

# Election Monitoring In Dekina Local Government Area of Kogi State Using Gis Approach

<sup>1</sup>Salifu, J.O, <sup>2</sup>Sule Z.O.&<sup>3</sup>Idoko, I.A.

<sup>1</sup>Department of Surveying and Geoinformatics Federal Polytechnic Idah, Kogi State

<sup>2</sup>Department of Surveying and Geoinformatics Federal Polytechnic Idah, Kogi State

<sup>3</sup>Department of Surveying and Geoinformatics, Federal School of Survey Oyo, Oyo State

Submitted: 25-06-2021

Revised: 01-07-2021

Accepted: 03-07-2021

**ABSTRACT:** GIS approach to electoral mapping is an efficient platform that provides database useful for electoral officials to conduct elections, manage and analyze electoral dynamics. This research is aimed at using geographic information system-based approach to monitor election in Dekina Local Government Area of Kogi State. The methodology employed in this research involves the conversion of analogue to digital map which also involves the process of scanning, Georeferencing and digitizing. The study map was updated using the GIS server(The add GIS server tool) and other processes conducted like plotting of coordinate points representing the various polling units, geodatabase creation and queries generation, statistical analysis using charts and tables. GIS based electoral mapping provides electoral officials the best platform to analyze and make smart decisions as it is the best technique of relating spatial data with attribute information. This research was able to find out that there are no polling units around Ochigi, Olaji at Ojikpalada ward in Dekina LGA. It was also able to suggest that Anyigba ward requires more of voter sensitization and education as just 20% of the total population are registered voters.

**Keywords:** Election, Geographic Information System, Geodatabase.

## I. INTRODUCTION

Election involves the participation of the people in the act of choosing their leaders and their participation in governance (Waldemar, 2013). Election do not only consist of the activities that surrounds election day though it is part of the fundamental component, it encompasses activities even before, during and after elections. The use of GIS in elections can cover the whole elections cycle from boundary demarcations (polling units area mapping) to the stage of election result broadcast including results management and citizen participation (Ojiako et al, 2016).

GIS has been discovered as one of the best techniques of the depiction of spatial data which has to do with the location of polling unit, the production of a robust database i.e electoral database for the easy coordination, management and monitoring of elections and also the enhancement of geographic visualization of electoral dynamics and electoral demography. Also, GIS can help in the analysis of election violence i.e knowing polling units that have record of violence.

GIS have been identified as one of the 21<sup>st</sup> century tools for communications, information processing and research enhancing abilities in findings, evaluation, integration, creating and analyzing issues and information at different levels (Omoleke et al, 2017). It has been discovered that there is a strong need of geospatial technology in the management of elections. This is because, violence in the elections is alarming due to the integrity of the country's electoral process that is at stake. Hence the need to foster credibility and acceptable elections in Nigeria (Nwanegbo, 2015).

Electoral data and analysis involve a GIS based approach which can enable all voters and election officers to visualize relationship, patterns and trends to deeply understand their constituency and effectively manage the entire electoral process. GIS has been seen to provide accessibility of information with respect to all facets of electoral management cycle like voter registration, polling stations locator and election data on demand.

## II. STUDY AREA

Dekina is a local government area in Kogi State Nigeria (see figure 1.1), located between Latitude 7° 27'N and 7° 31' North of the equator Longitude 7° 09'E and 7°12 East of the Greenwich meridian with estimated population of 260,312 at 2006 by the National Population Commission (NPC) and an area of 2461km<sup>2</sup> (950sq miles).

## III. METHODS

The methodology adopted in this research which involves the data requirement, the data source, the data processing, techniques and approaches are presented in the list of subsections below

### A. 3.1 Data Requirement/ Acquisition

The data obtained for this study includes

- a. The administrative maps of Nigeria, Kogi State and Dekina LGA was acquired for this project
- b. Road data of Dekina LGA. Was gotten from the digitizing of analogue map to be collected from ministry of Lands and survey. The GIS server was activated online for map update.
- c. Polling unit Directory and Register for Dekina Local Government was sourced from the Independent National Electoral Commission (INEC) Kogi State.
- d. Total number of registered voters in the different polling units. This was extracted from the polling Register to be collected from INEC office.
- e. Location of polling units, security posts in Dekina Local government was collected using the Handheld GPS for depicting their spatial locations.
- f. Incidence of Election violence data of 2019 General and House of Assemblies Election was collected from INEC, also by Oral interviews and Newspaper publications
- g. Demographic data was sourced from the National Population Commission, Kogi State. Other relevant data was sourced from statutory bodies where necessary.

### B. Acquisition of Primary Datasets

The primary datasets that were used for this research work were obtained through field visits; these includes:

- I. Positions or locations of polling units in Dekina Local Government was collected using a Handheld GPS.
- II. Attribute data: This includes non spatial descriptive information of the location of polling unit. E.g, polling unit location description
- III.

### C. Acquisition of Secondary Datasets

The secondary datasets were gotten from digitization of available map data and attribute data such as:

- a. The administrative maps of Nigeria, Kogi State and Awka Dekina Local government Area. These can be sourced from from Ministry of Lands and Survey, Lokoja, or otherwise downloaded as a shapefile form google. Road data can be gotten from the digitizing of analogue map which was collected from

ministry of Lands and survey. Google image of the study can be used to update the road map.

- b. Polling unit Directory for Dekina Local Government, was sourced from the Independent National Electoral Commission (INEC) Kogi State.
- c. Total number of registered voters in the different polling units was extracted from the Polling register to be collected from INEC office.
- d. Incidence of election violence data was collected from INEC, police stations and other social handles
- e. Demographic data was sourced from the National Population Commission, Kogi State.

### D. 3.2. Data processing

The methodology that was employed in this research involves conversion of analogue map into digital map, updating of Dekina street map using the ArcGIS server, plotting of coordinate points of polling units and nearby police stations, Geo-database creation and queries generations. First, the analogue map of Dekina Local Government was converted to digital through the process of scanning, georeferencing and digitizing. Subsequently the street map was updated using ArcGIS server in the ArcMAP 10.5 environment, georeferencing and digitizing was done using ArcGIS 10.5 environment. The coordinate points of polling units were plotted on the map, after which a robust geospatial database was created with the demographic and voter information. Consequently, the database was analysed and various queries was generated.

### E. 3.3 Data modelling in GIS

A data model is a set of constructs for describing and representing selected aspects of the real world in a computer (Batty et al, 1999). According to Longley (2001), when representing the real world in computer, it is helpful to think in terms of four different levels of abstraction. First, reality is made up of real-world phenomena, and includes all aspects that may not be perceived by individuals, or deemed relevant to particular application. Second, the conceptual model is a human oriented, often partially structured, model of selected objects and processes that are thought relevant to a particular problem domain. Third, the logical model is an implementation-oriented representation of reality that is often expressed in the form of diagrams and lists. Forth, the physical model portrays the actual application in a GIS, and often comprises tables stored as files or databases.

There are three important components of geographic data (Spencer, 2001):

- a. The spatial data: Geographic position specifies the location of a feature or phenomenon by using a coordinate system, which are used for representing geographical places: wards, towns, polling units, schools.
- b. The attribute data: Attribute data refer to the properties of spatial entities, which describe the characteristics of the geographic features: population, length, and area. Spatial features in a GIS database are stored in either vector or raster form.
- c. Vector data: GIS data structure adhering to a vector format store the position of map features as pairs X, Y (and sometimes Z) coordinates. A point is described by a single X-Y coordinate pair and by its name or label. A line is described by a set of coordinate pairs and by its name or label. Therefore, a line is built up of straight-line segments. An area, also called polygon, is described by a set of coordinate pair and by its name or label with the difference that the coordinate pairs at the beginning and end are the same. A vector format represents the location and shape of features and boundaries precisely. Only the accuracy and scale of the map compilation process, the resolution of input devices and the skill of the data-inputter limit precision.

### F. 3.4 Database Design

Database base design is the process of producing a detailed data model of a database (Harnandez, 2012). It consists of three design phases (Kufoniyi, 1998)

- a) Conceptual Design
- b) Logical Design
- c) Physical Design

The conceptual Design is the first stage that deals with the identification and description of the contents to be embedded in the database and this is done independently of the software and hardware that will be used to implement the database.

Logical Design is another stage of the database design where real world entities conceptualized are modeled into the real world. It is usually the representation of the conceptual design to reflect the recording or inputting of the data into a computer system using the relational database management system.

Physical Design is the stage that involves the interpretation of the real-world entities into the computer compactible forms of the chosen model which may be relational hierarchical for ease of implementation and management. Information stored in the database allows for easy access, retrieval, update and also provides ease for performing analytical functions that can supply information from the installed database.

## IV. RESULTS AND DISCUSSION

The result obtained from this study include statistical analysis of the spatial spread of voters, updated Dekina local Government Area road map showing the spatial distribution of polling units and various queries conducted on the geospatial database.

### 4.1 Population and Voter Spread within Dekina LGA

Inec voter register shows that, Dekina LGA has a total voter population of about 166,165 people. This number is distributed among the wards that make up the Local Government Area.

Table 4.1: Voter population and Spread

S/N	Wards	Voter Population	Percentage %
1	Dekina Town	12589	7
2	Iyale	15813	10
3	Emewe	8406	6
4	Odu I	7271	5
5	Odu II	10358	6
6	Abocho	22427	13
7	Ogbabede	10563	6
8	AdumuEgume	15078	9
9	Ojikpalada	7868	5
10	Anyigba	38008	23
11	Okura Olafia	8873	5
12	OganeInugu	8911	5
	Total	166,165	100

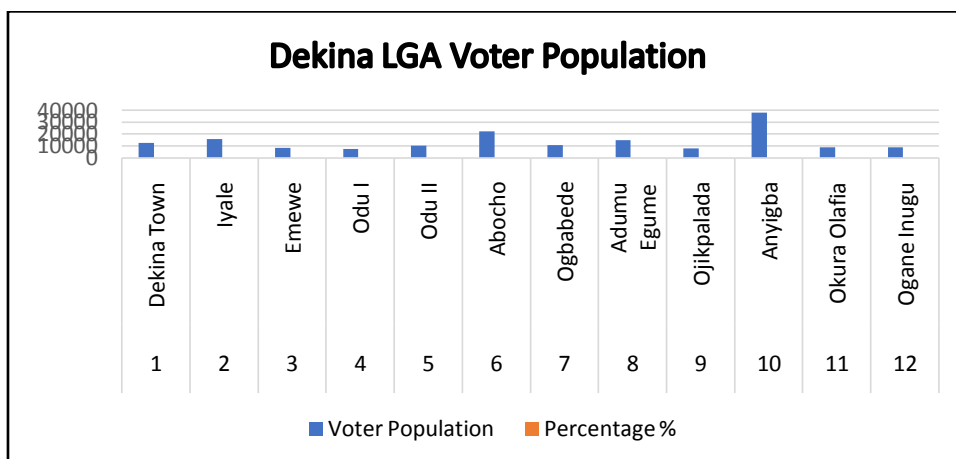


Fig 4.1: Bars showing Dekina LGA Voter population

The result shows that, Dekina LGA with all its population has more registered voters in Anyigba (23%). This supports the claim that Anyigba is the nerve center of political and socio-economy activities of Igala Nation (Idris, 2019). The town earned this status through a combination of vantage central Location and occupied a strategic position in Igala Land. It is otherwise regarded as the center and heartbeat of Igala town.

The importance of this information/data on voter population and spread is of primary relevance as it relates to providing smart decision platforms to electioneering. It is valuable to politicians as it helps them to be acquainted with the knowledge of where to concentrate and allocate resources during campaigns and advocacies. It is also vital to electoral bodies or officials as it helps them to know where there is need for more voter education, where to deploy more abled personnel's and even in the distribution of election materials as to meet the demand of the voter population.

It is as well invaluable to security bodies as it helps them to know that perpetrators of election crime may concentrate their mischief in

areas of high voter population density, thereby deploying more security personnel to such areas to ease the effect of electoral violence.

#### 4.2 Mapping of Polling Units

The map of Dekina LGA showing the 12 political wards and the 217 polling units distributed among the 12 wards was produced.

The map produced shows that Ogbabede has the highest distribution with 31 polling units about 14% of the 217 polling units of Dekina LGA but with a less percentage of voter population followed by Abocho with 29 polling units about 13% with an average percentage of voter population followed by Anyigba with 27 polling units about 12 percentage but with the highest voter population. Emewe with 19 polling units about 9%, OganeInigu with 18 polling units about 8%, Iyale with 17 polling units about 8%, Odu II and Ojikpalada with 11 Polling units about 5% respectively. Odu I has the least polling unit i.e. 9 about 4% of the 217 polling units within Dekina LGA (see table 4.2 and figure 4.2.1)

Table 4.2: Table showing Polling Units and Voter Population Spread

S/N	Wards	Total Polling Units	Percentage %	Voter Population	Percentage %
1	Dekina Town	16	8	12589	7
2	Iyale	17	8	15813	10
3	Emewe	19	9	8406	6
4	Odu I	9	4	7271	5
5	Odu II	11	5	10358	6
6	Abocho	29	13	22427	13
7	Ogbabede	31	14	10563	6
8	AdumuEgume	14	6	15078	9

9	Ojikpalada	11	5	7868	5
10	Anyigba	27	12	38008	23
11	Okura Olafia	15	8	8873	5
12	Oganelnigu	18	8	8911	5
	Total	217	100	166165	100

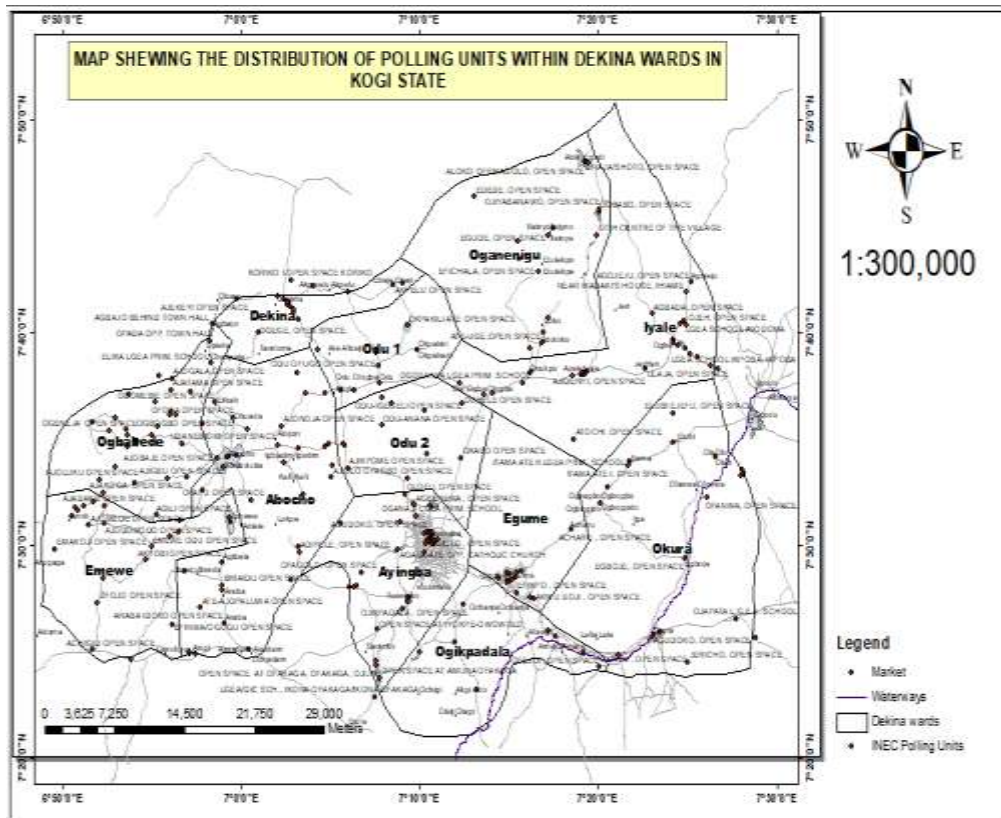


Fig 4.2.1: Dekina Polling Units

The result shows the spatial distribution of Polling Units within the different wards of Dekina LGA. It shows that the polling units are not sparsely distributed but are clustered in some areas as seen above (see figure 4.2.1) i.e Anyigba,

Egume, Dekina Town and some part of Iyale. This shows reason why the voter turnout on election day is poor because of the wide distance from little settlements to polling units.

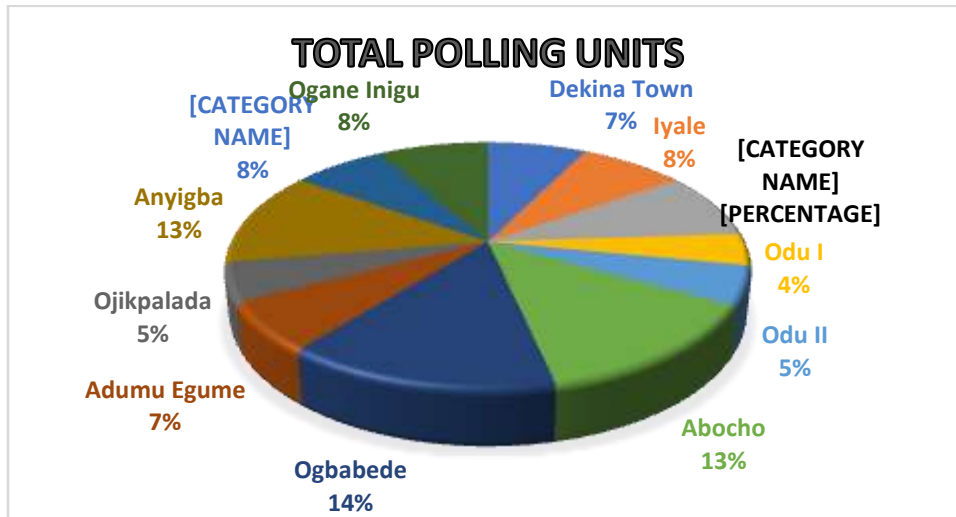


Fig 4.2.2: Pie Chart showing polling Units Spread

#### 4.3 Database Query

A single query Operation conducted to determine all the polling units with over 500 registered voters within dekina LGA as shown in figure 4.3

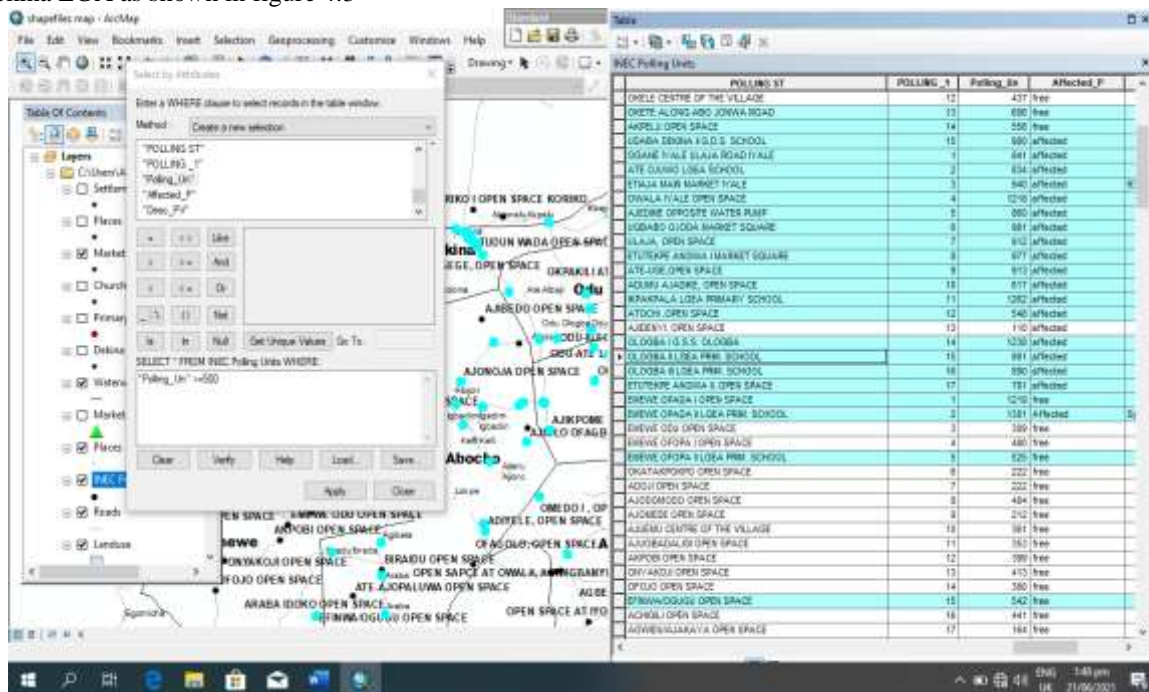


Fig 4.3: Showing the query result of all polling units with over 500 registered voters

The Result Showed that 147 polling units out of the total 217 polling has registered voters of above 500 voters

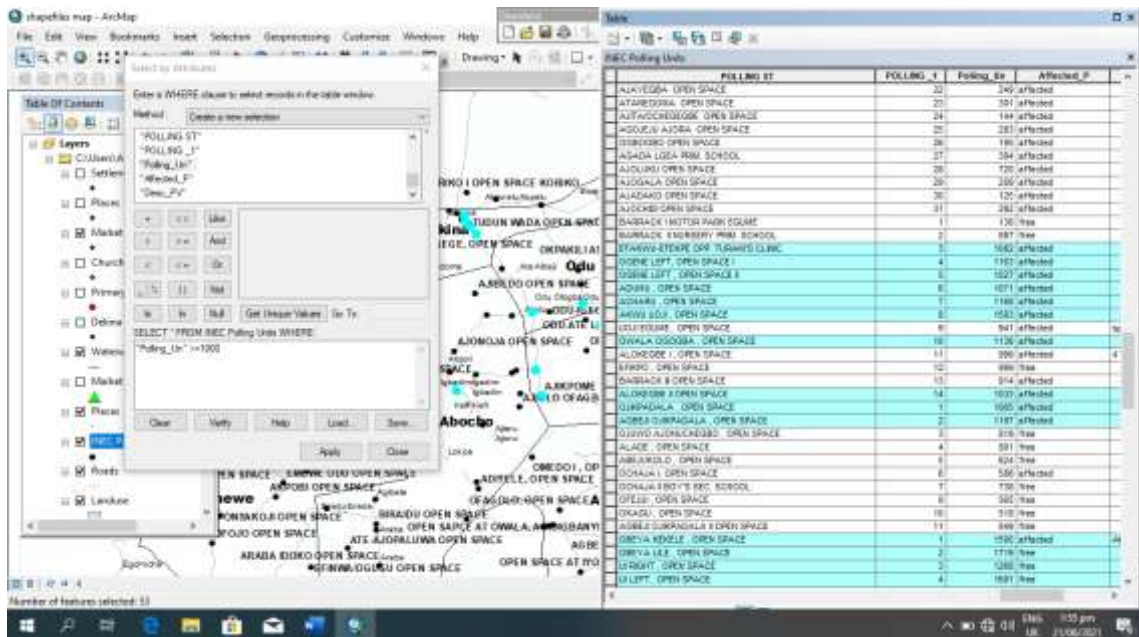


Fig 4.3.1: Showing the query result of all polling units over 1000 registered voters

The result shows that 53 polling units out of a total of 217 polling units within Dekina LGA has a voter population of above 1000 registered voters

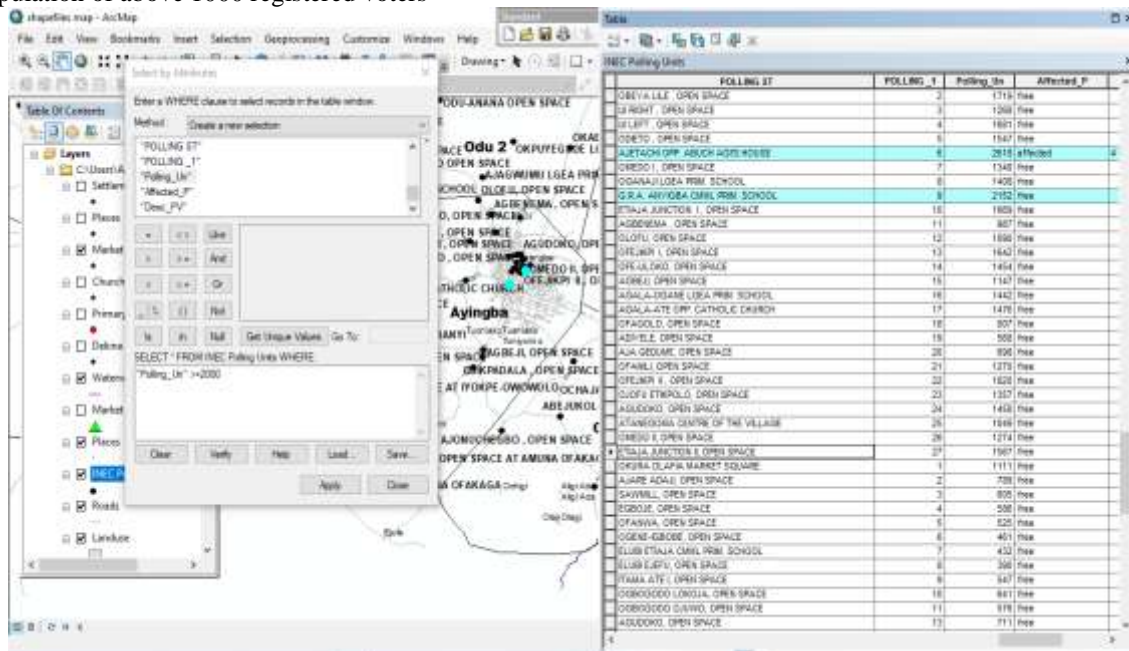


Fig 4.3.2: Showing the polling Units with above 2000 registered voters

The result Showed that two (2) polling units out of 217 polling units in Dekina LGA has more than 2000 registered voters. These polling units happens to be in the same ward i.e Anyigba ward.

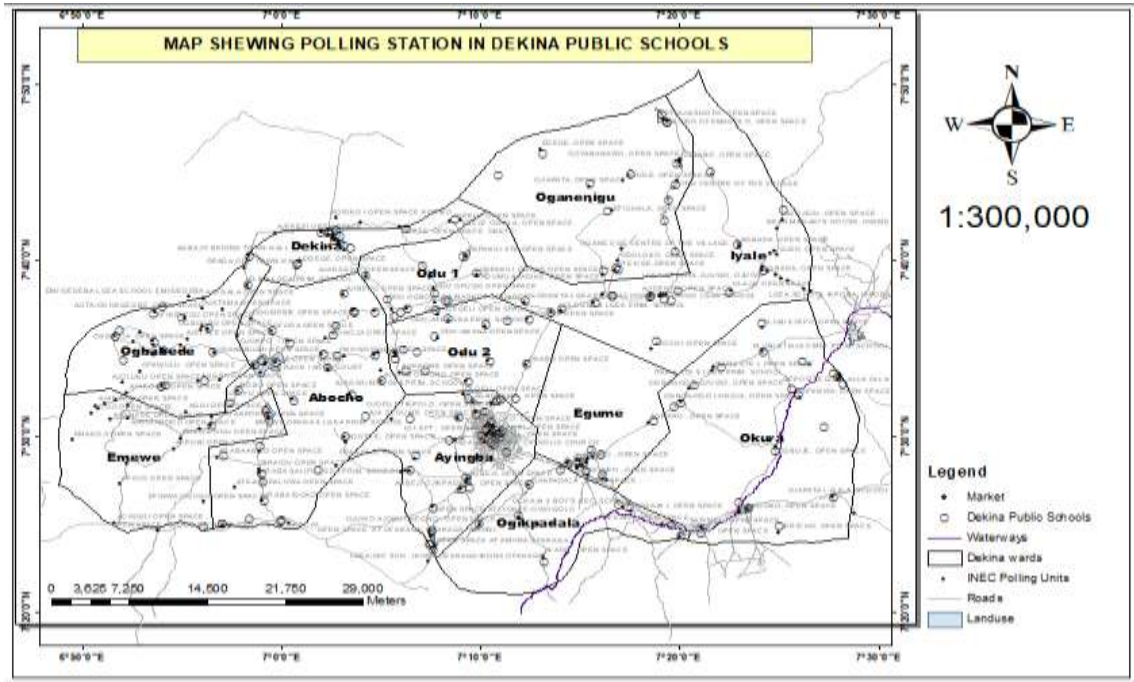


Fig 4.3.3: Map Shewing Polling units located in Dekina Public School

The map above (see figure 4.3.3) shows that 48 of the polling units within Dekina LGA are located in public Schools, 145 in Open Spaces, 10 are located in market square while the rest are in motor packs and Road sides. See figure 4.9 for query result.

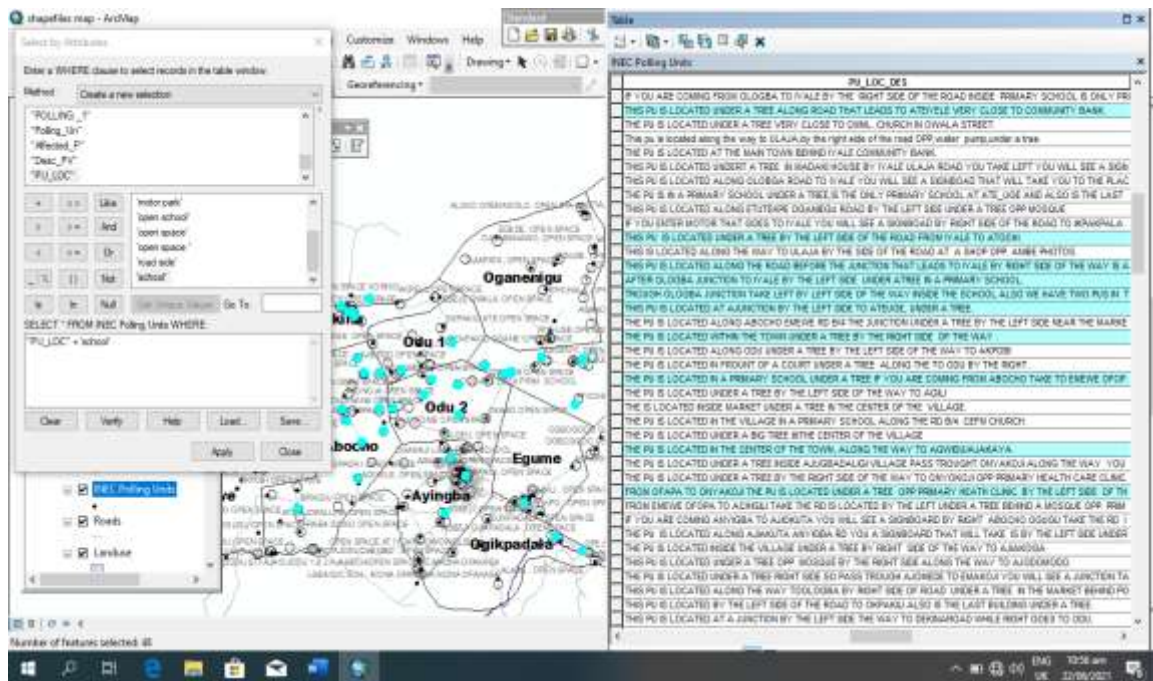


Fig 4.3.4: Query showing polling units located in schools



#### 4.4 MAPPING AFFECTED POLLING UNITS

In the last election conducted i.e., 2019 presidential/House of Assemblies election, they were reported incidence of election violence which led to the cancellation of election results in some

polling units within Dekina LGA. Knowing the spatial depiction of this polling units along with the number of affected register voters and the kind of violence will help for smart decisions in subsequent elections.

Table 4.4.1: Showing Number of Polling units affected with their percentage

S/N	Wards	No of polling units affected	Percentage %
1	Dekina Town	7	9
2	Iyale	17	21
3	Odu I	1	1
4	Odu II	4	5
5	Abocho	2	2
6	Ogbabede	31	39
7	AdumuEgume	10	13
8	Ojikpalada	6	8
9	Anyigba	1	1
10	OganeInigu	1	1
	Total	80	100

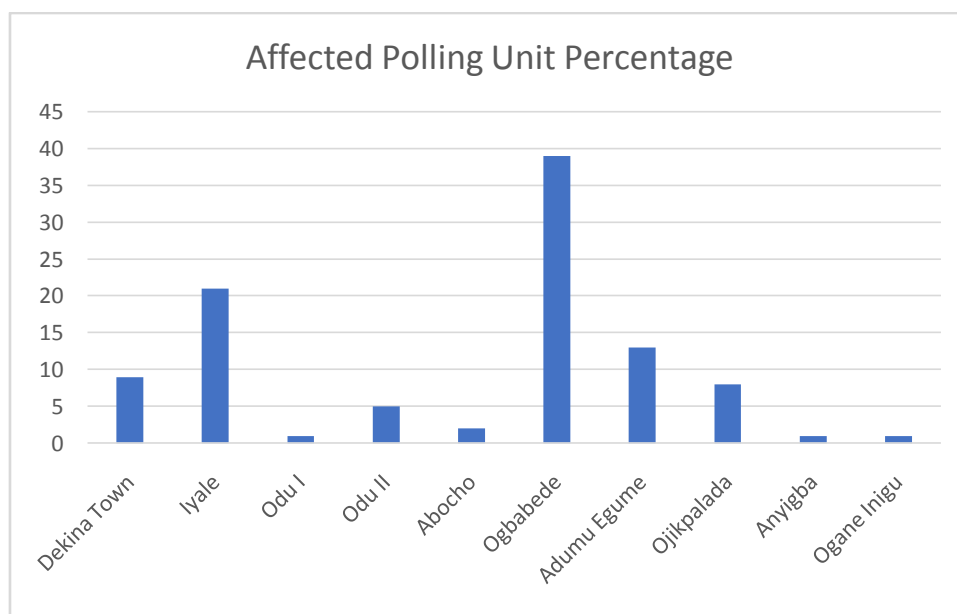


Fig 4.4.1: Affected Polling Unit Percentage

The chart above shows that Ogbabede has the highest number of affected polling units followed by Iyale, and then by AdumuEgume, followed by Dekina town and then Ojikpalada, Odu II, Odu I, Anyigba and OganeInigu respectively.

This information can be useful for the electoral bodies and officials to know where to place high monitors to avert the incidence of violence that may lead to the cancellation of election results in these areas.

Table 4.4.2: Number of Registered voters in the Affected Polling Units and Percentage

S/N	Wards	Registered Voters	Percentage %
1	Dekina town	5527	10
2	Iyale	15813	28

3	Odu I	745	1
4	Odu II	3582	6
5	Abocho	1522	3
6	Ogbabede	10583	19
7	AdumuEgume	11049	20
8	Ojikpalada	4132	7
9	Anyigba	2618	4
10	OganeInigu	870	2
Total		56441	100

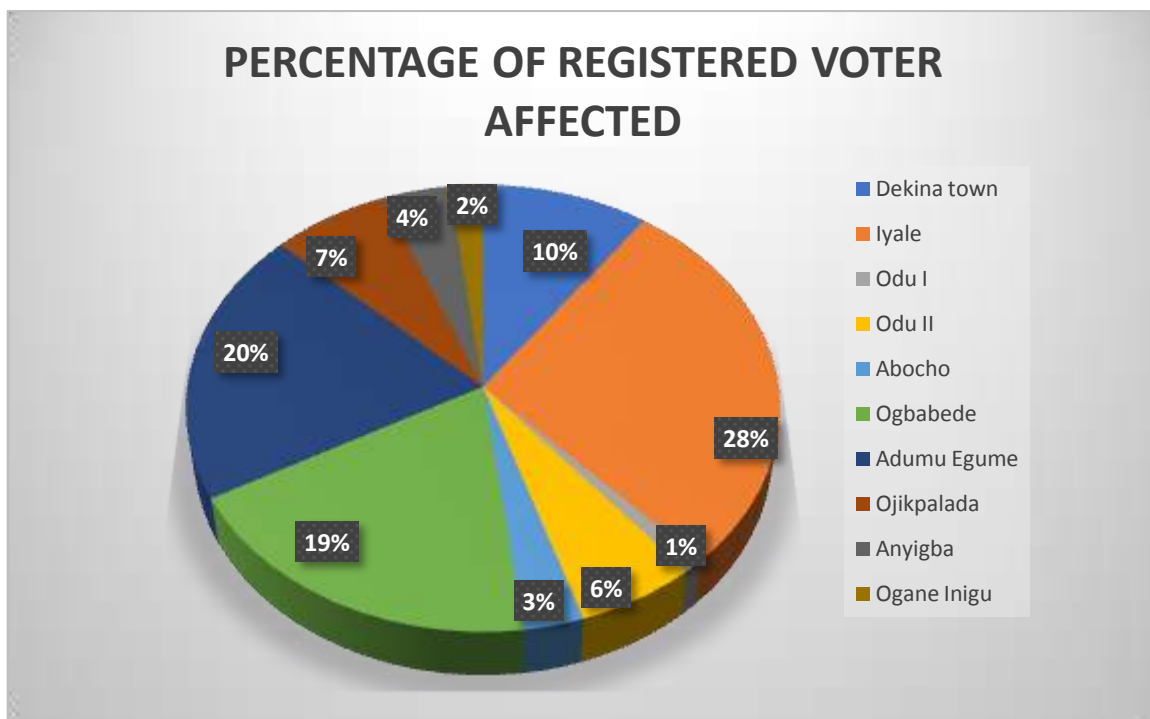


Fig 4.4.2: Pie chart of Registered Voter Affected

The chart above shows that Iyale has the highest percentage of affected registered voter with 28% of the total affected voters about 15813 followed by AdumeAgume with AdumuEgume with 20% about 11049 affected, then Ogbabede with 19% about 10583 Registered Voter, Dekina town with 10% about 5527 and then the rest wards with little percentage as shown above (see figure 4.4.2)

#### 4.5 Database Query for Affected Polling Units

A single query operation was conducted to display graphically the various affected polling units within the total of 217 polling units within Dekina LGA in the 2019 presidential/ House of Assemblies election. (see figure 4.5).

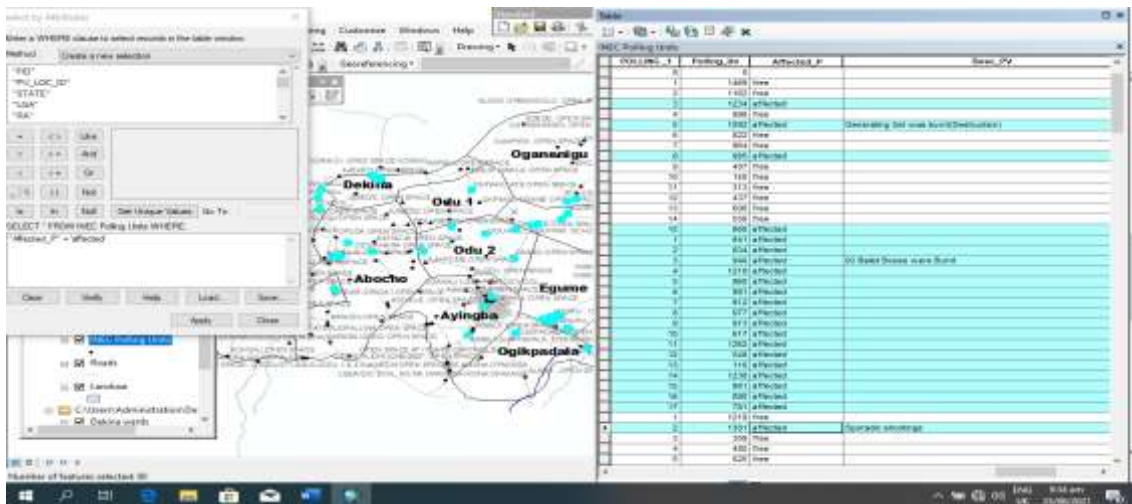


Fig 4.5: Query Showing affected polling units in Dekina at 2019 presidential/House Assemblies

The result above shows that 80 polling units were had violence issues out of a total of 217 polling units. The nature of violence that took place in this polling units that led to the cancellation of election results in this polling units were gunshot, thuggery, intimidation, harassment, kidnapping, destruction of election materials, forceful denial of some personnel to go their polling unit of posting etc. This information will help the election officials

to know where to place high monitors in the subsequent election thereby re-enforcing security measures.

A query was also conducted to show polling units with death record in the last Presidential/ House of Assemblies election. The result shows that, two polling units namely Barrack I area court and Barrack II LGEA primary school witnessed a death record (see figure 4.6)

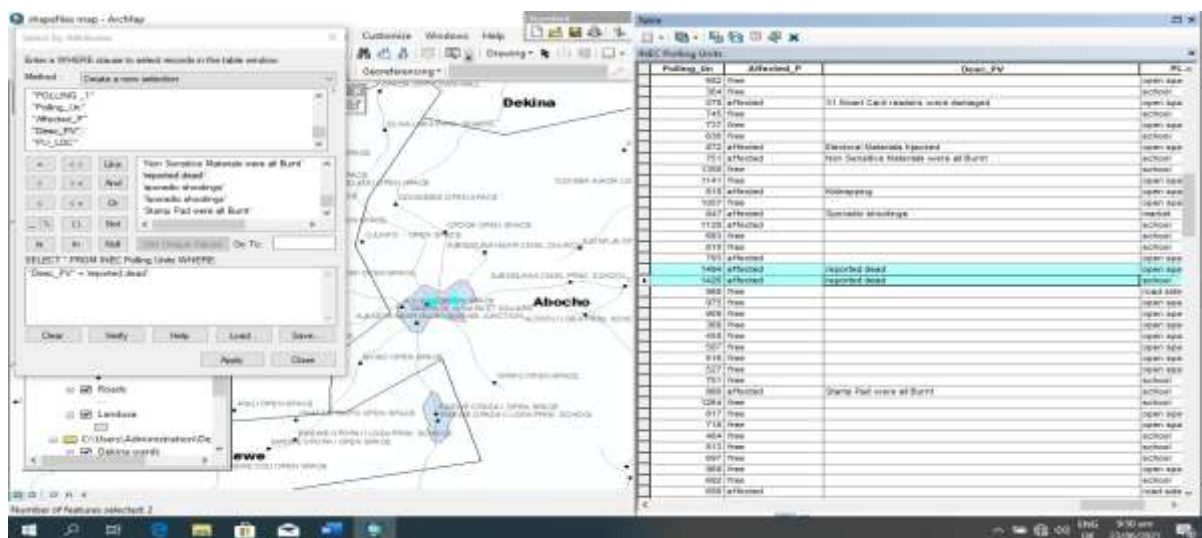


Figure 4.6: Query showing result for polling units with death record

## V. SUMMARY AND CONCLUSION

The research has demonstrated successfully the application of Geographic Information System Approach to election monitoring in Dekina Local Government Area of Kogi State, Nigeria. The following findings were obtained from the study

1. The spatial depiction of polling units helps to know the distribution pattern of polling units within the different wards. It shows that some polling units are clustered and some are scarcely distributed. This can result to lesser number of people coming out to carry out their franchise based on the distance of the polling units from their places of residence. It was

discovered that they are no polling units around Ochigi, Olaji within Ojikpalada ward of Dekina LGA.

2. Anyigba ward has a population of 189,976 as at 2013 (Ifetimehin, 2013), the total number of registered voter in Anyigba in the 2019 Presidential/House of Assemblies was 38,008 which is just 20% of the population. This suggests why there is a need for more voter sensitization and education in Anyigba Ward. This serves to attest to the fact that, GIS based electoral system enhance geographic visualization of electoral dynamics and electoral demography (Ojiako et al, 2016)
3. The ability of GIS database to store, analyze, and efficiently update electoral data will be of great relevance to electoral officials to be able to conduct, manage and monitor elections. GIS based electoral system provides the platform to effectively and statistically analyze the distribution of voters allocated to each polling unit.
4. Depicting Polling Units with records of electoral violence will help the security personnel to know where to take high security measures in order to enhance electoral security.
5. GIS based approach to electioneering will improve smart decisions as to where more polling units should be introduced, where is known for electoral violence, where voter education and sensitization should be carried out.

#### REFERENCES

- [1]. Batty, M., Xie, Y., and Sun, Z. L. (1999): Modelling Urban Dynamics Through GIS based Cellular Automata, Computers, Environment And Urban Systems, Vol. 23, 205-233.
- [2]. Hernandez, M. (2012): "Database Design for Mere Mortals: A Hands-on Guide To Relational Database Design." 3<sup>rd</sup> Edition. Pearson Education, Indianapolis, Indiana. Pp15, 22 and 31. Available at [http://en.wikipedia.org/wiki/Relational\\_database\\_management\\_system](http://en.wikipedia.org/wiki/Relational_database_management_system). Accessed 15th July, 2014.
- [3]. Idris, A., (2019): Anyigba My Hometown, A brief history of Anyigba. Available Online <https://m.facebook.com>. Accessed 22<sup>nd</sup> June, 2021
- [4]. Ifatimehin, O.O, Falola, and E.v. Odogbo (2013): An analysis of the spatial distribution of plasmodium sporozites and effects of climatic correlates on malaria infection in Anyigba Town, Nigeria. Global Journal of Health Science. Canadian Centre of Science and Education, 3. 45
- [5]. Kufoniyi, O. (1998): Database Design and Creation in Ezeigbo, C.U (ed). Principle and Applications of Geographic Information System, Department of Surveying, University of Lagos, pp 62-63.
- [6]. Spencer, C. (2001): GIS And Crime Mapping. Director Of Geographic Information, UCL JILL, Dando Institute Of Crime Science.
- [7]. Longley, P. (2001): Geographic Information System And Science.
- [8]. Nwanegbo, Jaja C. (2015): Electoral process and micro level Rigging in 2015 General elections in Anambra West and Awka North Local government area of Anambra State , Paper submitted to the two-day National conference on -the 2015 General elections in Nigeria; The real issues, June 17-18, 2015 by the electoral institute (TEI), of the independent National Electoral Commission (INEC).
- [9]. Ojiako J.C., Fashina O.P., Igbokwe E.C, Eneidah, I.C (2016): Geographic Information System based Approach to pre-Election Monitoring in Awka South Local Government Area of Anambra State, Nigeria, International Journal of advanced Engineering, Management and Science, vol 2 pp 1466-1269
- [10]. Omoleke Muslim Esq and Maduekwe, Nnamdi Ifeanyi (2017): The use of geospatial Technology for mapping Elections in Nigeria: Issues and Challenges, International journal of innovation and research in educational sciences. Vol 4, pp. 509-512
- [11]. Waldemar W. (2013): Functions of Election in Democratic Systems, Political Preferences, No 4/2013