DISTRIBUTIONALANALYSIS OF PRIMARY AND SECONDARY SCHOOLS IN PART OF ILORIN EAST AND MORO LOCAL GOVERNMENT OF KWARA STATE, USING GIS APPROACH

BY

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SUBMITTED TO
DEPARTMENT OF SURVEYING AND GEO-INFORMATIC, INSTITUTE OF ENVIRONMENTAL STUDIES (I.E.S), KWARA STATE POLYTECHNIC, ILORIN.

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE HIGHER NATIONAL DIPLOMA (HND) IN SURVEYING AND GEO-INFORMATIC.

JULY, 2025.

DECLARATION

I hereby certified that all the information given in this project were obtained as a result of observations and measurements made by me and that the survey was carried out in accordance with Survey Rules, Regulations and Departmental instructions.

NAME: LAWAL ZAINAB OMOWUMI

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SIGNATURE: ………………………………….

DATE OF COMPLETION: ……………………………………………….

CERTIFICATION

This is to certify that **LAWAL ZAINAB OMOWUMI** with matriculation number **HND/23/SGI/FT/0002** has satisfactorily carried out this project under our instructions and direct supervision.

SURV. A. G. AREMU ______________________

(PROJECT SUPERVISOR) *SIGNATURE AND DATE*

SURV. AWOLEYE R. S ______________________

(PROJECT COODINATOR) *SIGNATURE AND DATE*

MR. ABIMBOLA I. ISAU ______________________

(HEAD OF DEPARTMENT) *SIGNATURE AND DATE*

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EXTERNAL MODERATOR *SIGNATURE AND DATE*

DEDICATION

I dedicate this project to Almighty God, whose guidance, strength, and blessings have been my constant source of inspiration and perseverance. Through every challenge and triumph, your presence has been my guiding light and steadfast support. Thank You for granting me the wisdom, knowledge, and patience to complete this goal.

ACKNOWLEDGEMENTS

As I stand at the threshold of this significant milestone, I am overwhelmed with gratitude and love for the people who have made this journey possible.

I earnestly express my deepest gratitude to my project supervisor Surv. A.G. AREMU for the guidance and patience throughout my research work indeed he is an epitome of a great Lecturer.

My sincere gratitude also goes to My (H.O.D) MR. ABIMBOLA ISAU and other lecturers at the Department of Surveying Geo-informatics (SUR. A.G AREMU, SUR. R.S ASONIBARE, SUR. R.O AWOLEYE, SUR. BANJI, SUR. AYUBA, SUR. DIRAN, SUR. KAZEEM, SUR. KABIRU), for nurturing me in my academic activities. May Almighty Allah continue to bless you all abundantly.

My unreserved appreciation goes to my beloved parent, Mr. and Mrs. LAWAL for their un-measured words of encouragement, financial, moral and spiritual support given to me all through this program.

My profound gratitude goes to my wonderful friends and my group Member thanks for the good experience we have together.

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ABSTRACT

This study presents a distributional analysis of primary and secondary schools in selected areas of Ilorin East and Moro Local Government Areas of Kwara State using a Geographic Information System (GIS) approach. The aim is to assess the spatial distribution, accessibility, and adequacy of educational facilities in relation to population spread and settlement patterns. Geospatial data were collected through field surveys and existing school records, and mapped using GIS tools to visualize and analyze spatial relationships. The findings revealed an uneven distribution of schools, with a significant concentration in urban centers and noticeable gaps in rural areas, indicating disparities in educational accessibility. The study highlights the importance of integrating spatial data into educational planning for equitable resource allocation. Recommendations are made for targeted school development in underserved communities to promote inclusive education and sustainable development.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Education is a fundamental pillar of societal development, and the equitable distribution of educational facilities is crucial for ensuring access to quality education. In Nigeria, the disparity in the distribution of primary and secondary schools has been a persistent challenge, particularly in rural and semi-urban areas. Kwara State, located in North-Central Nigeria, faces similar issues, with some regions having inadequate educational infrastructure. Ilorin East and Moro Local Government Areas (LGAs) are among the regions where the spatial distribution of schools may not optimally serve the population.

Geographic Information Systems (GIS) have become an essential tool in spatial analysis, offering capabilities for mapping, analyzing, and optimizing the distribution of social amenities, including schools. In the field of Surveying and Geo-Informatics`, GIS provides a robust framework for assessing the accessibility, density, and coverage of educational facilities. This study leverages GIS techniques to evaluate the distribution of primary and secondary schools in parts of Ilorin East and Moro LGAs, identifying gaps and suggesting improvements for better educational planning.

A GIS (Geographic Information System) approach to analyzing the distribution of primary and secondary schools in parts of Ilorin East and Moro Local Government Areas of Kwara State, Nigeria, would involve using spatial data (like school locations, ward boundaries, and road networks) and attribute data (like school type, enrollment numbers, and infrastructure details) to map and analyze the spatial patterns of school distribution. This analysis could reveal areas with high or low school density, identify accessibility issues, and inform more equitable distribution of educational resources.

Education plays a pivotal role in the socio-economic development of any nation. It is widely recognized as a critical instrument for national development, social equity, and individual empowerment. In Nigeria, like many developing countries, access to quality education remains unevenly distributed, particularly between urban and rural areas. The location and spatial distribution of schools significantly influence access, enrollment rates, and educational outcomes. This calls for the need to evaluate how educational facilities are spatially distributed across different regions.

Geographic Information Systems (GIS) offer a powerful tool for spatial analysis and visualization, enabling stakeholders and policymakers to assess the distribution and accessibility of infrastructure, including schools. By integrating spatial data with demographic and infrastructural information, GIS allows for a more informed evaluation of educational facility planning, thus promoting equitable access.

Ilorin East and Moro Local Government Areas (LGAs) of Kwara State present a typical case of varying educational access. While Ilorin East is semi-urban with growing infrastructure, Moro is predominantly rural, characterized by scattered settlements and limited access to social services. Understanding the spatial distribution of primary and secondary schools in these areas is vital for planning educational interventions, resource allocation, and policy formulation.

Despite various government efforts aimed at improving educational access, some communities within these LGAs still face challenges such as long travel distances to schools, overcrowding in certain schools, and total absence of schools in remote locations. These issues are not only logistical but have far-reaching implications for literacy, school attendance, and long-term development.

This study, therefore, employs GIS techniques to conduct a distributional analysis of primary and secondary schools in selected parts of Ilorin East and Moro LGAs. It aims to map the existing educational facilities, analyze their spatial patterns, assess accessibility in relation to population centers, and identify underserved areas. The findings will provide insights that can guide educational planning and contribute to achieving inclusive and equitable education in the region.

By using GIS, researchers and policymakers can gain a better understanding of the spatial distribution of schools and make data-driven decisions to improve educational access and outcomes in Ilorin East and Moro Local Government Areas.

1.2 Statement of the Problem

The uneven distribution of schools in Kwara State has led to disparities in educational access, with some communities having an over-concentration of schools while others suffer from a lack of adequate facilities. Factors such as population density, terrain, and urban-rural divide contribute to these imbalances. In Ilorin East and Moro LGAs, some students travel long distances to attend school, which can lead to increased dropout rates and reduced academic performance.

Despite the recognized importance of education, there is limited geospatial analysis of school distribution in these areas. Traditional methods of school planning often rely on demographic data without considering spatial factors, leading to inefficient resource allocation. This study addresses this gap by employing GIS and surveying techniques to analyze the spatial distribution of schools, ensuring data-driven decision-making for educational development.

1.3 Aim of the project

The aim of this study is to assess the spatial distribution of primary and secondary schools in parts of Ilorin East and Moro LGAs using GIS techniques.

1.4 Objectives of the project

1. To map the existing primary and secondary schools in the study area.

2. To analyze the spatial distribution patterns of schools using GIS tools.

3. To evaluate the accessibility of schools based on proximity to settlements.

4. To assess the adequacy of schools relative to population density.

5. To identify underserved areas requiring additional educational facilities.

6. To recommend optimal locations for new schools based on spatial analysis.

1.5 Research Questions

To achieve the objectives, this study seeks to answer the following research questions:

1. What is the current spatial distribution of primary and secondary schools in the study area?

2. Are the schools evenly distributed, or are there clustering patterns?

3. How accessible are the schools to students in different communities?

4. Does the number of schools correspond to the population density in the area?

5. Which areas are underserved and in need of additional schools?

6. Where should new schools be located to improve accessibility?

1.6 Significance of the Study

This study is significant for several stakeholders, including:

- Government and Education Planners: The findings will assist policymakers in making informed decisions on school location and resource allocation.
- Community Leaders: The study will highlight areas needing educational infrastructure, enabling advocacy for better facilities.
- Researchers in Surveying and Geo-Informatics: The methodology can serve as a reference for similar studies in other regions.
- Students and Parents: Improved school distribution will reduce travel distances, enhancing enrollment and retention rates.

By integrating GIS into educational planning, this study contributes to sustainable development goals (SDGs), particularly SDG 4 (Quality Education) and SDG 11 (Sustainable Cities and Communities).

1.7 Scope of the Study

This study focuses on selected areas within Ilorin East and Moro LGAs in Kwara State. The analysis covers:

- Primary and secondary schools (both public and private).
- Population data from recent census and school enrollment records.
- Geospatial techniques, including buffer analysis, nearest neighbor analysis, and overlay mapping.

The study does not cover tertiary institutions or non-formal education centers. Data limitations, such as outdated population figures, may affect some analyses, but efforts will be made to use the most recent available data.

1.7 Methodology Overview

The research adopts a mixed-method approach, combining geospatial analysis with field surveys. Key steps include:

1. Data Collection:

- Coordinates of schools (using GPS).
- Population data from the National Population Commission.
- Satellite imagery and base maps.

2. GIS Analysis:

- Mapping school locations using ArcGIS or QGIS.
- Proximity analysis to determine service areas.
- Density mapping to identify clustering patterns.

3. Field Validation:

Ground-truthing to verify school locations and conditions.

Recommendations:

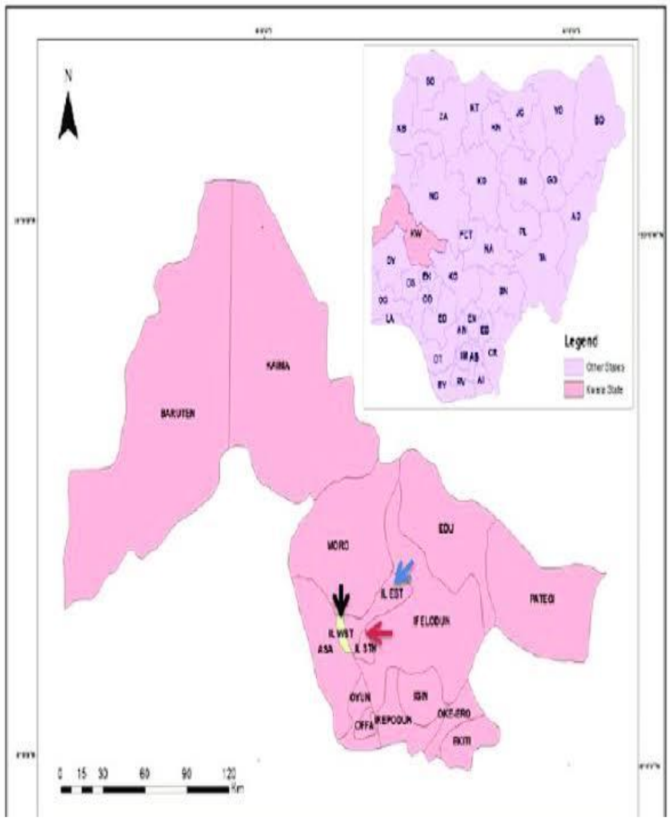
Proposing optimal sites for new schools using suitability analysis.

1.8 Study Area Description

The study covers selected areas within Ilorin East and Moro Local Government Areas (LGAs) of Kwara State, Nigeria. Kwara State is located in the North-Central geopolitical zone of Nigeria. Ilorin East and Moro LGAs are situated in the southern and central parts of the state, respectively. Ilorin East LGA lies approximately between latitude 8°28′N and 8°36′N and longitude 4°40′E and 4°50′E. Moro LGA lies between latitude 8°40′N and 9°10′N and longitude 4°20′E and 4°45′E. Both LGAs are bordered by Ilorin West, Asa, and Ifelodun LGAs, and share boundaries with Kogi State to the east.

1.8.1 Location

Ilorin East and Moro LGAs are two of the sixteen local government areas in Kwara State, located in the north-central geopolitical zone of Nigeria. Ilorin East is situated within the Ilorin metropolitan area, while Moro lies to its north. The study area lies approximately between latitudes 8°30’N and 9°00’N and longitudes 4°30’E and 5°00’E.



1.8.2 Physical Characteristics

The area experiences a tropical wet and dry climate, with two distinct seasons: the rainy season (April to October) and the dry season (November to March). The terrain is largely flat with patches of undulating hills and is traversed by a network of rivers and streams.

1.8.3 Socioeconomic and Demographic Features

Ilorin East LGA is largely urban and semi-urban, hosting parts of the state capital, Ilorin. It is characterized by high population density, diverse ethnic groups, and relatively better infrastructure. Moro LGA, on the other hand, is predominantly rural, with agriculture being the mainstay of the economy. The population distribution across both LGAs is uneven, influencing the demand for and accessibility to educational facilities.

1.9 Personnel Assigned to the Project

Fieldwork Participants

The fieldwork component of this project was carried out by the following students:

S/N	NAME	MATRIC NO.
1	LAWAL ZAINAB O	HND/23/SGI/FT/0002
2	OLATUNBOSUN A CHRISTIANAH	HND/23/SGI/FT/0001
3	ABIOLA AMINAT T.	HND/23/SGI/FT/0010
4	OLAGUNJU SEGUN	HND/23/SGI/FT/0003
5	OMOTOSHO JAMIU O.	HND/23/SGI/FT/0005
6	SAFADEEN AKANFE O.	HND/23/SGI/FT/0004

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides a detailed review of existing literature related to the distribution of educational facilities, accessibility to schools, and the application of Geographic Information System (GIS) in educational planning. It covers theoretical frameworks, empirical studies both within Nigeria and internationally, as well as gaps identified in previous research. The review highlights how GIS serves as an essential tool for understanding spatial disparities and promoting equitable education service delivery.

This study, therefore, employs GIS techniques to conduct a distributional analysis of primary and secondary schools in selected parts of Ilorin East and Moro LGAs. It aims to map the existing educational facilities, analyze their spatial patterns, assess accessibility in relation to population centers, and identify underserved areas. The findings will provide insights that can guide educational planning and contribute to achieving inclusive and equitable education in the region.

2.2 Conceptual Clarification

2.2.1 Education and National Development

Education is universally acknowledged as a key driver of national development. It provides individuals with the necessary knowledge, skills, and attitudes to participate effectively in economic, social, and political spheres. The role of primary and secondary education is especially critical, as it forms the foundational stage of learning upon which higher education and professional development are built.

Abubakar et al. (2023) conducted a GIS-based spatial study of 156 public primary schools in Moro LGA. GPS data and Nearest Neighbor Analysis (NNA) in ArcGIS revealed a clustered distribution pattern ($NNR = 0.86$, $Z = –3.39$, $p < 0.01$). Malete and Megida wards had the highest concentrations (10.3% and 9.6%), whereas Ajanaku and Pakunma were least served (1.9% and 2.6%). The authors recommended redistributing schools more equitably across wards

Mustapha et al. (2015) mapped primary schools in Ilorin West using GPS and Nearest Neighbor Analysis. They found a mixed spatial pattern—41.7% of wards were well-served, while 16.7% were unserved. Patterns varied: five wards random, three clustered, two dispersed . Their classification model may inform similar assessments in Ilorin East.

Mustapha et al. (year not specified in abstract) assessed accessibility to private primary schools using GIS overlay of schools and road networks. The study showed high spatial concentration along roads, highlighting accessibility bias favoring urban centers .

Another study applied GIS to government schools in Ilorin West, employing NNA and service-range analysis. It found clustered distribution ($NNR \approx 0.77$) and that 46% of the population lived within standard access distances, leaving over half underserved

Though not specific to Kwara, Ibara (2019) mapped secondary schools in Rivers State using document review, finding marked spatial imbalance and political distortion in siting secondary schools Journal ARJASS.

Likewise, national-level studies using GIS have demonstrated similar approaches—GPS data collection, NNA, network-access analysis—across Nigerian states (e.g., Umuahia North—49 secondary schools, inequitable distribution; Abia State)

2.2.2 Spatial Distribution

Spatial distribution refers to the arrangement of features or phenomena across a given space or geographical area. In the context of this study, it denotes the physical spread and pattern of primary and secondary schools within Ilorin East and Moro LGAs. Understanding spatial distribution helps in identifying regions with either a concentration or a scarcity of educational institutions.

2.2.3 Accessibility

Accessibility in educational planning involves the ease with which learners can reach school facilities. This can be measured in terms of physical distance, travel time, transportation availability, and geographical barriers. Poor accessibility contributes to reduced enrollment, absenteeism, and eventual dropouts, particularly in rural and peri-urban communities.

2.2.4 Geographic Information System (GIS)

GIS is a computer-based system used to collect, store, analyze, and visualize spatial data. It allows researchers and planners to create maps, perform spatial queries, and conduct proximity or density analyses. In the field of education, GIS is employed to evaluate the location of schools, determine areas of need, and support data-driven decision-making processes.

2.3 Theoretical Framework

2.3.1 Central Place Theory

Developed by Walter Christaller in 1933, the Central Place Theory suggests that settlements serve as 'central places' providing services to surrounding areas. In education, schools act as central places offering access to learning opportunities. This theory underlines the importance of strategically locating schools so that they serve maximum populations within a minimum travel distance.

2.3.2 Location-Allocation Model

This model focuses on the optimal placement of facilities to serve a dispersed population efficiently. It involves determining the most appropriate locations for services like schools based on population density, transportation networks, and demand levels. The location-allocation model is widely used in GIS-based school planning.

2.3.3 Equity Theory

Equity in education implies that every child, regardless of geographic location or socio-economic background, should have access to quality education. Equity theory in spatial analysis encourages the fair distribution of schools so that no community is disadvantaged in terms of access or quality.

2.4 Review of Empirical Studies

2.4.1 International Perspectives

Globally, the application of GIS in school distribution analysis has gained momentum. For instance, researchers in India used GIS to identify disparities in school accessibility and recommended policy interventions to reduce travel time for students in rural Rajasthan. Similarly, in Brazil, GIS was used to monitor the spatial coverage of schools in Rio de Janeiro, ensuring that infrastructure investments were equitably distributed.

In South Africa, GIS helped assess the impact of historical apartheid policies on school accessibility, revealing persistent inequalities between urban and rural communities. These studies demonstrate how GIS is integral to spatial justice and educational planning.

2.4.2 Nigerian Studies

Several researchers in Nigeria have explored the distribution of educational infrastructure using both traditional methods and GIS. For example:

- Akintola (2017) used GIS to analyze the location of public primary schools in Lagos State. The study found clustering of schools in urban centers and recommended redistribution toward underserved areas.
- Ijaya et al. (2014) examined accessibility to secondary schools in Kwara State using buffer analysis in ArcGIS. Results indicated that over 30% of students traveled more than 5km to the nearest school, violating UNESCO's recommended proximity threshold.
- Oyinloye and Kufoniyi (2012) employed GIS to evaluate the spatial inequity in the distribution of health and education facilities in Osun State. The study revealed significant disparities and called for spatially-informed infrastructure policies.

These studies highlight a consistent pattern of spatial imbalance, with rural communities being less served than urban counterparts. However, most of these studies are outdated or limited in scope, underscoring the need for localized and updated GIS-based investigations.

2.5 Application of GIS in Educational Planning

2.5.1 Mapping School Locations

GIS allows for accurate mapping of school locations using coordinate data (latitude and longitude). This spatial visualization is crucial for identifying clusters, gaps, and potential areas for new schools. By overlaying maps with demographic data, planners can match population needs with available resources.

2.5.2 Accessibility and Proximity Analysis

One of the most common uses of GIS in education is proximity analysis. It involves creating buffer zones (e.g., 1km or 5km radius) around schools to determine how many students live within walking or commuting distance. Areas falling outside acceptable travel ranges are identified as underserved.

2.5.3 Density and Service Area Analysis

GIS can be used to calculate the density of schools per square kilometer or per thousand residents. This helps in comparing service provision across different communities. Service area analysis using network datasets also allows for evaluation based on actual road conditions and travel paths rather than straight-line distance.

2.5.4 Decision Support and Policy Making

The spatial outputs generated from GIS can serve as decision support tools for ministries of education and planning authorities. They assist in prioritizing investments, relocating or merging schools, and forecasting future infrastructure needs based on population growth.

2.6 Challenges in School Distribution in Nigeria

Several challenges impede equitable school distribution in Nigeria, including:

- Poor spatial data availability and management.
- Political influences in school location decisions.

- Inadequate infrastructure in rural areas.
- Lack of community participation in educational planning.
- Financial constraints limiting construction and maintenance of schools.

These challenges can be addressed through improved data collection, the use of geospatial technologies like GIS, community-based planning, and strong political will for equitable education delivery.

2.7 Empirical Gap

While numerous studies have explored spatial distribution of schools in Nigeria, few have focused specifically on Ilorin East and Moro LGAs. Moreover, many existing studies relied on outdated data or traditional mapping methods, lacking the dynamic capabilities of GIS. This study aims to bridge this gap by providing an up-to-date GIS-based distributional analysis of primary and secondary schools in the selected areas, thereby contributing new insights and practical recommendations for policymakers.

2.8 Summary of Literature Review

This chapter has reviewed the conceptual, theoretical, and empirical foundations relevant to the study. Key theories such as Central Place Theory and the Location-Allocation Model offer frameworks for understanding how educational facilities should be distributed. Empirical studies both within and outside Nigeria show the growing relevance of GIS in promoting equitable school access. Despite progress, gaps remain, particularly in localized studies using GIS. This research seeks to address these gaps through a detailed spatial analysis of school distribution in part of Ilorin East and Moro LGAs.

CHAPTER THREE

3.0 METHODOLOGY

This chapter deals with stages and techniques involved in the execution of the project task from the, reconnaissance to data capture, database design up to the analysis stage and information presentation.

3.1. RECONNAISSANCE/PLANNING

Reconnaissance is the preparatory aspect of the project known as preliminary survey or investigation. It involves the collection of all necessary information relating to the job as well as making visitation to the field in order to get the real picture of the project site. Reconnaissance is of two types, namely office and field reconnaissance.

3.1.1 OFFICE PLANNING

This involves the collection of all necessary data such as control points coordinates, permission letter as well as logistics and planning on how to embark on the project. Ground control data and information about the job were decided to be obtained using South Dual Frequency Global Positioning System owing to the nature and large area involved

Table.3.1 shows the Coordinates of Controls

Station	Northing(m)	Easting(m)	Height(m)
PBIL3306	940288.197	678281.701	355.212
PBIL3304	940275.508	678254.250	350.532

Source: office of surveyor general kwara state

3.1.2 FIELD RECONNAISSANCE

This involved visiting the project site to have an overall view of the few of the schools to be surveyed. The station points were marked out along road junctions and at convenient points to be able to capture data of the area. At the end of the whole exercise, a sketch diagram known as Recce diagram shown below in fig. 3.6. The type of analysis to be carried out was also known from the survey carried out. The configuration of the hardware and the software system required of the work were also known through field recci and also in the choice of appropriate model and structure to use.

3.1.2 EQUIPMENT USED AND SYSTEM SELECTION

EQUIPMENT USED

The equipment used for this project includes the following:

i. 1 number of South Dual Frequency Global Positioning System and accessories
ii. 1 number of Downloading cable
iii. Computer system
iv. Field book and writing materials

SYSTEM SELECTION

HARDWARE REQUIREMENT

i. Operating System: windows 10
ii. Device: HP laptop

iii. Model: Intel® core(TM)2 DUO

iv. Processor Speed: 2.40GHz

v. RAM: 4.00 GB

vi. System type: 64-bit operating system

SOFTWARE REQUIREMENTS

1. Notepad
2. Microsoft excel
3. AutoCAD 2007 was used for plotting
4. ArcGis 10.2 was used for data analysis, spatial search and creation of database
5. Microsoft word 2007 for report writing
6. Microsoft power point for information presentation

3.1.3 TEST OF INSTRUMENTS

The only instrument test was the test of the South Dual Frequency Global Positioning System. South Dual Frequency Global Positioning System Base was set up on a station and the Rover was taken to two points A&B at an interval of about 30m to test for distance and coordinate accuracy.

All the necessary adjustment was carried out before the start of observation. The observation was done and the following data were recorded

Status (P):	Fixed
Horizontal Root Mean Square (H):	0.014
Vertical Root Mean Square (V):	0.021

Satellite Number (S): 10+4

Communication Mode (Channel): 4

Time (T) 11:05:38

3.2 CONTROL CHECK

Control check was carried out on the beacons PBIL3306 and PBIL3304 in order to ensure whether they were still maintaining their original positions. The reference receiver (base receiver) was set on PBIL3306 while the rover receiver was set on PBIL 3304. The following are the result obtained

Table 3.7: Coordinate of the observed and the original values of PT 02

Station	**Northing(m)**	**Easting(m)**	**Height(m)**	**Status**	**Remark**
PBIL3304	940288.197	678281.701	355.212		ORIGINAL
PBIL3304	940288.212	678281.681	350.532	FIXED	OBSERVED
DISCREPANCY	0.015	0.O20			

Source: - field work

The result shows that the control pillars were in Situ and in good condition for the survey operation. In the case of the instrument, it can be concluded to be in good working condition.

3.3 DATA ACQUISITION

Basically, there are two ways of acquiring data for any project; these are primary data acquisition and secondary data acquisition.

Primary Data Acquisition

The primary data acquisition includes both spatial and attributes data. The data set of the spatial data was acquired through the use of South Dual Frequency Global Positioning System and the attribute data was acquired through social survey that involved asking questions from the residents anything concerning the utility in the area.

SECONDARY DATASOURCE

AnimageryoftheareawasacquiredthroughUpdatedGoogle earth; thiswasusedtoascertaintheextent ofcoverageof theproject area.

3.3.1 GEOMETRIC DATA ACQUISITION

South Dual Frequency Global Positioning System was used for this geometric data acquisition. The base of South Dual Frequency Global Positioning System was set up on a Second Order Control at sangokulende area, number PBIL3306, we performed all necessary temporary, permanent adjustment, and instrument configuration was carried out, the existing coordinate of the occupied point was inserted on the data logger of the base instrument which is (940288.197). The rover of the instrument was configured with base station as follows:

- ✓ The unit of observation……..Minna Datum Zone 31P
- ✓ Ellipsoid…………………..Rinex
- ✓ Range …. 50km radius

- ✓ Observational procedure….. Stop and Go

After all setting was done; we start the observation by taking the rover to first point in Sango for coordinate acquisition to determine the other details. The coordinates were stored in the instrument memory of the rover which has been connected to the base. This process was repeated throughout the subsequent stations (schools).

3.3.2 ATTRIBUTE DATA ACQUISITION

We acquire attribute date through questionnaire feasibility studies, the following are data acquired:

- ✓ Total number of class rooms in each school
- ✓ Total of pupils/Student in each class
- ✓ Total number of Pupil/Students in each school
- ✓ Population of each locality/environment
- ✓ Ministry of Education guideline for sitting schools

3.4 DATA PROCESSING

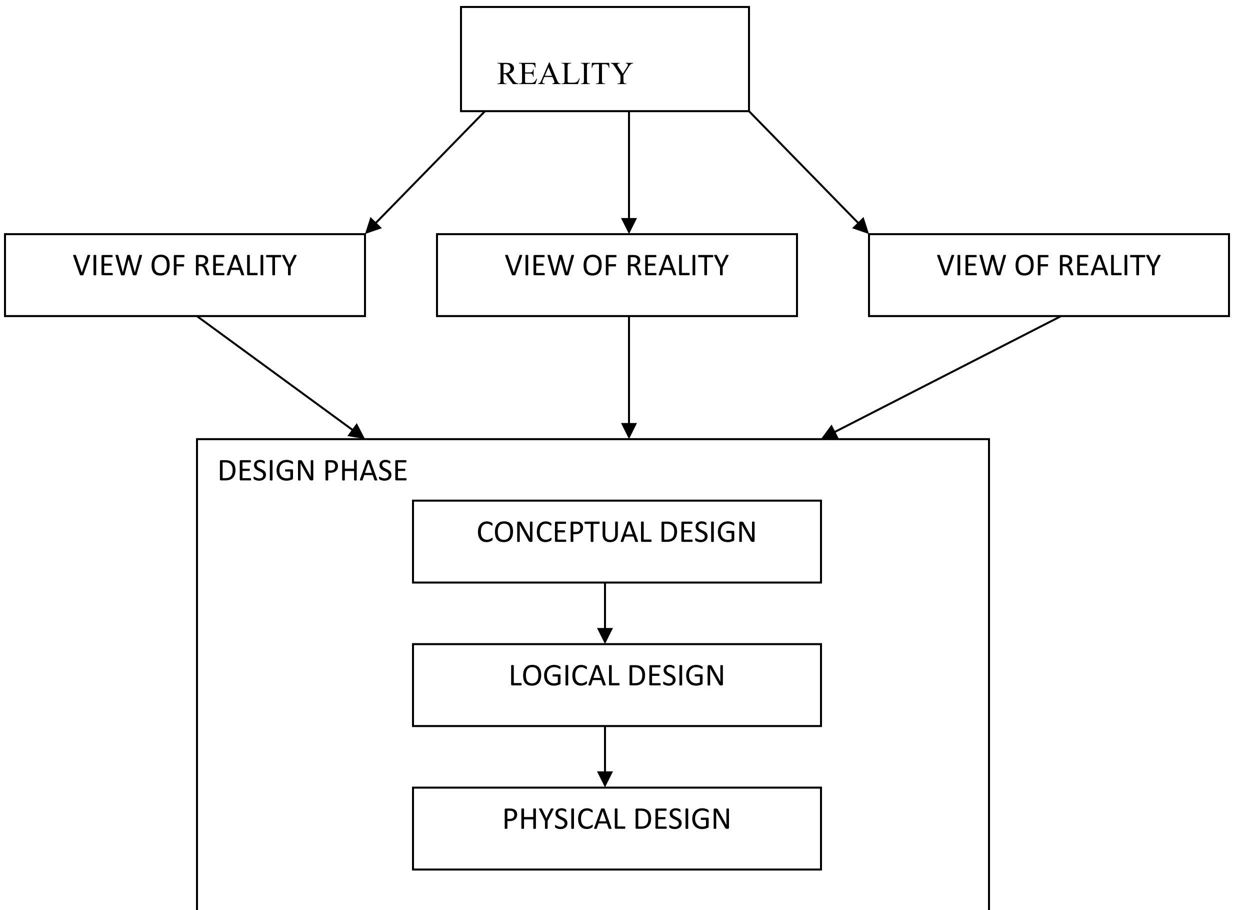
This process described how data is converted into information. Data are organized into structure group and database. The data acquired were downloaded using South Dual Frequency Global Positioning System cable to transfer data into personal computer and AutoCAD 2016 with ArcGIS 10.1 version was used for all drawings and database creations.

3.5 DATABASE DESIGN

The database is the heart of a GIS. The process of designing such a database is called data modeling. Data Model is the simplification and representation of reality, that is the process by which the real world entities and their inter-relationships are analyzed and modelled in such a way that maximum benefits are derived while utilizing a minimum amount of data. A database is as an organized, integrated collection of non-redundant data stored so as to be capable of use by different logical paths. It involves the following segments: Reality, Conceptual design, logical design and physical design.KufoniyiOlajide (1998)

In database design, four basic steps were normally taken. These steps are:-

1. View of reality.
2. Translation of reality to conceptual model.
3. Physical design.
4. Translation of conceptual model to logical design.



SPATIAL DATABASE

Fig 3.2: Design and Construction Phases of a Spatial Database (Kufoniyi, 1998)

3.5.1 VIEW OF REALITY

Realities were articulated based on geographical data within the study area with respect to Government schools distribution. In this case reality includes the Type of School, Number of classrooms, and population of students.

The creations of spatial database are in three phases. These are:-

i. Conceptual design phase, that is the arrangement or decision on how the view of reality will be simplified to satisfy the information required.
ii. Logical design that is the representation of the data model, designed to reflect the recording of the data in computer system called data structure.
iii. Physical design phase, this is the implementation of the type of GIS software to map out the data for variable manipulation, which can also take care of non-spatial queries as done with any other normal database management system (DBMS).GIS database's fashion from the fact that the data elements of the database are closely interwoven and therefore need to be structured for easy integration retrieval

According to Healey (1991), a proper database organization needs to ensure the following:-

1. Flexibility in the design to adapt to the needs of different users.
2. A system of validation checks to maintain the integrity and consistency of the data elements.
3. A controlled and standardized approach to data input and updating.
4. A level of security for minimizing damage to the data.

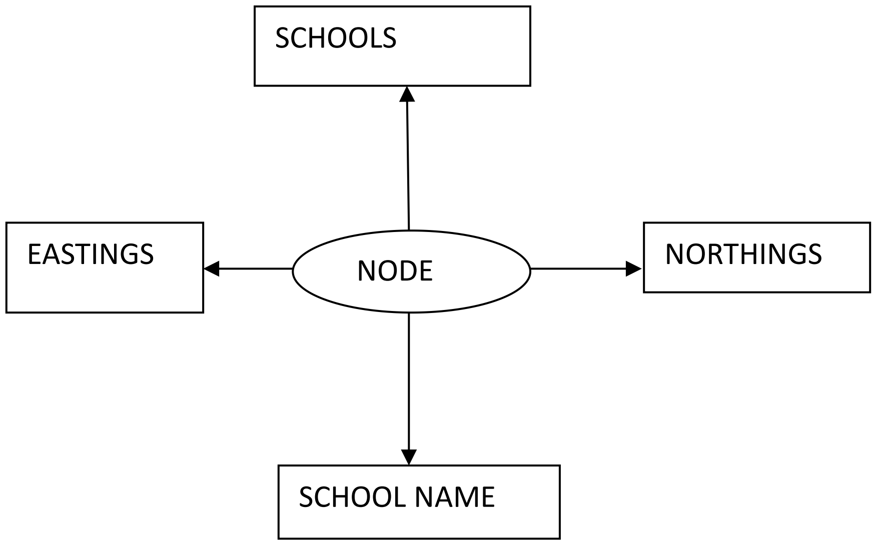
5. Reducing redundancy in data storage

3.5.2 CONCEPTUAL DESIGN

This is the representation of the human conceptualization of reality in simplified manner in such a way that a minimum amount of data is utilized to satisfy the project requirement to achieve its aim. The aim is to determine the basic entities, the spatial relationship and their corresponding attributes. What must be decided is how the entities are going to be represented but still satisfy the information requirement of the individual or organization concerned. The following were identified:

i. The related data sets
ii. Basic geometric and thematic data components of the application, which are node, arc, polygon (polygon only came in for the perimeter of the study area)
iii. The basic spatial object, their attributes and interrelationship. These spatial object were points and lines

Fig. 3.4: Schools and its attribute



3.5.3 LOGICAL DESIGN

This refers to the translation of conceptual model into logical design to represent a data model which can be acceptable by the computer that is the representation of data in a computer memory. In this stage, the data were structured to describe logically arrangement of data in the database. Relational data structure was chosen to implement the model because of its flexibility capability very wide deployment within and outside GIS.From the entity-relationship diagram, the following tables were designed.

Attribute of School table

S/NO	ATTRIBUTE COLUMN	DESCRIPTION
1	S_ID	SCHOOL IDENTITY
2	SCH_AREA	SCHOOL AREA
3	SCH_STATUS	SCHOOL STATUS

3.5.4 PHYSICAL DESIGN

This is the representation of data format of implementation software which is usually done at the beginning of the database creation phase. The software used is ArcGIS 10.1

Table 3.11: Data Declaration

FIELD NAME		FULL PROPERTIES				
	Data Type	Allow null values	Default values	Length	Geometry type	Grid
Shape	Geometry	Yes	Nil	Nil	Point	
Id	integer	Yes	Nil	Nil	Nil	
Location	Text	Yes	Nil	25	Nil	
school_source	Text	Yes	Nil	25	Nil	
Easting	Float	Yes	Nil	Nil	Nil	
Northing	Float	Yes	Nil	Nil	Nil	

3.5 DATABASE IMPLEMENTATION

The Arc GIS was lunched. The default table created for the graphics was then edited and other fields were formed .The table was populated to link schools, location and population with their attributes from where queries were made. The extract of attributes and topples created for the project are shown below

3.5.1 DATA SECURITY

This refers to the protection of data against unauthorized disclosure, alteration or destruction. The main aim is to protect the integrity of the data against system malfunctioning, virus, infection, technical hiccups or human error. Database security deals with all various aspect of protecting the database content, its owners and its users. Security measures include the use of fire proof vault, the preparation of microfilmed duplicates or regular creation of backup copies for all computer files and controlled access to sensitive areas.

3.5.2 DATA INTEGRITY

This is the process of ensuring that the data in the database is accurate and setting of certain constraint to prevent inconsistency in the database. Integrity of the database must be ensure at all times, thus care must be taken when inserting data and updating the database. The integrity enforced/utilized by Arc GIS 10.2 is that of data type constraint. The software prevents for example a text value from being entered in a field that was declared as number. Also to ensure quality in GIS, separate databases were created for graphic data and non-graphic data. They were linked via identification codes. In this way each file could be managed separately.

3.5.3 DATABASE MAINTENANCE

Proper keeping, updating and management of database ensure on its currency and fitness for the purpose for which the database was created. The quality of the database depends on its currency and its fitness for use as a decision support system and must be maintained.

H

CHAPTER FOUR

4.0 RESULT AND DISCUSSION

4.1 NAME OF SCHOOLS CONSIDERED FOR THE PROJECT

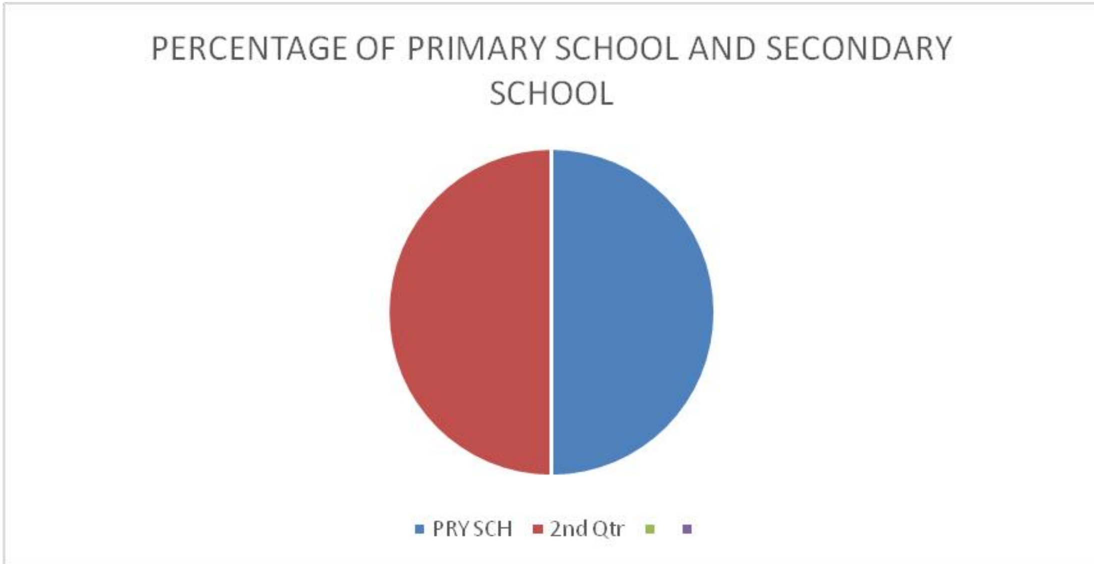
The schools considered for this project are both Primary and Secondary schools in Part of Ilorin East, South and Moro Local Government Area of Kwara State. From the table below, we have total number of (17) seventeenth schools for the distribution analysis within the part of the study area.

Table 4.1: Name of Schools

S/N	NAME OF SCHOOL	ADDRESS	LGA	STATUS
1	Govt Day Sec Sch	Sango, Ilorin		Secondary
2	Govt Day PriSch	Sango, Ilorin		Primary
3	GalikiPri. Sch	Sango, Ilorin		Primary
4	Maya/ IleApaPriSch	Maya, Ilorin		Secondary

5	Eleko LGEA	Idi Ori, Ilorin	ILORIN EAST	Primary
6	OkeOse LGEA	Abanta road		Primary
7	Sentu LGEA	Lajiki road		Primary
8	Govt Girls College	Old jebba road		Secondary
9	C.S.S. OkeOyi	Jolasun Road		Secondary
10	LGEA OkeOyi	Old Jebba Road		Primary
11	LGEA Sch II OkeOyi	Lanwa Road		Primary
12	Tepatan Sec Sch	Oyun, Ilorin	MORO	Secondary
13	TepatanPriSch	Oyun, Ilorin		Primary
14	Sch of Special Needs	Oyun, Ilorin		Secondary
15	Eleko LGEA	Idi Ori, Ilorin		Primary
16	KwaraPoly Sec Sch	KwaraPoly campus		Secondary
17	KwaraPolyPriSch	KwaraPoly campus		Primary

Source: Field Observation Data, Author, 2025.



4.2 POPULATION PER LOCATION

From the table below, we have total number of (17) seventeen schools in consideration within the part of the study area. The population of each location (community) was taken from the Population Census website using 2006 record and 2025 population projection for the analysis.

Note: - the last census was conducted in 2006 and to estimate the population for 2025, we employed the compound annual growth rate (CAGR) method. This approach assumes a constant growth rate over the specified period.

The population of local government per yearly growth rate of 3.41% and the formula use to calculate 2025 shows below;-

$$P = P_{\circ} \times (1 + r)^{n}$$

Where P = final population

$P_{\circ}$ = initial population

r = growth rate (3.41%)/year = 0.0341

n = numbers of year (2025 - 2006 = 19 years)

The 2025 approximate calculation for Ilorin East, South and Moro local government area are:

Ilorin east = P=207,462× (1+0.0341) ^19years = 392,307.68

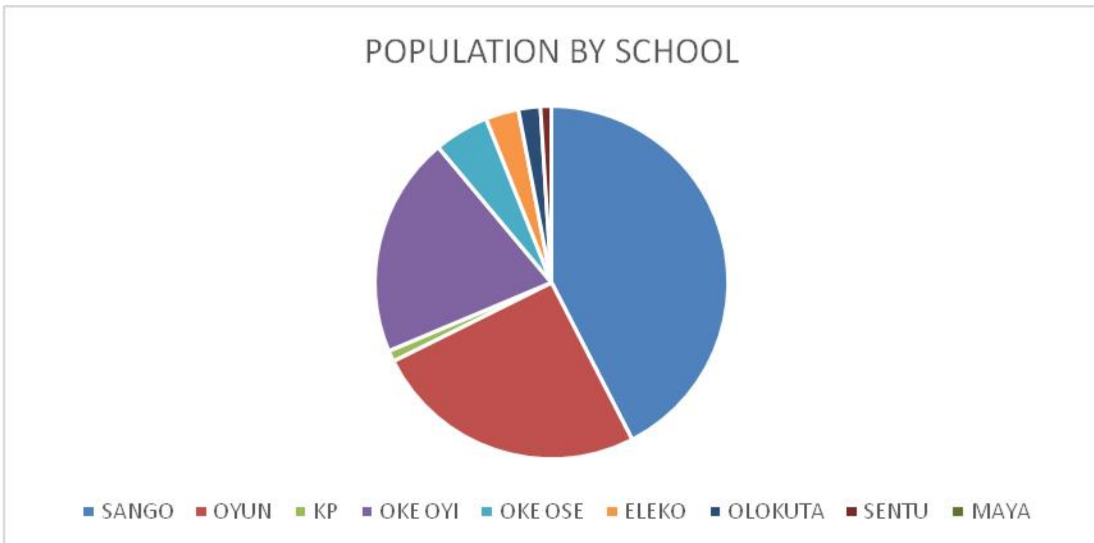
Moro = P= 108,715 × (1+0.0341) ^19years = 205,578.50

Table 4.2: Name of Schools

S/N	NAME OF SCHOOL	Community	ADDRESS	2006 CENSUS	2025 APP. POPULATION *PROJECTION*
1	Govt Day Sec Sch	A	Ilorin East	207,462	392,307.68
2	Govt Day PriSch				
3	GalikiPri. Sch				
4	Maya/ IleApaPriSch				
5	Eleko LGEA				
6	OkeOse LGEA				
7	Sentu LGEA				
8	Govt Girls College				

9	C.S.S. OkeOyi				
10	LGEA OkeOyi	B	MORO	108,715	205,578.50
11	LGEA Sch II OkeOyi				
12	Tepatan Sec Sch				
13	TepatanPriSch				
14	Sch of Special Needs				
15	Eleko LGEA				
16	KwaraPoly Sec Sch				
17	KwaraPolyPriSch				

Source: Field Observation Data, Author, 2025.



From table 4.2 above :- it observe that the larger population In the showing area is in community A, comprising Sango and Galiki both have a total of 3 schools and the smallest population in the showing area is in community E which comprise 1 school which is Okeose.

4.3 POPULATION RATIO PER LOCATION

From the table 4.3 , we have total number of (17) seventeen schools for the distribution analysis within the part of the study area in different locality; we observe their some locality has more than one school. The population of each location (community) is based on population projection for 2025 using the population census of 2006

Note: - the last census was conducted in 2006 and to estimate the population for 2025, we employed the compound annual growth rate (CAGR) method. This approach assumes a constant growth rate over the specified period.

The population of local government per yearly growth rate of 3.41% and the formula use to calculate 2025 shows above;-

$P = P_\circ \times (1 + r)^n$

Where P = final population

$P_\circ$ = initial population

r = growth rate (3.41%)/year = 0.0341

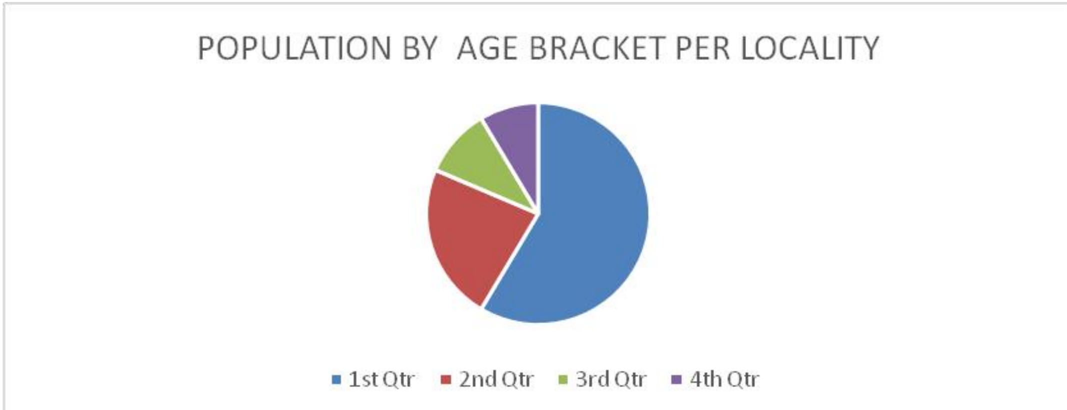
n = numbers of year (2025 - 2006 = 19 years)

Table 4.3: Population Census per Locality 2006 & 2025 Approximate population projection Records

S/N	NAME OF LOCALITY	2006 CENSUS	APPROXIMATE POPULATION BY 2025 CENSUS	CHILDREN (42%) OF POPULATION 3YEARS TO 18YEARS 2025 PROJECTION	ADULTS (54%) OF POPULATION (2025 PROJECTION)
1					
2					
3					
4					
5	Ilorin East local government				
6					
7			392,307.68	164,769	211,846
8		207,462			
9					
10					

11	Moro local government	108,715	205,578.50	86,343	111,012
12					
13					
14					
15					
16					
17					

Source: Field Observation Data, Author, 2025



4.4 EXPECTED ENROLLMENTIN RELATION TO SCHOOL POPULATION

From the table below, we have total number of (17) seventeen schools for the distribution analysis within the study area; some locality has more than one school. The population of each location (community) was projected from the Population Census of their respective local government

Table 4.4: Expected Enrollment in Relation to School Population

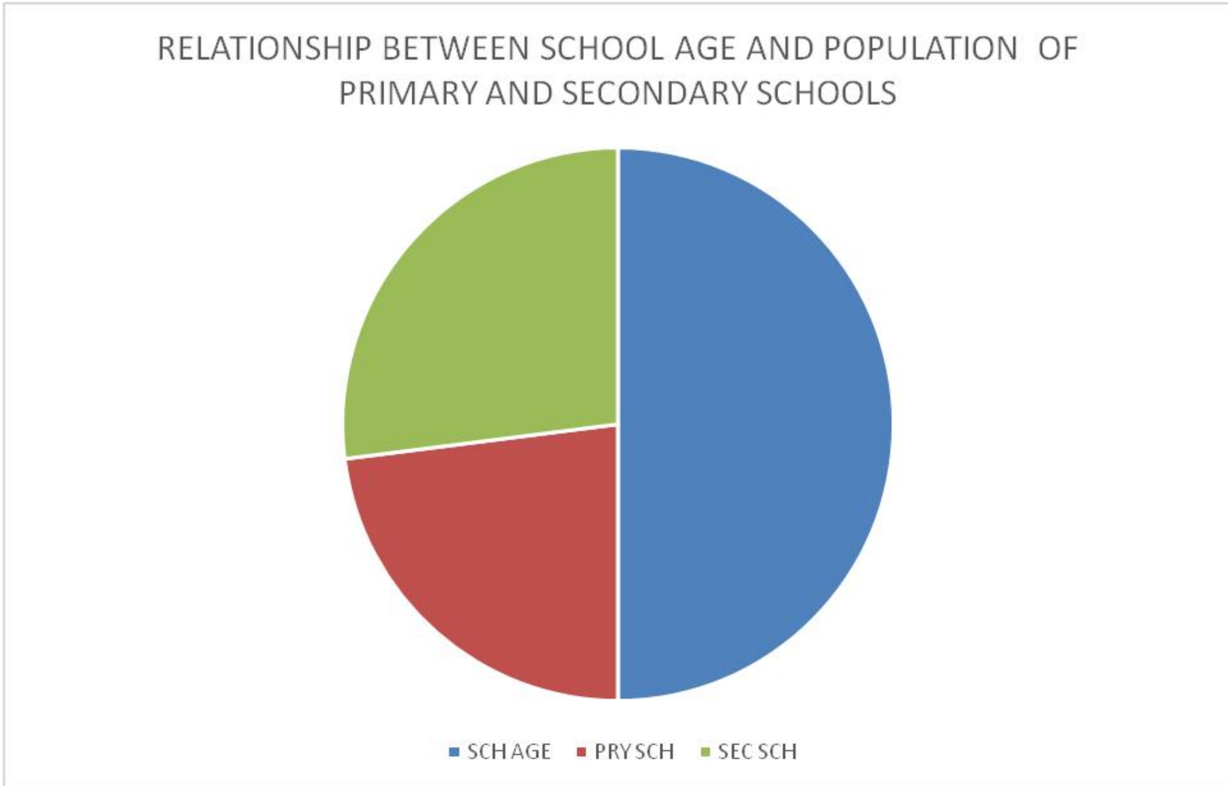
S/N	LOCALITY	NAME OF SCHOOLS PER LOCALITY	2006 CENSUS	APPROXIMATE POPULATION BY 2025 CENSUS IN THE AREA	SCHOOL AGE PER LOCALITY (PRI & SEC SCH)	SECONDARY SCHOOL POPULATION FROM REGISTER	PRIMARY SCHOOL POPULATION FROM REGISTER	NUMBER OF SCHOOL CHILDREN
1	Sango	Govt Day Sec Sch						
2	Sango	Govt Day PriSch			2,279	198	201	
3	Galiki	GalikiPri. Sch					217	**616**
4	Maya/ IleApa	Maya/ IleApaPri Sch				215	98	
5	Eleko	Eleko LGEA			1,790			**313**
6	OkeOs	OkeOse	207,462	326,923		302	106	**408**

	e	LGEA						
7	Sentu	Sentu LGEA			1,157	221	-	**221**
8	NNPC	Govt Girls College			338	-	45	**45**
9	OKE OYI	C.S.S. OkeOyi			799	-	97	**97**
10	OKE OYI	LGEA OkeOyi			-	206	-	**206**
11	OKE OYI	LGEA Sch II OkeOyi			-	-	39	**39**
12	Tepatan	Tepatan Sec Sch			937	-	201	**201**
13	Tepatan	TepatanPriSch			639	-	87	**87**
14	NNPC	Sch of Special Needs	108,715	84,650		62	-	**62**
15	ELEKO	Eleko LGEA			2,588	199	-	**199**
16	KWARAPOLY	KwaraPoly Sec Sch				-	163	**163**

17	KWA RAPO LY	KwaraPol yPriSch				-	102	**102**

Source: Field Observation Data, Author, 2025.

Note : - the percentage of children in school seems small compared to the expected number of children in schools. We assume the children in the locality are attending private schools



4.5 POPULATION RATIO IN RELATION TO SCHOOL CLASS ROOM AND CLASS NUMBER

From the table 4.5, we have total number of (17) seventeen schools for the distribution analysis within the part of the study area in different locality, though some locality has more than one school. The population ratio of each Class room number / population based on Ministry of Education regulation is taking between 28 Pupils and 32 Students for secondary level

Table 4.5: Population of Students in Relation To Number ofClass Room

S/N	NAME OF SCHOOLS PER LOCALITY	CLASS ROOM NUMBERS PER SCHOOL	SECONDARY SCHOOL POPULATION FROM REGISTER	PRIMARY SCHOOL POPULATION FROM REGISTER	NUMBER OF CHILDREN INCLASS ROOM
1	Govt Day Sec Sch	6	198	-	**616/18= 34.22 students per**
2	Govt Day PriSch	6	-	201	

3	GalikiPri. Sch	6	-	217	**class**
4	Tepatan Sec Sch	6	215	-	**313/18= 26.08 students per class**
5	TepatanPriSch	6	-	98	
6	Sch of Special Needs	6	302	106	**408/6=68 students per class**
7	Olokuta Sec Sch	6	221		**221/6=36.86 students per class**
8	Maya/ IleApaPriSch	6	-	45	**45/6= 7.5 students per class**
9	Eleko LGEA	6	-	97	**97/6=16.17 students per class**
10	KwaraPoly Sec Sch	6	206	-	**206/6=34.33 students per class**

11	KwaraPolyPriSch	6	-	39	**39/6=6.50 students per class**
12	OkeOse LGEA	6	-	201	**201/6=33.50 students per class**
13	Sentu LGEA	6	-	87	**87/6=14.50 students per class**
14	Govt Girls College	6	62	-	**62/6=12.75 students per class**
15	C.S.S. OkeOyi	6	199	-	**199/6=33.16 students per class**
16	LGEA OkeOyi	6	-	163	**163/6-=27.12 students per class**
17	LGEA Sch II OkeOyi	6	-	102	**102/6=17**

Source: Field Observation Data, Author, 2025.

Note: - from table 4.5 it is discovered that the school in the special need has a higher student concentration of 68 pupil per class, while kwara poly primary school has the lowest pupil per class.

4.5 ANALYSIS OF THE RESULTS

The following are the results derived from field data and other secondary data obtained from reliable sources:

1. The study area can be literally divided into two (2), the urban and rural community.
2. The community tapped ‘A’ falls under the urban community while the rest can be termed rural.
3. It is observed that the schools enrollment within the urban community is much higher than the rural (sango, ganiki and school of special needs).
4. However for both, the class enrollment seems small compared to the estimated population.
5. Some reasons that could be adduced to this may be found in the restricted sample of our research, that is, government schools alone.
6. Similarly, the rural community appear averse to sending their children to school. They prefer farming.
7. Also there seems to be more classroom spaces than the number of pupil in the classes.
8. Apparently it can then be concluded that the distribution and availability of government school within the study area is adequate but the enrollment is less than adequate.
9. This probably may be as a result of preference of parents for private schools than government schools.

4.6 COSTING

The costing of this project was done using the Nigeria Institution of Surveyors (NIS) professional scale of fees for Consultant in the construction industry. The total area of the project is 39.303 hectares, the project component and their direct costs were as follows.

- RECONNAISSANCE

PERSONAL/QUANTITY	UNIT RATE(₦)	DAY(S)	TOTAL AMOUNT(₦)
1 Senior Surveyor	9,814.20	2	19,628.4
1 Technical officer	6,542.80	2	13,085.6
2 Skilled Labour	4,078.66	2	8,157.32
Transportation	19,826.67	2	39.653.34
Basic Equipment	19,826.67	2	39,653.34
TOTAL			120,178

- LINE CLEARING

PERSONAL/QUANTITY	UNIT RATE(₦)	DAY(S)	TOTAL AMOUNT(₦)
1 Assistant Surveyor	6,540.80	1	6,540.80
1Assistant Technical Officer	4,673.43	1	4,673.43
6 Labour crew	12,235.98	1	12,235.98

Transportation	19,826.67	1	19,826.67
Basic Equipment (6)	19,826.67	1	19,826.67
TOTAL			63,103.55

DEMARCATION

PERSONAL/QUANTITY	UNIT RATE(₦)	DAY(S)	TOTAL AMOUNT(₦)
11 Beacons	23,100.00	1	23,100
1 Assistant Technical Officer	4,673.43	1	4,673.43
4 Labour crew	8,157.32	1	8,157.32
Transportation	19,826.67	1	19,826.67
Basic Equipment	5,664.00	1	5,664
TOTAL			61,421.42

TRAVERSING AND DETAILING

PERSONAL/QUANTITY	UNIT RATE(₦)	DAY(S)	TOTAL AMOUNT(₦)

1 Surveyor	9,814.20	8	78,000
2 Assistant Surveyor	13,085.60	8	104,684.8
6 Labour crew	12,235.98	8	97,887.84
Transportation	19,826.67	8	158,613.36
Basic Equipment	28,323.80	8	226,590.4
TOTAL			665,776.4

DATA EDITING AND PROCCESING

PERSONAL/QUANTITY	UNIT RATE(₦)	DAY(S)	TOTAL AMOUNT(₦)
1 Principal Surveyor	13,085.60	3	39,256.8
1 Surveyor	7,944.83	3	23,834.49
1 Assitant Technical Officer	4,673.43	3	14,020.29
Computer Accessories	21,242.85	3	63,728.55
TOTAL			140,840.13

- PLAN AND MAP PRODUCTION

PERSONAL/QUANTITY	UNIT RATE(₦)	DAY(S)	TOTAL AMOUNT(₦)
1 Senior Surveyor	9,814.20	1	9,814.2

1 Technical Officer (CAD)	6,542.80	1	6,542.8

PERSONAL/QUANTITY TOTAL	UNIT RATE(₦)	DAY(S)	TOTAL AMOUNT(₦) 40,751.25
1 Chief Surveyor	14,487.62	1	14,487.62
1 Surveyor	7,944.83	1	7,944.83
1 Secretary	6,542.80	1	6,542.80
1 Computer	10,000.00	1	10,000.00
Consumable	6,000.00	1	6,000.00
Standard set(Computer,plotter)	28,323.80	1	28,323.8
TOTAL			44,680.8

Technical report

- SUMMARY OF THE COST RATE

ITEM	PROJECT QUANTITY	UNIT RATE(₦)
1	Reconnaissance	120,178
2	Land clearing	63,103.55
3	Demarcation	61,421.42
4	Traversing and detailing	665,776.4 1,140,975.55
5	Data Editing and processing	140,840.13
6	Plan and map production	44,680.8
7	Technical report	44,975.25
8	Accommodation	225,000
11	VAT 5%	57,048.78
	TOTAL	1,423,024.33

The total Estimated Cost of the project =1,423,024.33

(One Million Four Hundred Twenty Three Thousand Twenty Four Naira and Thirty Three Kobo)

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

This study was conducted to analyze the spatial distribution of primary and secondary schools in selected parts of Ilorin East and Moro Local Government Areas of Kwara State using a Geographic Information System (GIS) approach. The research involved data collection through GPS survey and secondary data sources. ArcGIS software was used to visualize, map, and analyze the spatial distribution patterns of the schools.

Key findings from the study include:

- Uneven Distribution: There is a noticeable imbalance in the distribution of schools across the selected areas. Some communities, particularly in the rural and remote parts of Moro LGA, have limited access to both primary and secondary schools.
- Clustering Pattern: Schools were observed to be more concentrated around urban and semi-urban areas, especially in Ilorin East, suggesting that these areas are better served educationally compared to the rural outskirts.
- Accessibility Issues: Several schools are located at considerable distances from residential areas, posing accessibility challenges for school-age children in some communities.

- Lack of Secondary Schools: While primary schools are relatively more available, secondary schools are fewer and farther apart, especially in the rural sections of Moro LGA.
- GIS Utility: The application of GIS proved highly effective in visualizing disparities in educational infrastructure and identifying underserved locations.

5.2 Conclusion

This study concludes that the spatial distribution of primary and secondary schools in Ilorin East and Moro Local Governments is uneven and inadequate in many rural areas. There is a clear need for a more equitable distribution to ensure educational accessibility and equity for all. The GIS approach successfully revealed critical spatial patterns and gaps that may not have been easily identified through traditional methods.

5.3 Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Establishment of More Schools: Government and educational stakeholders should prioritize the establishment of more schools, especially in underserved and rural areas of Moro LGA.
2. Equitable Resource Allocation: Efforts should be made to ensure fair distribution of educational facilities across communities to promote equal learning opportunities.

3. Regular GIS-Based Monitoring: GIS should be institutionalized as a tool for monitoring and planning educational infrastructure to support data-driven decision-making.
4. Improved Infrastructure and Access Roads: Investment in road infrastructure leading to schools in remote areas should be prioritized to improve accessibility.
5. Community Engagement: Involving local communities in the planning and siting of schools can help in identifying actual needs and ensuring schools are located in practical and accessible locations.

5.4 Contribution to Knowledge

This study has contributed to understanding the spatial dimension of educational infrastructure distribution in Kwara State. It highlights the effectiveness of GIS in educational planning and resource management. The results can serve as a baseline for further studies and policy formulation aimed at achieving equitable education access in Nigeria.

5.5 Suggestions for Further Study

Future research could explore:

- Temporal analysis of school expansion or decline over time using GIS.

- Evaluation of school quality and teacher distribution alongside spatial analysis.
- Incorporation of socio-economic variables in determining school placement needs.

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