Developing a Geospatial Database for Public Secondary School Facilities in Umuahia North L.G.A, Abia State, Nigeria

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ABSTRACT

This paper aimed at populating a geospatial database for secondary school facilities in Umuahia North L.G.A, Abia State using GIS approach. This aim was achieved through the following objectives; acquisition and processing of primary and secondary datasets within the study area, creation of a functional spatial database on public secondary school facilities and carrying out spatial attribute queries. The methodology adopted included: the geo-referencing and digitization of the existing map of Umuahia North, plotting the coordinates of schools, conducting spatial queries. The software used included; ArcGIS10.1 and Microsoft office suite. The result showed that only eleven out of the seventeen schools have a recommended minimum of twenty classrooms, while, the remaining six schools are lacking adequate classrooms, three out of seventeen schools had Teachers having NCE and B.ED as minimum and maximum qualifications respectively, thirteen out of seventeen schools had well equipped laboratories for physics, biology and chemistry, it was also observed that ten schools have well-conditioned libraries with modern textbooks which will enhance their level of reading and assimilation while the other seven schools have sub-standard or no libraries at all making the level of reading and understanding low and not easy at all. This is significant as the results obtained in this study should serve and aid as a decision support system in management of secondary school facilities in Umuahia North L.G.A Abia State.

Keywords: Education, Facilities, Database, Geographic Information System.

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1.0 INTRODUCTION

Education is a basic human right and it is indispensable for the realization of other needs of Man for social, cultural, political and economic benefits. It is transformative and empowering; education contributes to building more just societies. Nigeria continues to struggle to improve on education in spite of technical and financial assistance given by United Nation Education Scientific and cultured organization and the World Bank (Ojiako and Igbokwe 2011). In Umuahia Urban Area, education affects development in various dimensions. These include cognitive competence, literacy (reading and writing) numeric modernity and problem solving behaviors. Having accurate data or information for decision making for the management of these facilities is vital as these data and structures will provide vital information upon which individual, private organization and government will harness for use.

Yoko and Seisuke (2004) stated that schools in Bangkok have their databases scattered all over different agencies and are not integrated into digital format thereby preventing location analysis using GIS. Ojiako and Igbokwe (2011) identify the same at Nnewi Urban area of Anambra State. They stated "The learning conditions in schools are alarming with lack of teaching materials, overcrowded classrooms and generally run-down condition of many of the schools buildings. The significance of these cited reviews is that the introduction of GIS as a tool helps data presentation easier to access, provide more flexible assistance in prospective planning at multiple unit of analysis and carrying out queries at any time.

Geographic information system (GIS) and education share common characteristics that cross the boundaries of disciplines and application areas. Similarly, education has been a subject of interest to every areas of our life and as such, the potential for GIS application in education is significant (Ayeni et al., 2012). GIS is now recognized widely as a valuable tool for managing, analyzing, displaying large volumes of diverse data pertinent to many local, regional and national activities. Its use in environmental planning is rapidly increasing. Education management is an activity highly dependent on environmental resources since the process most time involves structures and is a phenomenon which in event of lack of planning is likely to erode its base; hence its strength can be enhanced by GIS application (Ayeni et al., 2012).

2.0 STUDY AREA

The study area is Umuahia North Local Government Area of Abia State Nigeria. It comprises of 24 communities including the state capital Umuahia. The region lies between Latitudes 7° 19' 21''and 7° 37'29''North, and Longitudes 5° 23' 18''and 5° 45' 31''East It has its headquarters at Umuahia Town and was carved out from Ikwuano/Umuahia L.G.A. in 1991.
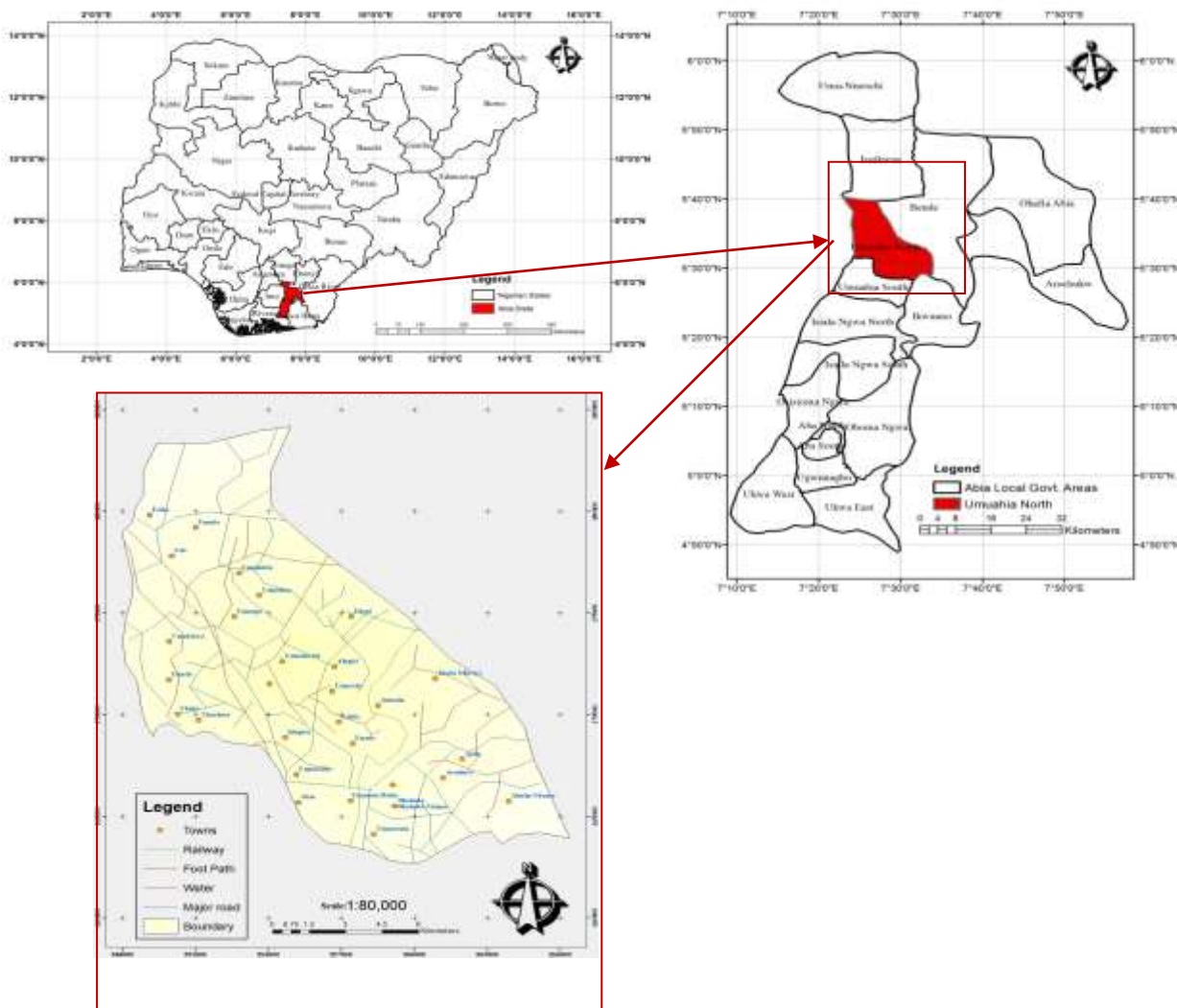

Fig 1(a) Map of Nigeria, (b) Map of Abia State (c) Map of Umuahia North L.G.A

3.0 METHODOLOGY

The methodology adopted in this paper is subdivided into various steps such as: planning stage, Data requirement/acquisition, digitization and coordinate plotting, attribute creation and GIS analysis and result as shown in the flowchart below.
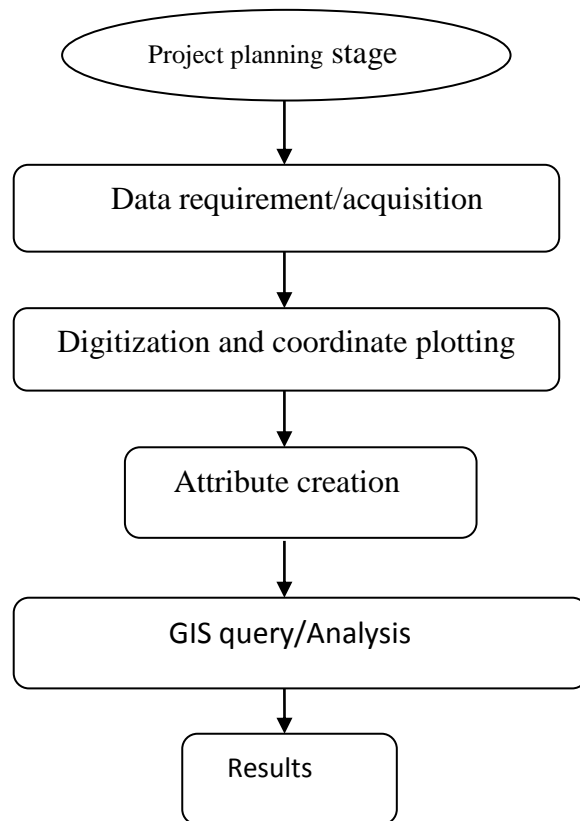
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FIG 3.1 FLOWCHART OF METHODOLOGY ADOPTED

For a proper and effective optimization, planning is very important. In this phase of the project, a user requirement analysis was done to focus on what information is presently being used, who is using it and how the source is being collected, stored and maintained. This process was followed by collecting various data required for the research. These data was then processed with ArcGIS software resulting in a comprehensive database for secondary school facilities in Umuahia North. Then attribute queries were performed on the database to provide and answer necessary questions regarding management of secondary school facilities in Umuahia North L.G.A

4.0 RESULTS

Results of database queries were presented in form of digital maps and tables. These maps could be thematic in nature. These presentations can be in hard copy, soft copy and on screen.

4.1. Query to determine schools with NCE as min. qualification and B.ED as max qualification.
A query to determine the schools that have teachers with NCE as min qualification and B.ED as max qualification was formulated using the command ("Min_Qua" = 'NCE' AND "Max_Qua" = 'B.ED').
The result Fig 4.1 shows that 3 schools out of 17 schools (18%) namely Amazukwu girl's secondary school, Girl's secondary school and Mbom community school respectively had NCE and B.ED as min and maximum qualifications respectively.

This result is significant because teachers in secondary schools should have M.ED as maximum qualification. Teachers having NCE and B.ED as minimum and maximum qualifications respectively are not good enough as to give sound education especially in the post primary schools because the level of their qualification will definitely affect the performance of the students negatively. Most teachers become complacent and do not endeavor to upgrade their qualifications unless they need it for promotion. These teachers should be advised to go on further studies in other to upgrade their qualifications.
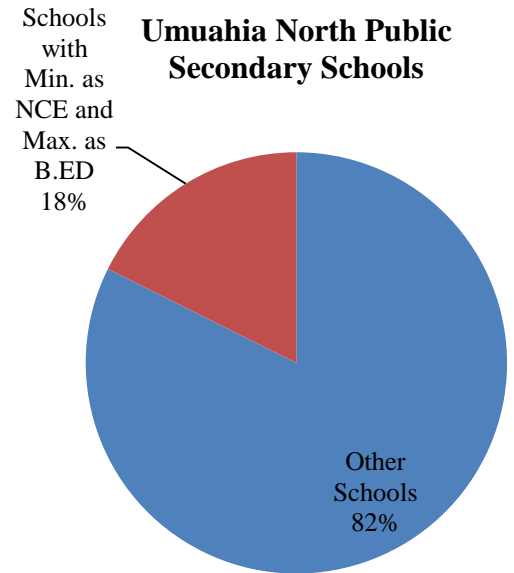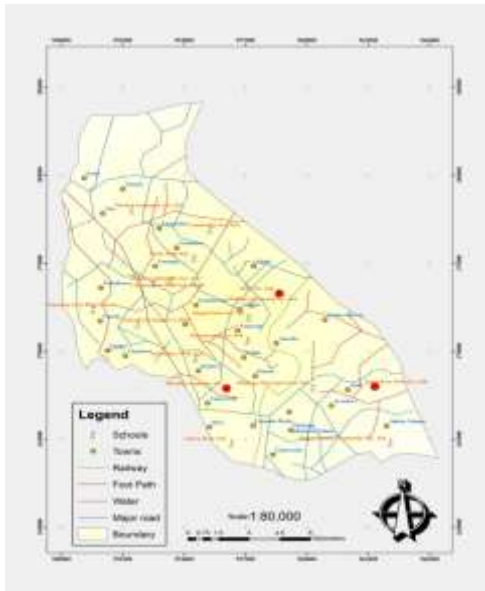
Fig 4.1 Map showing schools with NCE as minimum qualification and B.ED as maximum qualification
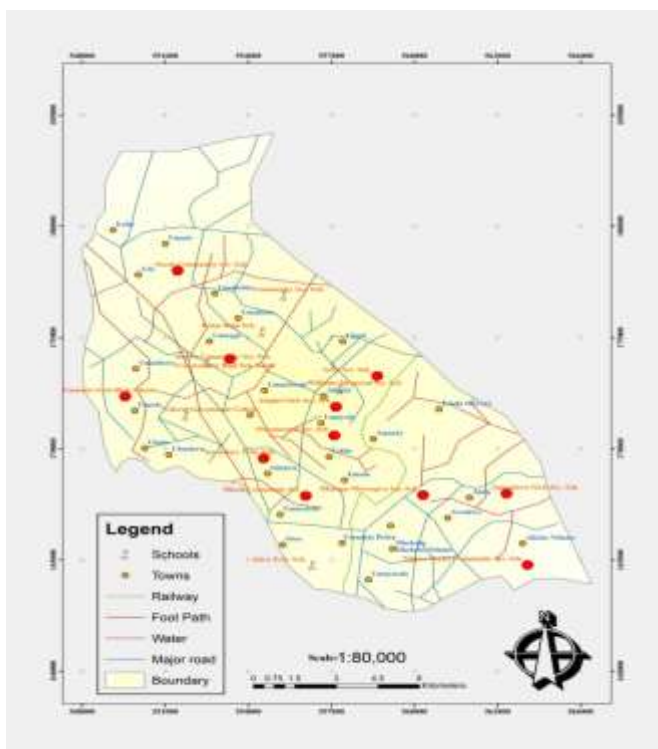
4.2 Query to determine schools with total number of classrooms above 20

This query was performed in other to determine the schools with a min of 20 classrooms. This query is necessary because schools usually admit a large number of students and as such should have a min of 20 classrooms. Using the query command ("No_of_Clas" >= 20).

The result Fig 4.2 shows only 11 out of the 17 schools have a recommended minimum of 20 classrooms, that means only 65% of schools in Umuahia Local Govt. Area have a set recommended 20 classrooms from the Educational board.

This result is significant because if 65% of schools in Umuahia North L.G.A met the set recommended minimum of 20 classrooms then the other 35% of schools don't have the set recommended number of classrooms which means that there will be a greater ratio of students to classrooms, which will lead to overcrowding.

This result also helps to identify schools in need of classrooms, since these schools are public 'state' schools, state education funds should be directed towards erecting classrooms for these understated schools.
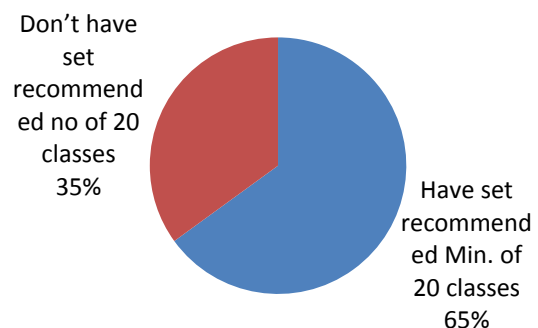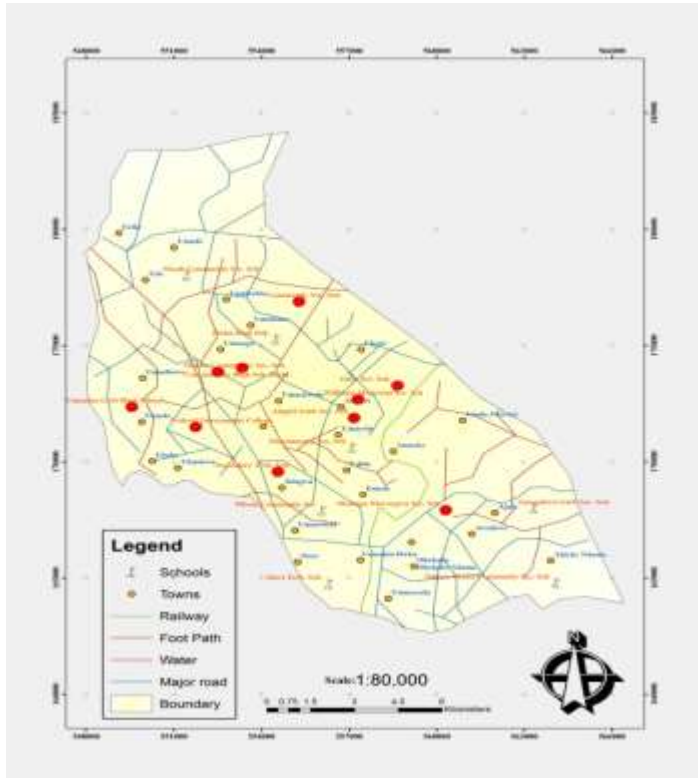

Fig 4.2 Query result showing schools with total number of classrooms above 20

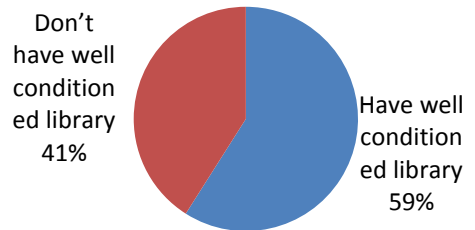**4.3 Query to determine the schools with libraries that are in Good condition**

This analysis was performed in other to determine the schools having libraries that are also in good condition. This was done by the usual way of typing in the query command (""Library" = 'Yes' AND "Con_lib" = 'Good').

From the result Fig 4.3, it was realized that 10 schools (59%) have well-conditioned libraries with modern textbooks which will enhance their level of reading and assimilation.

This is significant because the result has identified 41% of schools in need of textbooks and other library materials, so that the level of reading and understanding in these schools will not suffer due to lack to textbooks and reading materials.

Fig 4.3 Map showing schools with libraries that are in good condition

4.4 Query to determine the schools with at least 3 laboratories that are well equipped.

This query was formulated and performed in other to determine the schools having at least 3 laboratories that are equipped. This analysis was done by typing in the query command ("No_Lab">=3 AND "Lab_Stat"=Well Equipped').

From the result Fig 4.4, it was discovered that 13 schools out of 17 schools have all 3 labs equipped for physics, biology and chemistry. While the remaining 4 schools either have 1 or 2 of the labs which could be sub-standard, fair and not equipped. The criteria for standard lab are that school labs must have all the necessary practical apparatus and also, these apparatus must be in good working condition.

This implies that 74% of schools in Umuahia North have well equipped labs for physics, biology and chemistry while 24% don't have well equipped labs.

This significant because schools have arts or science based students, science based students are practically inclined and as such, having labs that are not well equipped will hinder their practical development, they will be left with just textbooks to read about cases they need to be studying in the lab. So this result has identified schools in need of lab equipments this in turn will help nurture and enhance student practical skills.
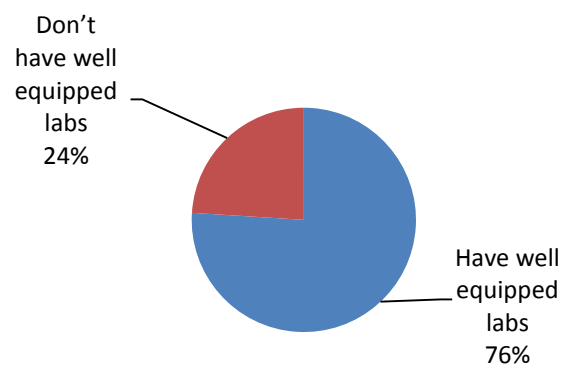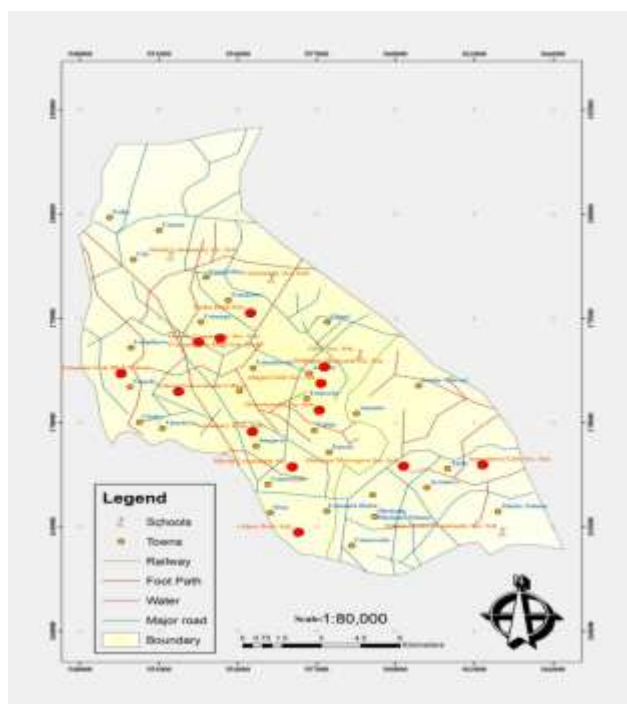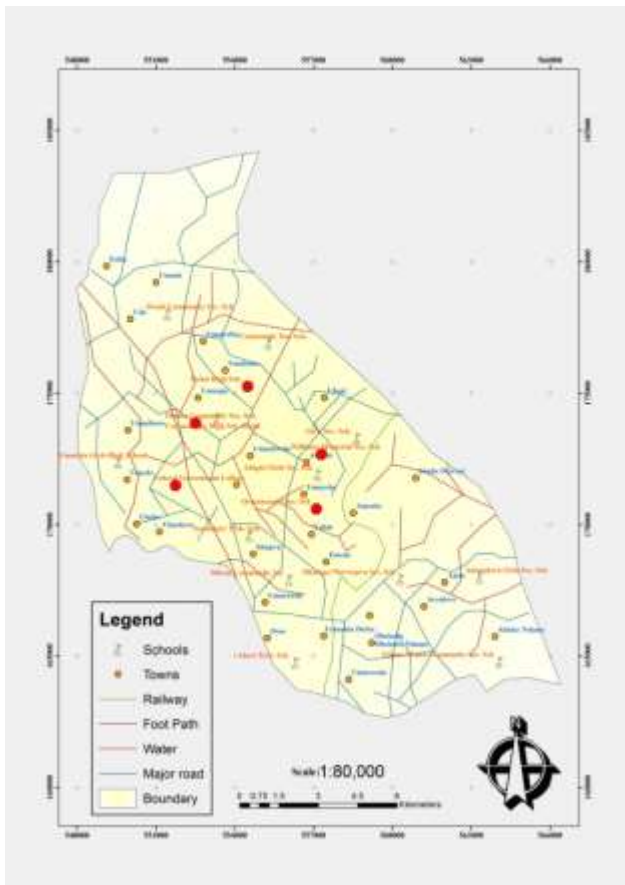
Umuahia North Public Secondary Schools

Fig 4.4 Map showing the schools with at least 3 laboratories that are well equipped

4.5 Query to determine schools with dilapidated classrooms in need of renovation

This query was formulated and performed in other to determine the schools whose classrooms are in need of renovation. It was done on the basis that conducive environment for learning enhances education and a good solid building/structure with standard roofing and ventilated classrooms is one of the key factors of conducive environment for learning. The query command that was used was ("Build_Dlap"=Yes). From the result Fig 4.5 it was observed that 5 out of 17 schools have their classrooms in a very bad shape which needs renovating. Structural hazard is a serious disaster that could happen if buildings are not checked or monitored, especially in a school environment where there are a lot of day to day activities inside these buildings. It is advised that these class rooms be renovated and managed in other to avoid casualties or death of students and teachers. This query result is important because conducive environment for learning enhances education and a good solid classrooms/structure with standard roofing and ventilated classrooms is one of the key factors of conducive environment for learning. This result also highlights schools in need of building renovations so that whenever the government directs education funds to schools, the issue of dilapidated buildings is not ignored.
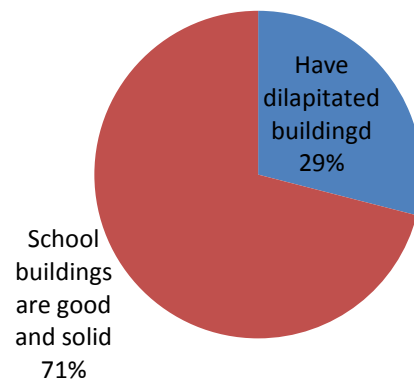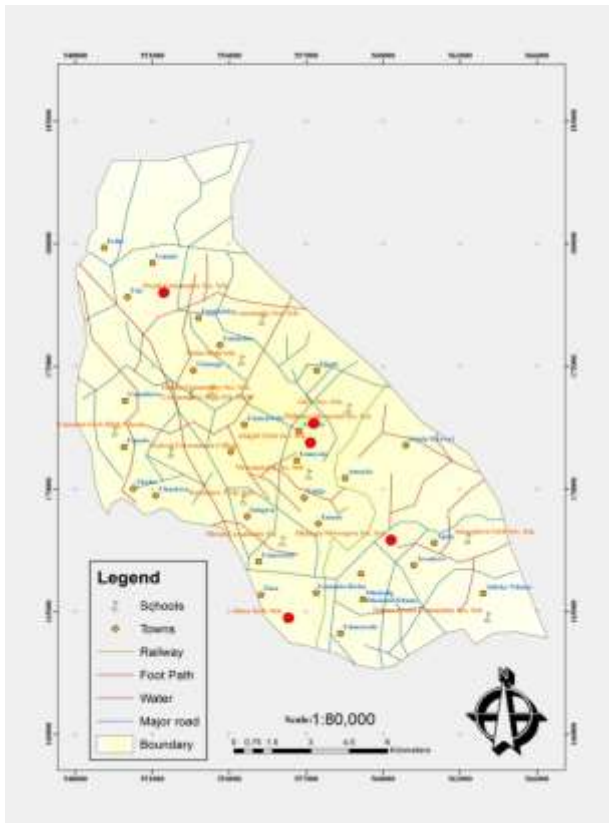
Fig 4.5 Map showing the schools with dilapidated buildings

4.5 Query to determine schools with internet facilities

This query was formulated and carried out so as to determine the schools with internet facilities. It was done on the basis of the modern trend and advances in technology and its benefits. The query command ("Internet" = 'Yes') was used. From the result Fig 4.6, only 5 schools have internet facilities while the remaining 12 schools do not have internet facilities. This is significant because this era is described as the computer era; most exams written now are computer/ internet based (e.g. Jamb, Post UME).

If these students are not taught or if they don't become familiar with the changes it might become difficult for them to cope with these exams.

This result helps to indicate schools in need of ICT facilities so that vital information can be accessed and students can also gain ICT knowledge from the onset.

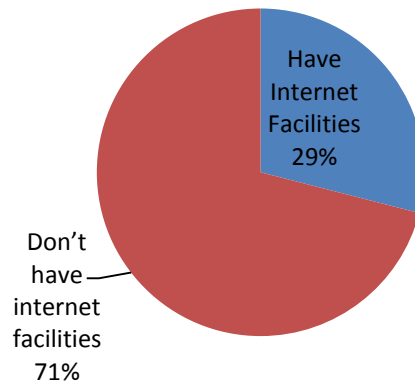**Umuahia North Public Secondary Schools**

Fig 4.6 Map showing the schools with internet Facilities

4.7 Query to determine the schools with Recreational Facilities

This analysis was formulated and performed in other to determine the schools having recreational facilities for example basketball pitch, volleyball pitch and football fields. It was done by using the query command ("Recreation" = 'Yes').

The result fig 4.7 showed shows that 6 out of the 17 schools have recreational facilities; this includes volley ball, basketball court and football field.

This is significant because recreational facilities are very important because it removes fatigues, keeps the students physically fit, strong and healthy. Students at that time in their life need to be very active and sports will keep them from doing other negative things. It is advised that the other 11 schools should endeavor to provide these facilities in the school as to promote sporting activities in the school.

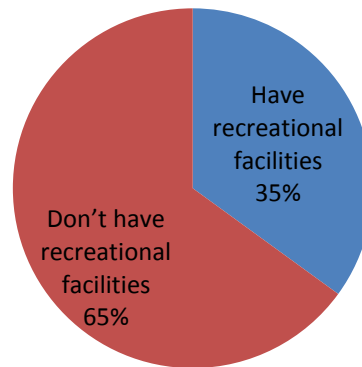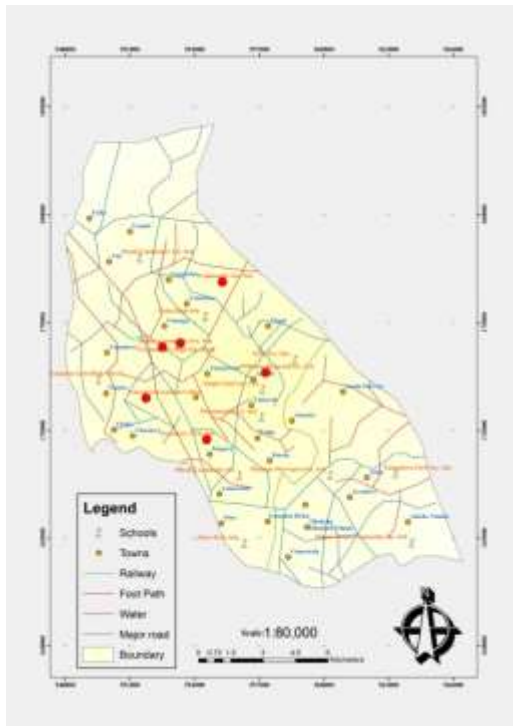## Umuahia North Public Secondary Schools

Fig 4.7 Query result showing the schools with Recreational Facilities

**4.8 Query to determine schools having Social and Educational Clubs**

This query was performed in other to determine the schools having social and educational clubs; these include debate, rotary club and bible society. It was done to assess the social interaction and communication of students within and outside the school. The query command ("S_E_Clubs" = 'Yes') was used.

The result Fig 4.8 indicated that 5 schools out of 17 schools have social/educational clubs, while the other 10 schools have one, two or no social clubs at all. Students that do not engage themselves with these social clubs will have difficulties in interacting with their fellow students within the school, outside the school and in the general public.

The importance of social interaction between students cannot be overstated; social interaction between students at a young age helps them become socially confident, and they can merge and move appropriately within the society.

Lack of social interactions between students could lead to social awkwardness, when this happens the students will find it difficult to adjust to society leading to social anxiety.

So it is advised that social/educational clubs be created in this schools lacking them in order to prevent the occurrence of social anxiety in the future.
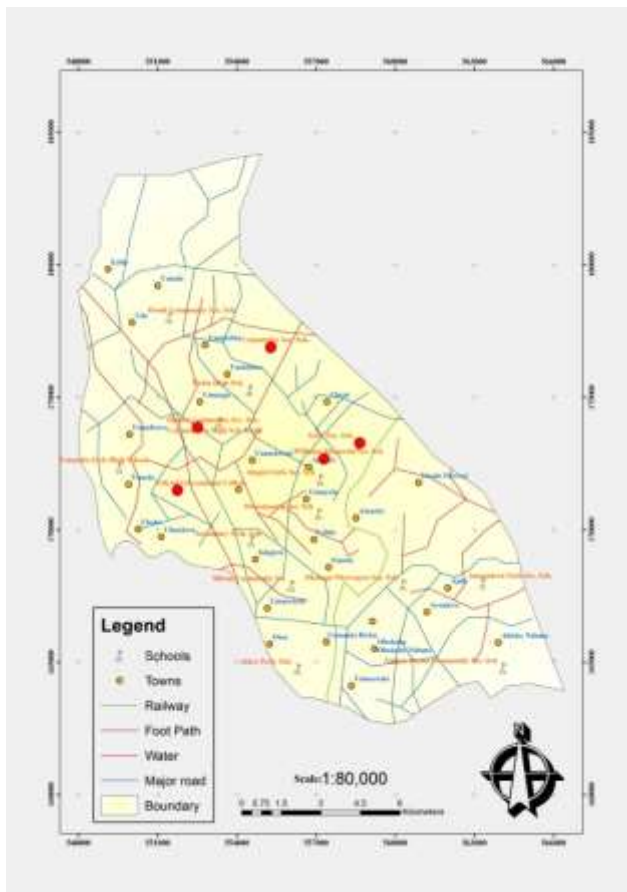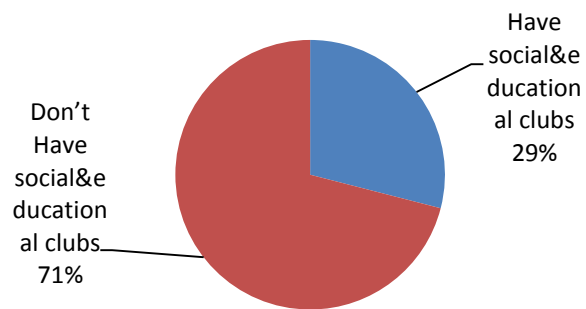
Umuahia North Public Secondary Schools

Fig 4.8 Map showing the schools with social and educational facilities

5.0 CONCLUSION

This study successfully demonstrated the potentials of using GIS approach in the database management of secondary school infrastructure in Umuahia North L.G.A. of Abia State, Nigeria.

It was discovered that 3 out of 17 schools had Teachers having NCE and B.ED as min. and maximum qualifications respectively, 11 out of the 17 schools have a recommended minimum of 20 classrooms, 13 schools out of 17 schools have at least 3 equipped laboratories for physics, biology and chemistry. It was also observed that 10 schools have well-conditioned libraries with modern textbooks which will enhance their level of reading and assimilation It was realized that about 12 schools do not have internet facilities, that only 6 schools have recreational facilities. It was realized that 5 schools have Social/Educational Clubs (debate club, Rotary club and bible society) for their social interaction and communication It was also discovered that 5 out of 17 schools have their classrooms in a very bad shape which needs renovating. These classrooms should be renovated and managed in other to avoid casualties or death of students or teachers.

The results obtained in this study aid as a decision support system in for management of secondary school facilities in Umuahia North L.G.A Abia State as it will provide information on secondary school infrastructure for immediate and future educational authorities.

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