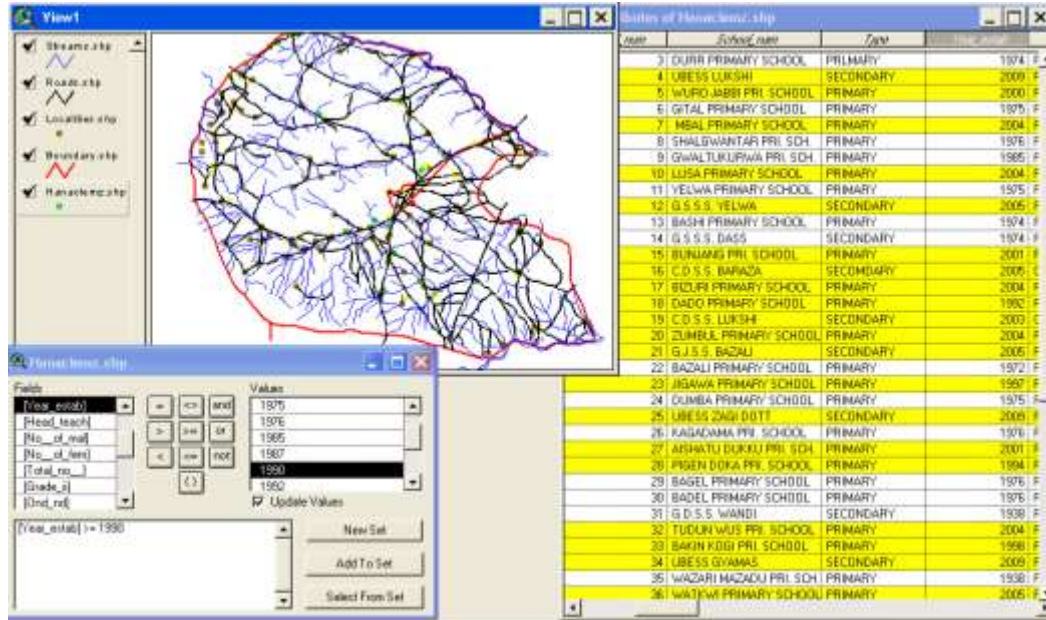
FIG. 2. A QUERY BY ATTRIBUTE SHOWING SCHOOLS ESTABLISHED FROM 1990 TO DATE.

PROCEDURE:

- Click on the QUERY BUILDER icon on the tool bar, a query dialog box appears
- Double click on the YEAR OF ESTABLISMENT in the FIELD box, inside the query dialog box.
- Click on the "greater than or equal to sign" (>=).
- Double click on 1990 in the value box.
- Click on NEW SET. The schools established from 1990 to date, are automatically highlighted (yellow), as well as its location on the Map, as shown in the figure above.
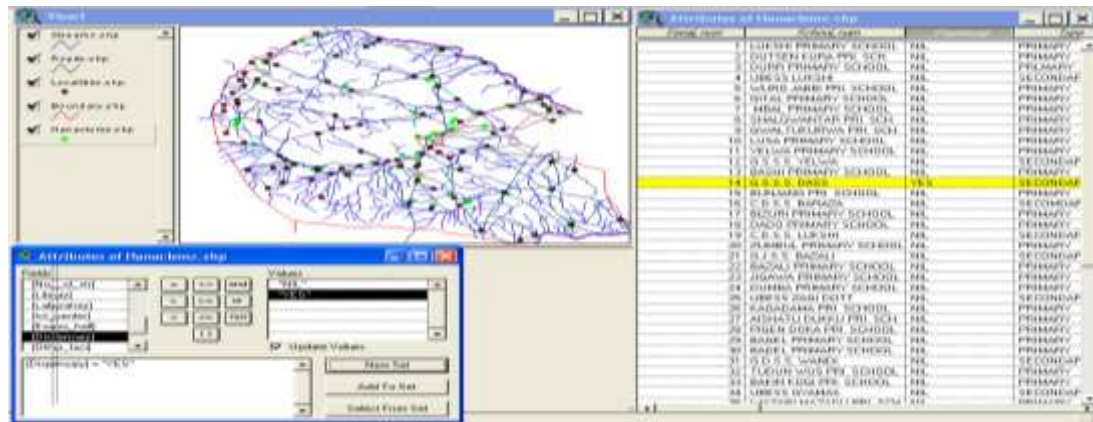

FIG. 3. A QUERY BY ATTRIBUTE SHOWING SCHOOLS HAVING DISPENSARY
PROCEDURE:

- Click on the Query builder icon in the tool bar, a query dialog box appears
- Double click on DISPENSARY in the FIELD box
- Click on the "equal to sign'' (=)
- Double click on the YES in the FIELD VALUE box
- Click on NEW SET

The schools having dispensary are automatically highlighted (yellow), as well as its location on the Map, as shown in the figure above.
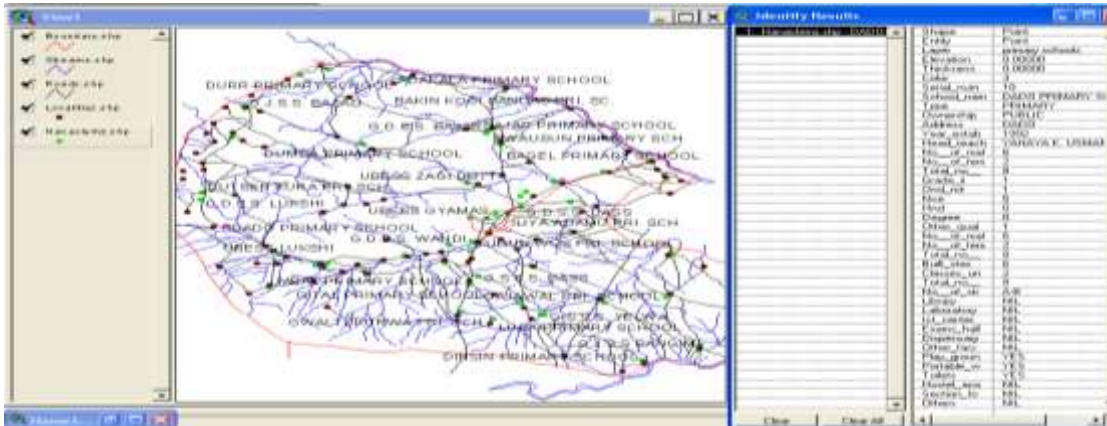
FIG. 4. A QUERY BY LOCATION SHOWING ATTRIBUTES INFORMATION OF DADO PRIMARY SCHOOL.

PROCEDURE:
- Open the map in the Arc view environment
- Click on IDENTIFY (i)
- Double click on the point whose attribute information is required.

Haven double clicked on the point, an attribute table containing variable information about that point (school), will appear as shown in the figure above.
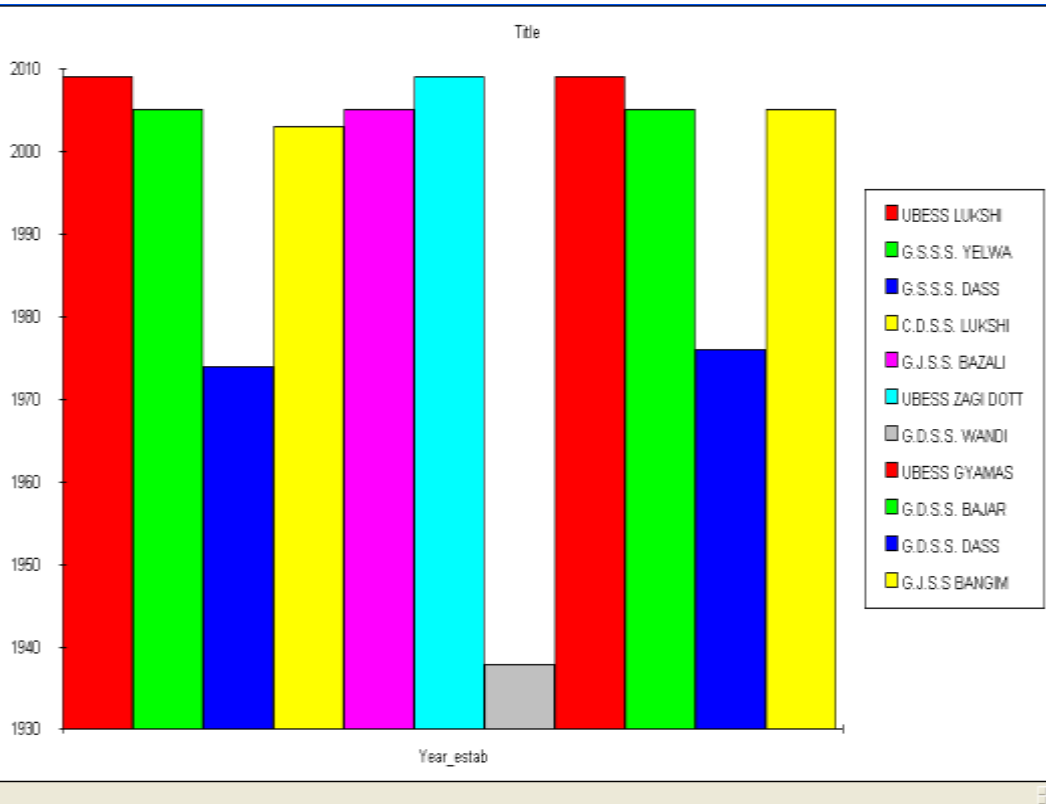

FIG. 5. A CHART SHOWING THE YEARS OF ESTABLISHMENT OF ALL THE SECONDARY SCHOOLS IN DASS L.G.A

PROCEDURES:

- Click on CHART on the tool bar, a chart property table appears.
- Select YEAR OF ESTABLISHMENT in the field box.
- Select SCHOOL NAME in the label series box
- Click on ADD, the selected field will be added under Group box.
- Click ok

Haven clicked on OK, a chart showing the year of establishment of all the secondary schools is displayed, with different colour representing each school as shown above.
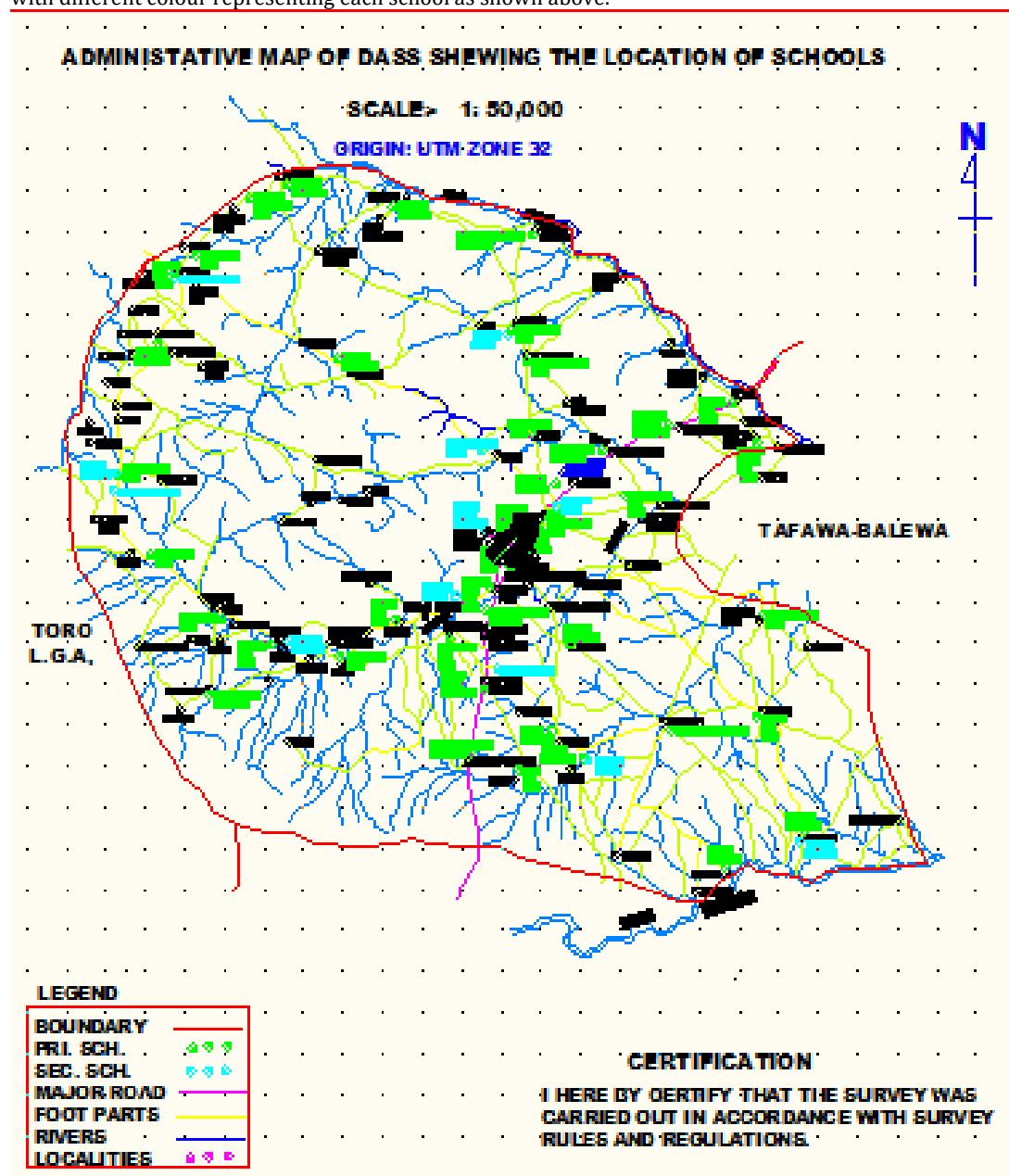

FIG 6. A COMPOSITE MAP OF DASS L.G.A. SHEWING THE LOCATION OF SCHOOLS