GEOGRAPHY AND THE MAKING OF VIABLE AFRICAN CITIES

12Th Annual Conference

& Induction of New Members (Kaduna 2019)

BOOK OF PROCEEDINGS

RC 850620

The Institute of Certified Geographers of Nigeria

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December 14th 2019

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EXECUTIVE SUMMARY

The title of this book, *Geography, and the Making of Viable African Cities,* as a book of abstract covers the main issues of the institute of Geographers of Nigeria's conference and induction of new members for the year 2019. The work is the fourth in a series of books and journals from the ICGN and this edition covers the entire proceedings for the Kaduna conference.

The papers were assessed and found worthy for publishing in accordance with the institute's standards and professional tradition. I therefore recommend this book to all especially to those who are willing to perceive geography as corporate, and leading the interdisciplinary and multidisciplinary inquiry in environmental ad spatial studies.

The book is divided into six chapter according to the number of papers published. The first chapter, *Demand-Responsive Transportation System in Security Services in Ibadan Urban Centre Using GIS and Remote Sensing Techniques*, uses Geographic Information System and Remote Sensing to device an advanced user oriented form of public transport characterized by flexible channeling and planning of vehicles operating in shared route mode between pick-up and drop-off locations, according to the needs of passengers.

Chapter 2, *Inspection of Campus Infrastructures Using Unmanned Aerial Vehicles (UAVs): A Case Study of Federal School of Surveying, Oyo,* uses Unmanned Aerial Vehicles, also known as geographic resource tools, to visually monitor construction and high-rise operational buildings, bridges, and other types of civil infrastructure systems. It uses a tertiary school campus as a case in reference.

Chapter 3, *Comparative Analysis of Housing Affordability and Livability in Public and Private Housing Estates in Ilorin Nigeria,* attempts to examine housing affordability and livability in selected public and private housing estates in a bid to reach the global desire of making decent housing for urban dwellers. This is followed by the paper titled: *Small Scale Business: A Panacea to Urban Poverty and Sustainable Development in Sokoto Metropolis.* The paper attempts to show how promoting and supporting small and medium scale industries can combat urban poverty.

Chapter 5, *Effect of Obajana Cement Factory Waste on its Immediate Environment,* measures the impact of the quantity of waste of a cement factory to its adjourning urban dwelling. The result is to ascertain whether the factory waste has left health threatening impact on the host community or not. While the final chapter, *Assessment of Private Housing Estate Development and Planning Standard in Abuja Municipal Area Council, Nigeria,* sues to assess the private housing estate development and planning standard**,** with a view to providing decent, safe, healthy and affordable housing environment.

Most of the papers take their examples from practical case studies to show that solutions and recommendation could be applied in related scenarios in other climes and locations. I suffice to state that the opinions stated in this collections, though those of the authors', reflect the goals and aspirations of the institute.

The Director General, Prof CO Balogun, the president, Malam Adamu Dabo Sambo, the vice president, Prof LO Enukora and the entire council of the institute supported and encouraged the work of the publication team and for that they have my gratitude. Finally, I take responsibility for the form the final publication has taken.

Akwo, Jude Souza, fcg
Registrar

DEMAND-RESPONSIVE TRANSPORTATION SYSTEM IN SECURITY SERVICES IN IBADAN URBAN CENTRE USING GIS AND REMOTE SENSING TECHNIQUES

By

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Abstract

Demand-Responsive Transportation System is an advanced, user oriented form of public transport characterized by flexible routing and scheduling of vehicles operating in shared ride mode between pick-up and drop-off locations according to passengers' needs. This mode of transportation system was also channeled into crime fighting in part of Ibadan, Oyo State of Nigeria. The problem of not getting to crime scenes on time and inadequate knowledge of alternative routes in carrying out security patrols in the study area necessitated the study. The methodology involved using Remote Sensing and Geographical Information System techniques. Data were acquired from Primary and Secondary sources, database was designed and created. The single criterion query showed that 505 road segments are in good condition representing 21.90% of 2306 road segments digitized. The Multiple criteria query returned a total of 356 road segments that are single lane and are also in good condition representing 15.4% of the total road segments in the study area. Travelling between Housing Roundabout by the Security agents and Iwo Road at a Crime Scene along the best route generated a distance of 5.84km. The alternative route taken with a barrier along the best route at Idi Ape was 6.17Km. The study made some recommendations including introducing Geocoding to convert addresses to points identifiable in the pool of buildings in the study area.

Keywords: Demand-Responsive, Transportation, Security, Geographic and Remote Sensing

1.0   Introduction

Transportation and security are inseparable in the sense that security officers are expected to constantly patrol the city in order to curb excesses of law breakers within the society apart from the usual 'stop and search' operations or mounted road blocks as the situation may warrant. Transportation is the movement of people and or goods from one place to another through a means. The means may be walking on land, vehicle on road, train on the rail and plane in the air or ship on the sea (Akomolafe, Adekayode, Gbadeyan & Ibiyemi, 2009). Ogunbodede (2008) observed that urban mobility problems had been on the increase since independence. This had greatly put pressure on the socio-economic facilities in the urban centres and one of the consequences is crime. The congestion in Ibadan is one of the reasons why crimes of sort are on the increase in Ibadan and hence the use of Geographic Information Systems and Remote Sensing techniques to aid the existing modalities by the Law enforcement agents.

Demand-Responsive Transportation System (DTS) is a special kind of Transportation system that is new to the Third world countries including Nigeria and the study area; but with the advancement in technology crossing borders through Information and Communication Technology (ICT), awareness is on the increase on DTS. The DTS is an alternative solution to help the security outfits to combat crime in Ibadan urban centre so that investors can be encouraged when they are sure that adequate security measures are in place. Geographic Information Systems' techniques and other related technology were deployed in achieving the aim and objectives of this study. Longley, Goodchild, Maguire and Rhind (2005) concluded that GIS is a proven technology and the basic operations of GIS today provide secure and established foundations for measurement, mapping, and analysis of the real world.

The study area falls within three of the eleven local government areas in Ibadan Metropolis (See Figure 1). The study area which is part of the city of Ibadan lies between longitudes 3º 53' 20.922" and 3º 56' 39.438" east of the Greenwich Meridian; and between latitudes 7º 23' 25.101" and 7º 26' 07.185" north of the Equator. It cuts across three local governments in the state namely; Akinyele, Lagelu and Ibadan North.
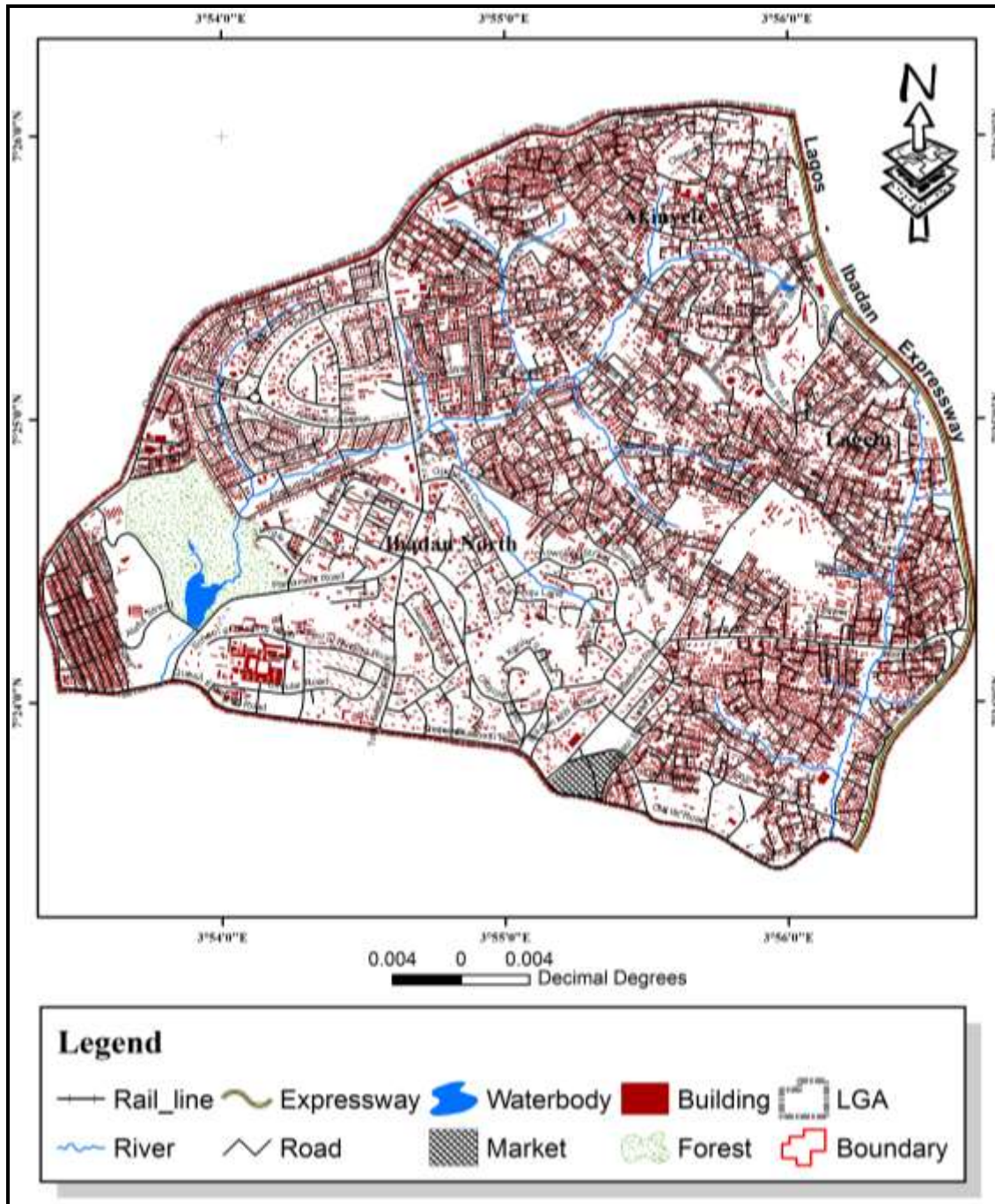
Figure 1. Ibadan showing the Study Area

Source: Field Study, 2019

Ringalink (2016) found out that the Demand-Responsive Transportation System can be defined as one that is adapted to meet the known needs of users and that it is important to remember that the characteristics of both DRT and conventional transport services vary dramatically depending on whether the location is urban, peri-urban or rural in nature.

In another study by Mageean, Nelson and Wright (2003), Demand-Responsive Transport (DRT) services provide transport "on demand" from passengers using fleets of vehicles scheduled to pick up and drop off people in accordance with their needs. In this case of using the DRT for security services, Automated Vehicle Locationing (AVL) systems are used to provide real-time information on the status and location of the fleet for the route optimising software. This implies that all patrol vehicles used by the security personnel can be tracked in real time so that service areas are not exceeded and for adequate monitoring from a central system for those operating outside their jurisdiction.

2.0   Materials and Methods

Geospatial data can be acquired using a variety of technologies and can be entered into GIS (Folger, 2009). The attributes of the collected data, such as land-use information, demographics, landscape features, or crime scene observations, can be entered manually or, in the case of a land survey map, digitized from a map format to a digital format by electronic scanning.

The primary data used for the study are the locations of the bus stops along the major roads in the study area. This was done with a handheld GPS (Etrex) with 3.0m accuracy which is adequate for the study. The secondary data were from statutory organisations who are custodians of such data. They include:

i)   1.0m resolution Ikonos imagery of the study area gotten from the Office of the Surveyor-General of the Federation (OSGOF), Abuja Nigeria

ii)   Local Government boundary map from National Population Commission, Abuja Cartographic department, Abuja Nigeria.

Data collected for the study were processed using ArcGIS 10.6. Data conversion was done on the base map which involved georeferencing the map and extracting the study area boundary in a process called digitizing. The entities are as shown in Table 1.

Table 1: Entities type Table

Entity	Shape
Boundary	Polygon
LGA	Polygon
Water Body	Polygon
Building	Polygon
Market	Polygon
Forest	Polygon
River	Polyline
Express Way	Polyline
Road	Polyline
Police Point	Point

Table 1 shows the entities modelled for the application and their shapes. The Entity-Relationship diagram for the study is shown in Figure 2. It shows the relationships that occur between the various entities in the study area. The rectangles are the entities; parallelograms are the relationships while the alphanumeric represent the cardinality ratio.
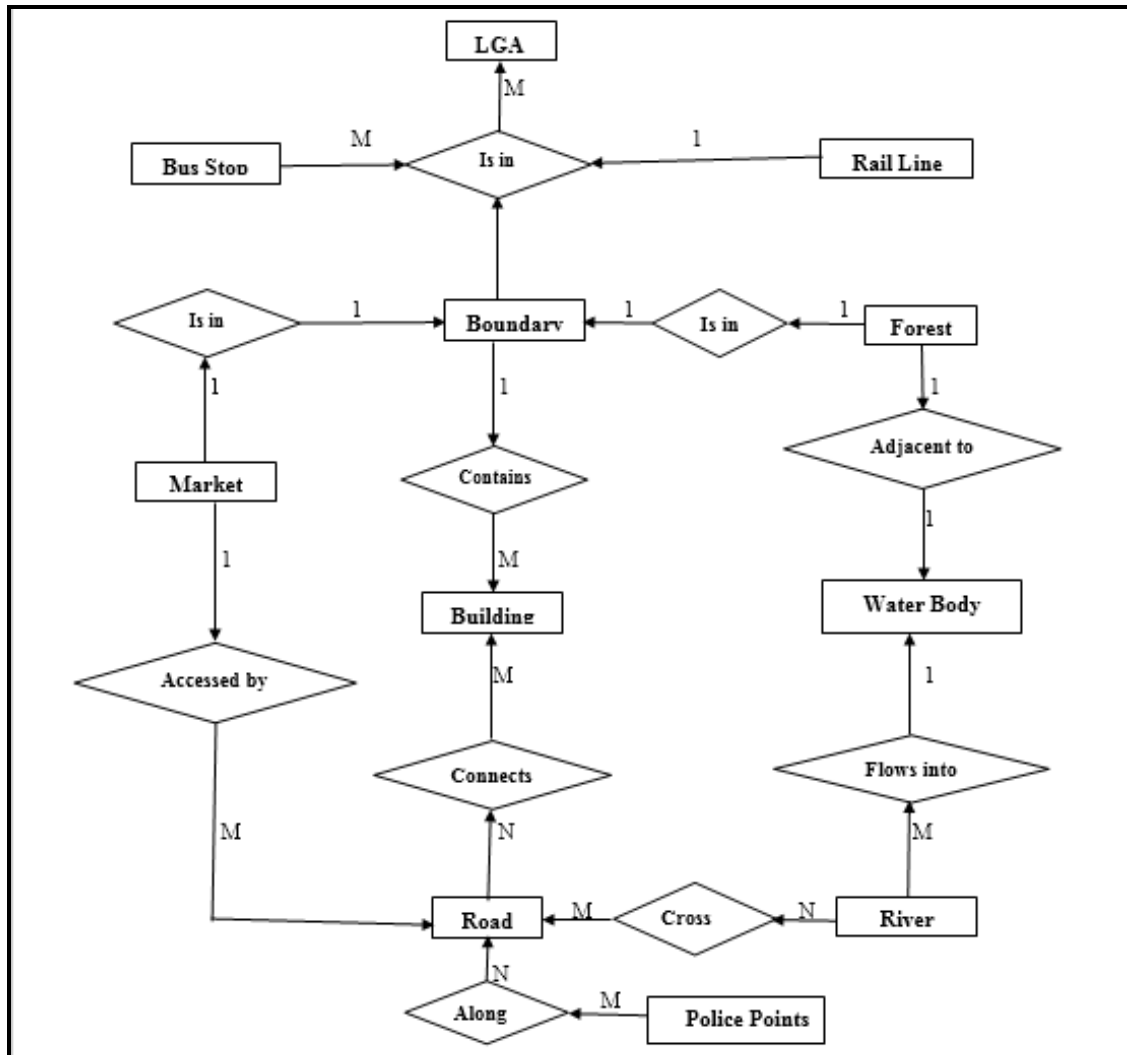
Figure 2. Entity-Relationship diagram

Source: Field Study, 2019

3.0   Data Analysis and Results

This involves the processes that were carried out on the data collected for the execution of this project. The imagery was already georeferenced from the source and that implied that extraction of the entities was done through head-on digitizing without necessarily going through the process of georeferencing the image for the study.

3.1   Testing of Database

Spatial and attribute queries were carried out to test the database created. The Single Criterion Query and Multiple Criteria Queries were performed on the database created for the study.

3.1.1 Spatial and Attribute Queries

Queries are useful for processing and decision making purposes as shown in this study. Spatial and attribute queries were carried out to test the database created. Queries were used to find out the attributes of the roads. The database created were tested under Single criterion query and Multiple criteria query.

3.1.1a Single Criterion Query

Single Criterion Queries use only one field. They are also called single condition query. The query uses only one field of the tables created for the entities. Two queries were carried out under this single criterion query. The single criterion query issued was to retrieve from the database those roads that are in good condition (Figure 5). The study depends on the availability of good roads for easy and fast access.
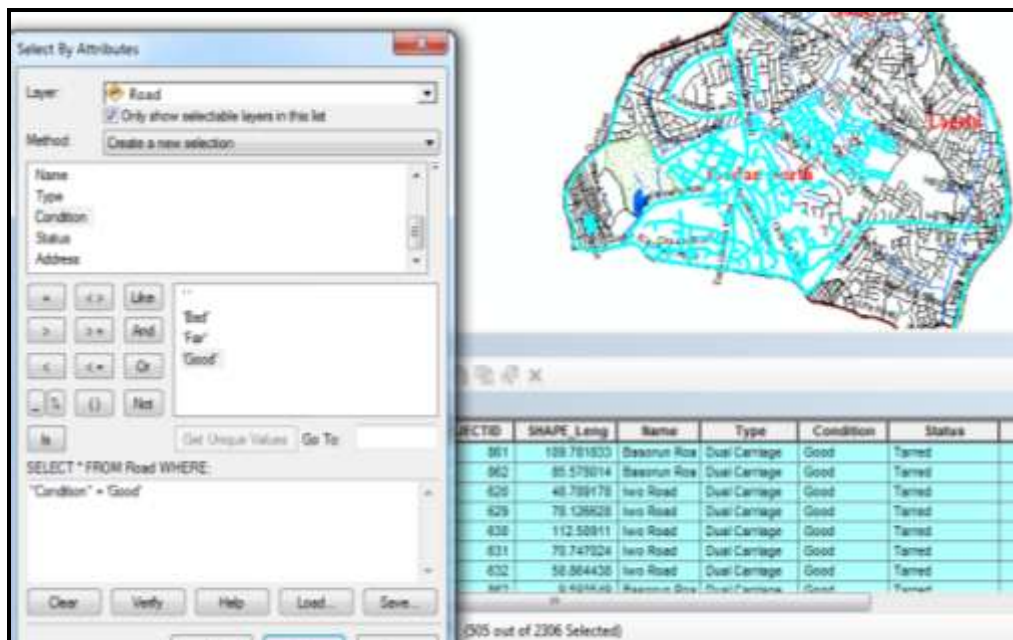

Figure 5. Result of query to show the Roads that are in good condition

Source: Field Study, 2019

3.1.1b Multiple Criteria Query

Multiple criteria queries use more than one field. The multiple criteria queries carried out were to extract from the database using more than one conditions. The conditions given under this query

are single lane roads that are also in good condition. The condition of the road is directly linked to the success of the DTS. This is shown in Figure 6.
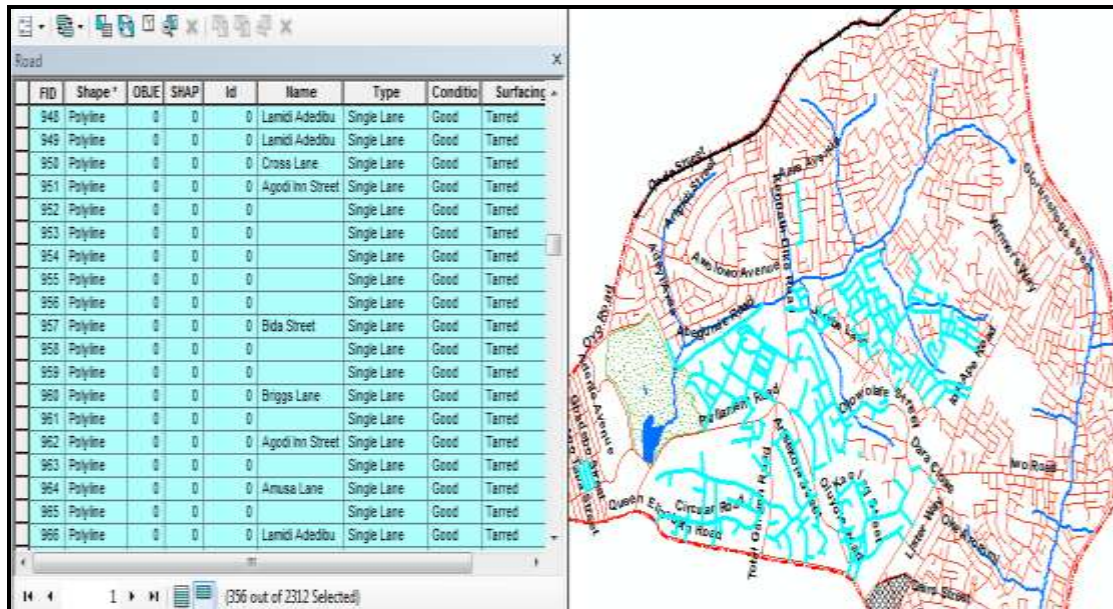
Figure 6. Result of query to show the Single Lane Roads in good condition

Source: Field Study, 2019

3.2   Routing within the Study area

3.2.1   Best Route

The best route can be defined as the route that has the lowest impedance, or least cost, where the impedance is chosen by the user (Environmental Systems Research Institute, 2019). The Security Agents and crime scene were located (Figure 7). The Security Agents' position is indicated by **1** at Housing Roundabout while the crime scene is indicated as **2** at Iwo Road Bus Stop (Figure 7). The system generated the best route from the Security Agents to the crime scene (Figure 8).
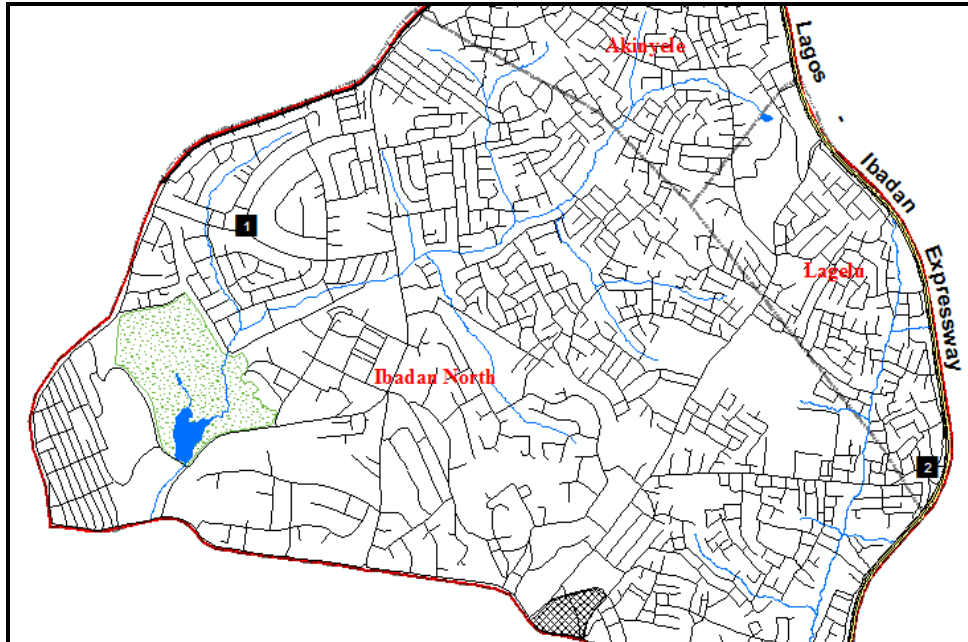
Figure 7. Defining the locations of the Security Agents (**1**) and the Crime scene (**2**)

Source: Field Study, 2019

The direction to be followed by the Security Agents to the crime scene is shown in Figure 8. The direction window of Best Route from the Security Agents to the crime scene is shown in Figure 9 with a travel distance of 5.84Km and the formatted map is shown in Figure 10.
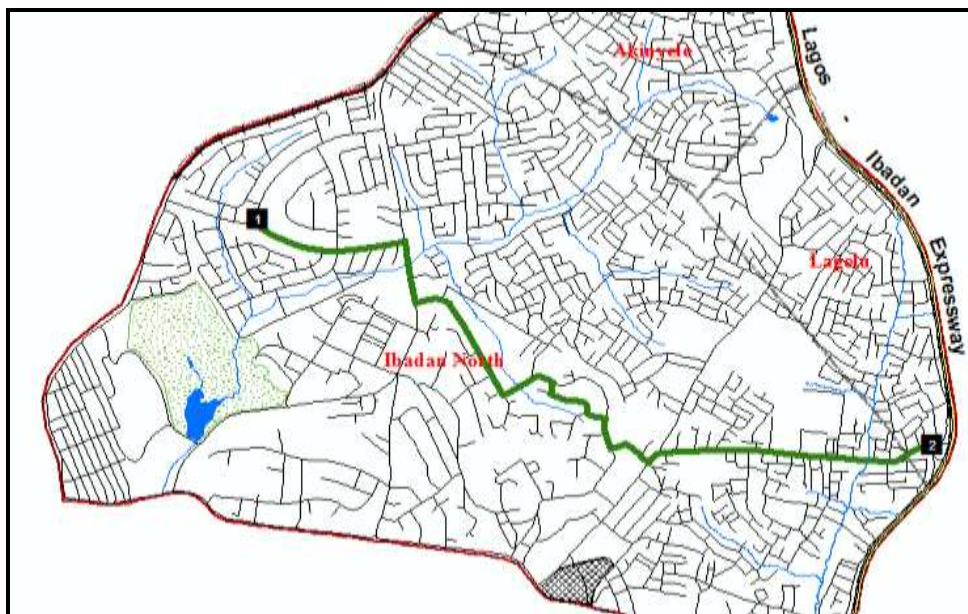
Figure 8. Best Route from the Security Agents to the Crime scene

Source: Field Study, 2019

Figure 9. Direction Window of Best Route from the Security Agents to the Crime scene

Source: Field Study, 2019

Figure 10. Map of Best Route from the Security Agents to the Crime scene

Source: Field Study

3.2.2   Alternative Route

The alternate route is necessary when there is a barrier on the best route. In other words, the system finds another route that can be followed in case of restriction or barrier on the best route. The barrier in the study area may be traffic hold up, terrible pothole on the roads, road blockage during celebrations of sorts especially during the weekends, trailer or tanker breakdown on these roads. In order to avoid all these, alternative routes are created to guide the security personnel to get to the crime scene on time to be able to save loss of life and properties.
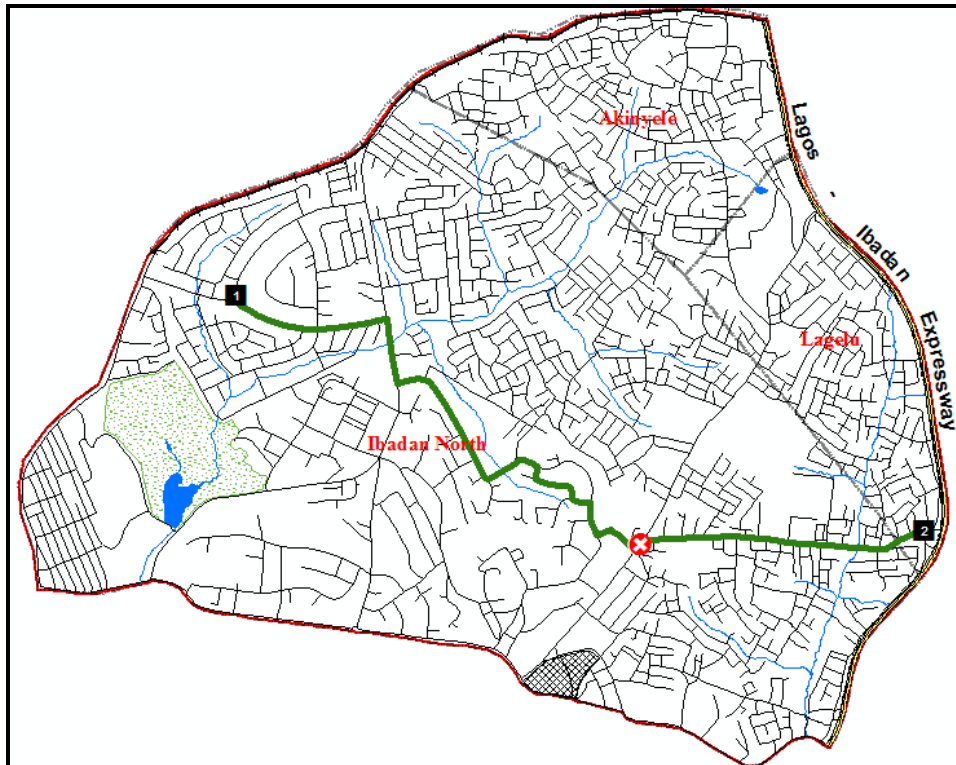
Figure 11. Locating the Security Agents, the Barrier and the Crime Scene

Source: Field Study, 2019

The barrier placed on the Best Route is at Idi Ape Bus Stop as shown in Figure 11. The point is always chocked up at the peak period. Travelling on the alternative route takes the security operatives longer time to get to the crime scene as indicated in Figure 12. It shows the alternative route generated when the barrier is at Idi Ape Bus Stop. The system was able to generate an alternative route to be followed.

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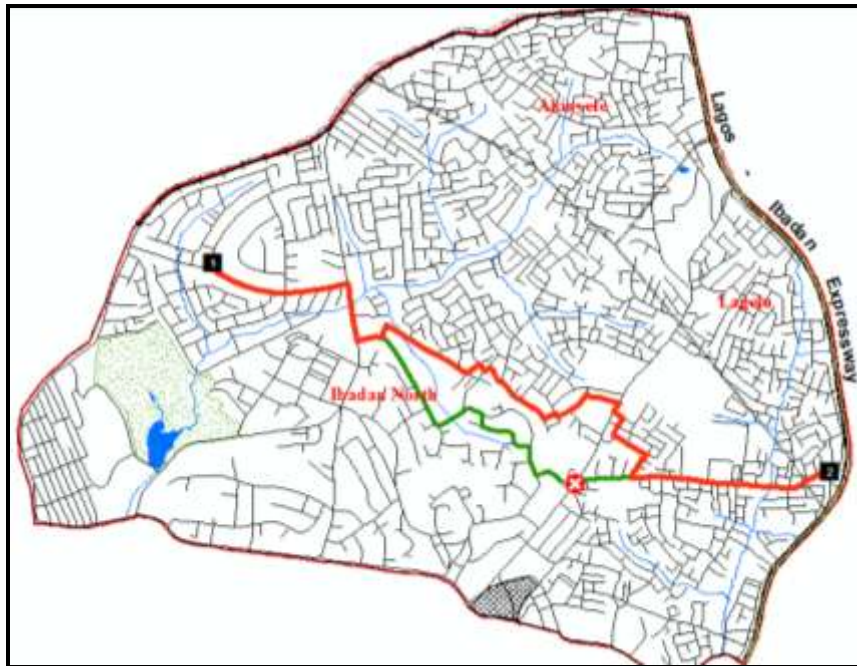
Figure 12. Alternative Route from the Security Agents to the Crime scene

Source: 2019

Figure 13. Direction Window of Alternative Route from the Security Agents to the Crime scene
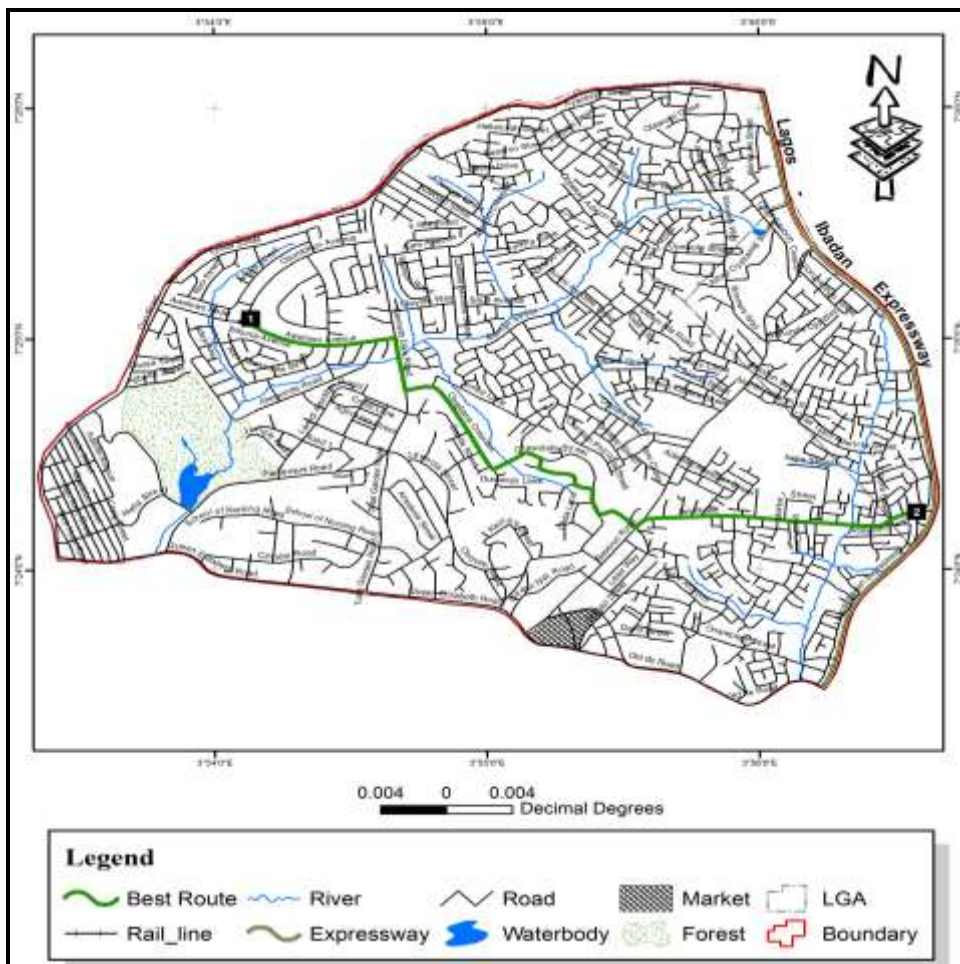
Source: Field Study, 2019

Figure 13 shows the direction window as indicated by the software with the total travel distance of 6.17Km. This is an indication that a passenger taking the alternative route between these two points will travel an additional distance and taking longer time than when travelling on the best route. Figure 14 is the formatted map of the Alternative route between the Security Agents to the Crime scene.
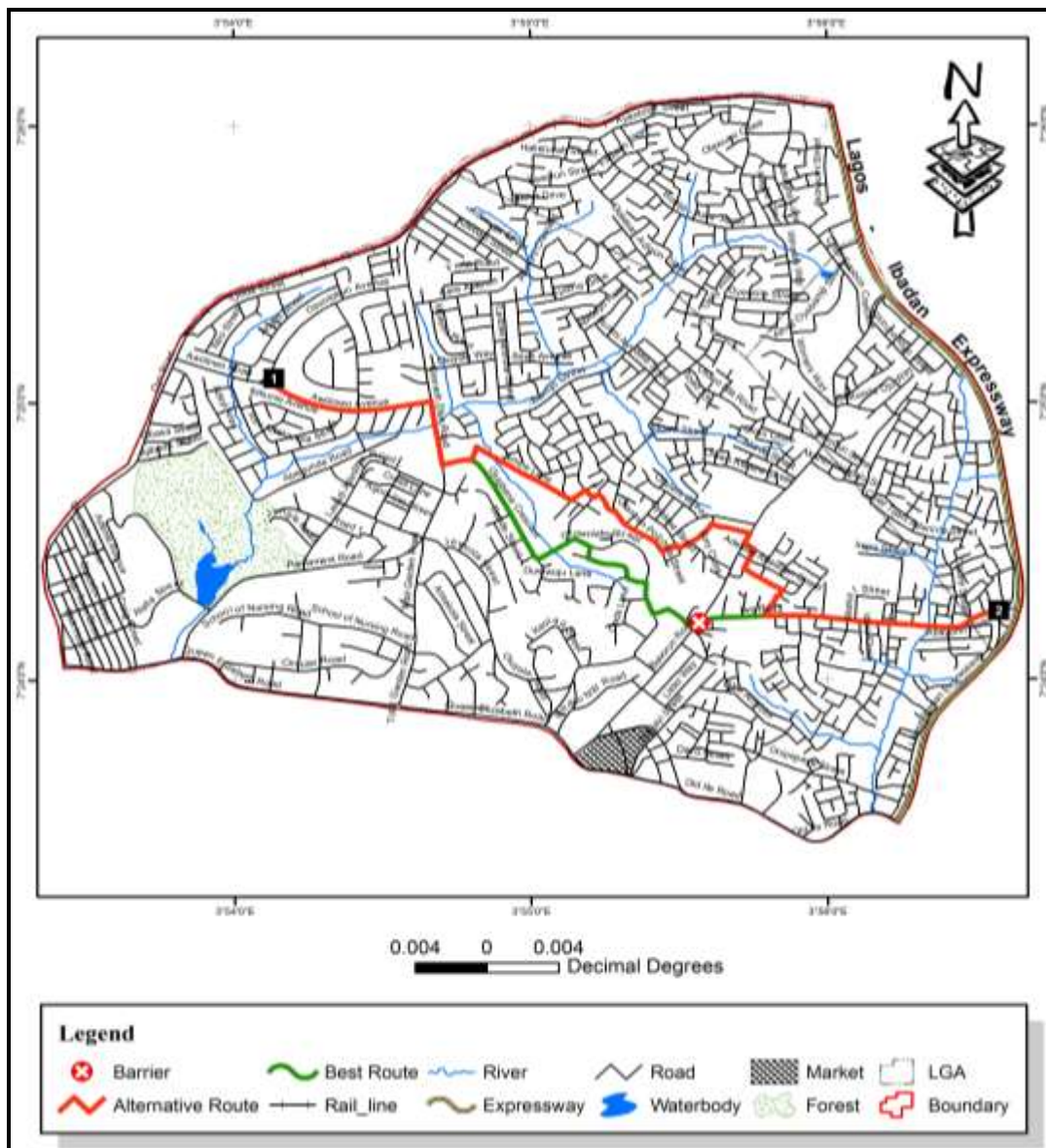
Figure 14. Map of Alternative Route from the Security Agents to the Crime scene
Source: Field Study, 2019

4.0   Discussion of results

A total of 505 road segments are in good condition representing 21.90% of the total road segments digitized in the study area. The application of this query is to know whether the roads are motorable or not so that if the roads are chosen as best route then the Patrol teams can know the condition before using the roads or alternatively, roads with better condition can be taken. The second query which is a multiple criteria query returned a total of 356 road segments that are single lane and are also in good condition. The number represents 15.4% of the total road segments in the study area. This is important to this study because while carrying out a security patrol, the patrol team is more cautious and able to take note of the driving speed limits on single lane roads in residential areas.

Travelling between Housing Roundabout and Iwo Road along the best route generated a distance of 5.84km. The alternative route taken when there is a barrier along the best route at Idi Ape Bus Stop during the peak period was gotten to be 6.17Km. This indicated an additional 330m will have to be covered to connect the two points; and consequently, the more the barriers on the best route, the longer the travel distance.

5.0   Conclusion and Recommendations

5.1   Conclusion

The design and creation of spatial database for development of a GIS-Based Demand-Responsive Transportation System in security operations in part of Ibadan is a challenge which consists of series of interrelated operations. The creation of digital database information system was successfully executed. The products generated from this study can help in dealing with crime issues within the study area. With the creation of the database, information can be retrieved at ease and used to solve crime cases as shown in the study. The database is capable of getting service area extents and also providing information on the navigation between the incident location (crime spots) and closest facility (security posts or check points).   After carrying out many of these analyses, it was concluded that the aim and objectives of this study were achieved.

5.2   Recommendations

The recommendations are put forward to every stakeholder in the security operations of the immediate environment and the country at large. They include but not limited to the following.

1.   It was noted that greater percentage of the roads in the study area are in a very bad shape indicating that even if the system selected the best route, it may end up not becoming the fastest route as expected. The roads in the study area should be paved with asphalt so that service delivery can be timely.

2.   The best route from every perspective is the shortest route. So, for a successful Demand-Responsive Transportation System in curbing crime, all roads on the best routes should be in good condition. Expansion of major roads like Bodija to Ashi, Iwo-Road to Gate, Idi Ape to Basorun is highly necessary to allow free flow of traffic along these routes. The Gate Market should be avoided during the peak periods when the traffic is heavy.

3.   The security personnel should also be trained from time to time on the need to move with the trends of events in the handling of Geospatial information and technologies. There should also be real time communication between the base stations and the officers on patrol for emergencies.

4.   Further studies involving Geocoding of addresses in any crime prevalence areas in the study area and in other parts of the country should be put in place. This allows converting the addresses into points that makes it possible for easy access online and subsequent deployment of security operatives to swing into action.

References

Akomolafe, D.T; Adekayode, F.O; Gbadeyan, J. A. & Ibiyemi, T. S. (2009). Enhancing road monitoring and safety through the use of geospatial technology. *International Journal of Physical Sciences. 4*(5), 343-348

Environmental Systems Research Institute (2019). ArcGIS 10.6 Instruction Manual.

Folger, P. (2009). Geospatial Information and Geographic Information Systems (GIS): Current Issues and Future Challenges. Congressional Research Service Report Prepared for Members and Committees of Congress on June 8, 2009. Retrieved from www.crs.gov on 19th February, 2016

Longley, P.A; Goodchild, M. F; Maguire, D. J. and D. W. Rhind (2005): *Geographical Information Systems and Science.* John Wiley & Sons Ltd; The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England.

Mageean, J; Nelson, J.D. & Wright, S. (2003). Demand Responsive Transport: Responding to the Urban Bus Challenge. *Association for European Transport.*

Ogunbodede E. F. (2008). Urban Road Transportation in Nigeria from 1960 to 2006: Problems, Prospects and Challenges. *Ethiopian Journal of Environmental Studies and Management. 1*(1), 1-25

www.ringalink.ie/demandresponsivetransport. Accessed on 08/07/2016

INSPECTION OF CAMPUS INFRASTRUCTURES USING UNMANNED AERIAL VEHICLES (UAVs): A CASE STUDY OF FEDERAL SCHOOL OF SURVEYING, OYO

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ABSTRACT

Over the past few years, the application of Unmanned Aerial Vehicles (UAVs) for visually monitoring construction and high-rise operational buildings (both old and new), bridges, and other types of civil infrastructure systems has exponentially grown. These platforms can frequently survey construction sites, monitor work-in-progress, create documents for safety, and inspect existing structures, particularly for hard-to-reach areas. The purpose of this paper is to focus on the concise review of the most recent methods that streamline data collection for roof inspections for large and complex structures or others utilities such as water tanks can sometimes be tough, expensive, and risky. Unlike the modern technology around us that had potential of quick inspection and documentation of in-depth information for basic and simple structures. These provide capability for geo-spatial analysis, visualization, and communication of the visual data captured from these platforms, with and without using Building Information Models (BIM) as apriori information. Specifically, it leads to civil infrastructure condition assessment and provide output information the decision makers to work on.

1. INTRODUCTION

The use of Unmanned Aerial Vehicles (UAVs) which are known as the Drone has exponentially increased over the years (ENR, 2015). Recently, there has been an increase in the use of drones for high risk jobs, high-raise buildings, search, rescue and among others. Drones have the capability of high-definition and high-resolution cameras that allow users on the ground to

achieve a real-time data for survey, video, or capturing image or phenomena. Traditionally, the aerial camera had been used to capture from a light aircraft or helicopter, and the fuel cost alone is a demerit that makes drones a much more viable and reliable alternative since the source of power for their flight can easily be recharged if exhausted of power (Lavars, 2015). Building inspection, geo-hazard investigations, solar power plant investigations, surveying, feature extraction and orthophoto mapping, analyzing the size and dimension of road surface distresses, road assessment, safety inspection, structural damage assessment, and surveillance are part of the major benefits of drone technology and perhaps, the most common application of drones in an organization with a huge facility such as a school campus.

With drones, land and building management becomes very easy. By using infrared cameras at low speeds, drones can take clear images of fire-prone areas and buildings where heat and air are escaping out of the envelopes, which were hitherto difficult with manned aircrafts because they are expensive and their velocity makes it almost impossible to get clear images of these areas (Anderson, 2015). Today, massive numbers of relevant service businesses such as Architecture, Engineering, Construction and Facility Management used these timely technologies to provide in-depth information for operational buildings, bridges, and other types of civil infrastructure systems. By capturing exceptionally expansive collections of pictures and recordings, alongside strategies that handle the visual information into 3D models, these stages regularly study the development locally, see the work that is in progress, make archives for security, and review existing structures, especially for hard-to-reach zones (Liu *et al*. 2014). A pilot project (Siemens Corporation in 2015) whereby data acquired by drones is combined using the image processing software to envision energy losses across the whole neighborhoods. The data acquired is then given as thermal maps making it possible to recognize the buildings that could be renovated or the one that needs to be made more energy efficient (Siemens, 2016).

Nowadays Conventional Roofs assessments are quite hazardous - from collapsing rooftops and creepy crawly nibbles to falling off stepping stools. Roofs are highly susceptible to solar radiation, thereby characterizing the amount of heat transfer into the building during high solar periods and increasing the energy usage in a building. Roofs account for a large amount of heat loss or gain, especially in buildings with large roof area, such as auditoriums, sports complexes, exhibition halls, etc. However, new technologies have a way of minimizing or completely

eliminating most of the risks such as the falls, collapsing roofs under the inspector's feet, and much more. In addition, sending a drone to perform inspections before climbing, also help to identify the defects immediately because there is no need to acquire and transport scaffolding, lifts, ladders and other climbing equipment and gears. From all the attention drones are getting right now, it is inevitable that people are finding new practical uses of drone interesting. One area where drones are rapidly gaining attraction is in building inspection and construction, it does not require many people, hence cutting down on the equipment and labour costs by reducing the time and labour.

OPERATIONAL PRINCIPLE, CLASSIFICATION AND REGULATIONS OF UAVS

The UAV is autonomous in nature and is controlled via a non-board autopilot using Global Navigation Satellite System (GNSS), principled to measure (x, y and z) positional data (Whitehead & Hugenholtz, 2014). The Inertial Measurement Unit (IMU) measures and collects the angular velocity and linear acceleration data which are quickly transferred to the main processor. It contains two separate sensors which include accelerometer and magnetometer. It is often used to maneuver the drone through the autopilot by making necessary adjustment on course either throttles or adjusting flaps. The positional camera on board possesses capability of turning through the vertical and horizontal sections. Over the past few decades, drones of various shapes, sizes, and capabilities have been developed with their potentials for civilian applications (Colomina & Molina, 2014).

There are several classes of drone in the professional literature. Watts et al., (2012) classified drones into seven categories as: Micro or Miniature (MAV) or Nano Air Vehicles (NAV), Vertical Take-Off & Landing (VTOL), Low Altitude Short Endurance (LASE), LASE Close, Low Altitude Long Endurance (LALE), Medium Altitude Long Endurance (MALE), and High Altitude Long Endurance (HALE). Besides, Anderson and Gaston (2013) classified drones into four size classes: large, medium, small and mini, and micro and nano. Again, Tang and Shao (2015) classified them based on drone takeoff and landing techniques which evolved the horizontal and vertical takeoff and landing. Fixed-wing drones adopt horizontal takeoff and landing and they cover a wider area due to the speed whereas rotary-wing drones perform vertical takeoff and landing and stable in acquiring high spatial resolution measurement but

cover little area (Tang & Shao 2015). In terms of the utility, drones were classified into five usage types: target and decoy, reconnaissance, combat, research and development, civil, commercial and many more.

The regulatory platform plays a crucial role in UAVs adoption. Currently, there seems to be little common ground on designing effective rules across borders, let alone continents. Regulations vary widely from country over the coming years, particularly in the USA. But regulators are constantly being criticized for moving too slowly on the matter. Mary Cummings in her Boston Globe article, urges politicians to act that congress needs to hold the FAA's feet to the fire before this technology takes flight and leaves the US commercial market behind. She cites estimations of a USD 10bn yearly loss for the US economy caused by overly strict regulations. But regulating bodies believe they have solid arguments for taking their time. Amazon's plans to use UAVs for deliveries have been grounded for the time being; with the FAA declaring that they will not allow UAVs to be used for delivering packages to people for a fee. She explained further by stating the three major reasons explain why UAV regulation is a delicate matter: Congested Airspace, Inherent Risks and Public Concern (DHL Trend Research, 2014). These regulations addressed the safety issues arising from civil uses of UAVs. However, Whitehead *et al.* (2013) revealed some of the regulations and tagged them as a stumbling blocks, limitations or restrictions on how UAVs should be operated.

As reported, some of these existing rules in countries like Canada, the United States and the United Kingdom adopted three criteria as follows: Limitation in flying altitude; flying within visual range and proximity to built-up areas or some of reserved areas such as army barrack, airport, and schools among others. In Canada and the United Kingdom, operators of miniaturized UAVs require to flying below 400 feet (122 m) above ground level unless otherwise specified. In the United States, similar restrictions are applicable, but permission is being sought to fly to 1000 feet (305m) altitude above ground level. In Nigeria, there is no restriction like that of Canada, US and UK but the Federal Airport Authority of Nigeria (FAAN) placed restrictions on certain reserved areas such as, Airports, Army barracks, Navy barracks, Police barracks, Air force barracks, Para-military stations and all government architecture securities barracks. Permission must be secured in all these areas before drones can be fled.

ACQUIRED INFORMATIVE VISUAL DATA

Providing detailed information on the state of construction or current civil infrastructure conditions requires UAVs to gather visual information in the form of photographs and from the most important locations and views on a phenomenon. Research on UAV-driven visual data collection must tackle the following challenges to streamline this process:

(1)   Autonomous or semiautonomous path planning, navigation, and take-off and landing procedures;

(2)   Characterization of the criteria necessary for data collection, including the configurations among the images to guarantee complete as-built and among others.

This sharp practice of UAVs still relies on over-experienced pilots navigating UAVs on and around features of interest, although recent efforts have been made by the research community on Simultaneous Localization and Mapping (SLAM) techniques. It has been shown in recent studies (Fernandez Galarreta *et al.* 2015; Kerle2999; Zollmann *et al.* 2014) and in commercial systems (DJI 2015) created autonomous navigation and data collection capabilities using GPS waypoints and predetermined flight path. These approaches are beneficial in land surveying or monitoring low-structures with large footprint. In any case, a GPS-driven flight arranging approach that builds on existing maps has the taking after downsides. It does not compensate for alterations on a development location and its impact on security (2) may be antagonistically influenced by GPS flag misfortune / obstructions or by shadowing impacts caused by adjacent buildings or other thickly populated structures.

LOCATION OF THE STUDY AREA

Federal School of Surveying (FSS), Oyo is geographically located in southwestern Nigeria. It lies between latitudes 7º50′22.997" N and 7º50′41.608" N of the Equator and longitudes 3º56′54.254" and 3º57′25.210" E of the Greenwich Meridian. It is found within Oyo East Local Government Area, Oyo State, Nigeria. It is located on about 34 hectares of land. The relief pattern is low lying; elevation ranges from 281m to 334 m above the mean sea level. The dry season lasts from November to March while the wet season commences from April and ends in October with the highest rainfall records between July and August (Ogunrayi *et al.,* 2016),

average daily temperature ranges between 21°C and 29°C almost throughout the year (Adejoba *et al.,* 2014).

The Survey School, Oyo was founded on 1ˢᵗ July, 1908 as a Government Departmental Training Institution attached to the Colonial Survey Department in Lagos for the education of Technical Assistants. It later moved from Lagos to Ibadan in 1926 and later to Oyo in 1934. Then the school only admitted the Technical Assistants that were recommended among the practicing Surveyors for the training and these made the school so unique among all schools. In 1990, the School was legally established under Decree 19 of 25ᵗʰ June, 1990 otherwise known as Federal School of Surveying Decree where students were admitted through Joint Admission Matriculation Board (JAMB). It had its own objectives as a Tertiary Institution set up particularly to produce Professionals, Technologists and Technicians in the discipline of Land Surveying and Geoinformatics, GIS, Photogrammetry and Cartography and other related programmes of the National Economy.
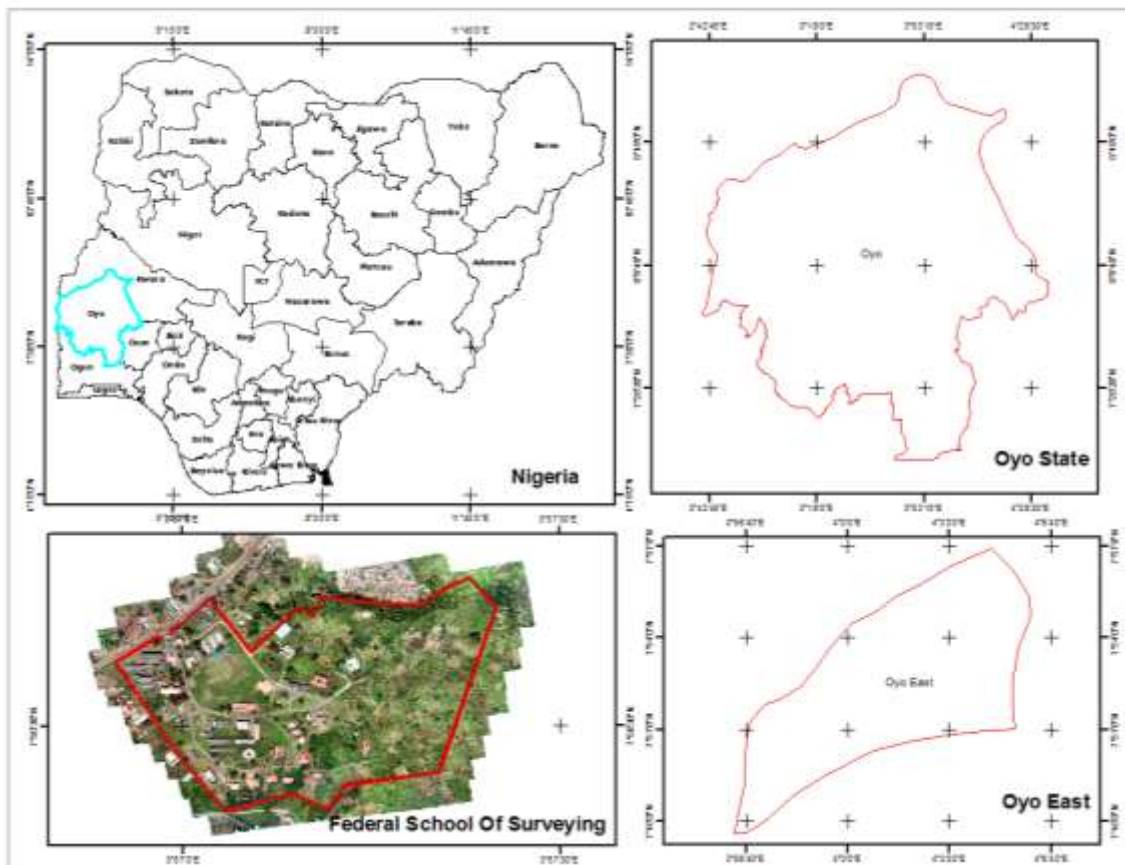
Figure 1. The study area

Source: Field Study, 2019

2. MATERIALS AND METHODS

The procedures adopted in the acquisition of the imageries, which include UAVs flight path planning, mapping of immediate surroundings, inspection and monitoring of buildings were described in this section. Besides, the techniques of data processing and the limitation of using UAVs in data gathering were also discussed. Database design portrays the representation of entities and their relationships. It enhances the organized integrated collection of non-relevant dataset stored to be used by relevant application at hand. Database design phase consists of three (3) stages; conceptual design, logical design and physical arrangement of database schemas and with forms translated to representative relational database schema.

2.1   Description of Quadra-copter used for the study

In this study, a Rotary-wing drone (Quadra-copter) was used to acquire imageries for the study (Plate 1). Rotary-wing drones (Quadra-copter) perform vertical takeoff and landing with ultra-high spatial resolution measurement due to stable technique of acquiring image but it usually covers small area (Tang & Shao, 2015). It has a payload capacity of around 1Kg, durability maximum of 45 minutes' flight and it is equipped with camera (Phantom vision fc200_5.0_ 4864 x 3648 (RGB) with Sensor dimensions of 2.61 x 2.61 μm on board that measured the roll and pitch of the airframe. It automatically maintains the level of flight, controls the altitude, log system data, and fly through a series of predefined waypoints and flight lines.

 Plate 1: Typical example of Rotary-wing drones

Source: Field Data Collection, 2019

2.2   Flight Path Planning and data acquisition techniques

Data acquisition from UAVs commenced with flight path planning. This involves the configuration of flight path planning software (drone deploy application software) in a smart cell phone using waypoints and base-map or Google image to make a clear distinction of the study area. As stated by Whitehead and Hugenholtz (2014), the desired altitude, the focal length and orientation or camera speed, the desired amount of overlap between images, and the desired flight direction as an additional parameter can be configured by the users. In this study, Google map of the study area was gridded to determine proper coordinates of the selected portion of the School. The coordinates were pre-loaded into Quadra-copter drone through the designed path that is, the traverse from the origin to destination.

It was flown at altitude of 103m above the ground level. The altitude was chosen to avoid tree canopy obstructions for the drone. The drone speed was set at 3m/s; 16.1 mega pixels integrated camera was onboard for the field of view (FOV) of 28.94 degrees look angles. Images were

captured in panchromatic mode of (RGB) with shutter capture speed at 1/1000s, which was more stable than the fixed wings drone. It is instructive to note that the images captured with fixed wings drone seems faster and can cover land mass than rotary drone. Only 216 UAVs images from 230 imageries were selected for the study. The imageries were generated by the camera with a band pass filter. The ortho-mosaic spatial resolution of 1 x GSD (2 cm/pixel) was achieved. The side and forward overlapping stereo imagery of 75% and 85% forward overlap, which covered about 34 hectares of the study area. It recorded orthomosaic size of 38,370 x 27,127, coordinate system in Minna Datum / UTM Zone 31N (EPSG:26331) and it has 3 bands, then Root Means Square (RMS) re-projection error centered at 0.131179 (0.997852 pix).

The flight plan generated was uploaded automatically into the UAVs autopilot and every detail allows autopilot to calculate the necessary waypoints and positional adjustments through the aid of Global Navigation Satellite System (GNSS) and Inertial Measurement Unit (IMU) stead on board. The GPS receiver and an IMU onboard navigates by defining set of waypoints being pre-programmed to form a set flight path and synchronizes at every point of time. The drone deploys (Flight planning software) in a smart cell phone calculated the spacing and layout of waypoints of the acquired images of the study area. The software provided room to eliminate imagery with excessive tilt, motion blur or bad exposure. On completion the flight, a log file contains imageries was downloaded from UAVs into computer. The Drone2map software was used to process the data and report was generated to give details of the image resolution, camera, georeferencing, image calibration, overlap, bundle block adjustment for projection, 2D matches, geolocational, point cloud densification and DSM, orthomosaic and index details.
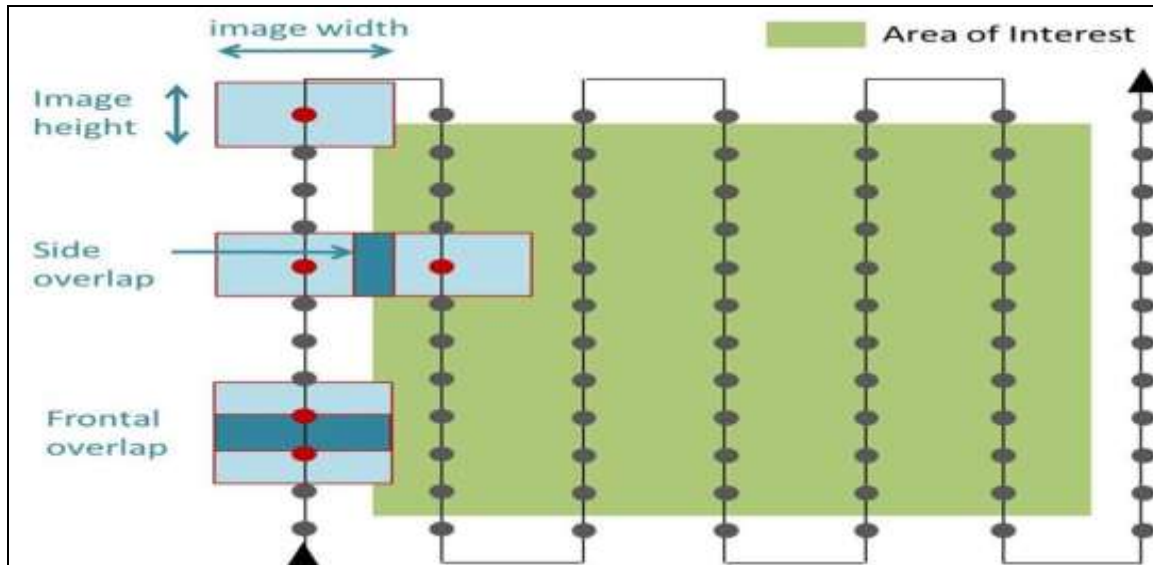
Plate 2. Image footprint with Side and forward overlap
Adapted from (https://support.pix4d.com/hc/en-us/articles/202557459)

2.3   TECHNIQUES OF UAVs DATA PROCESSING

The UAVs imageries are voluminous in nature. Two-hundred and thirty images captured were downloaded into computer through a card-reader from the drone but only 216 images were used for the study. Agisoft Meta shape professional was used to process the imageries and enabled detailed analysis in ArcGIS environment. It has the capability of eliminating errors such as, noise error induced by electrical interference introduced during manufacturing (Mansouri *et al.,* 2005), vignette error found on the edge of the image (Yu, 2004; Mansouri *et al.,* 2005), and lens distortion caused by misalignment between the lens and detector plane resulted to planar shift (Wang *et al.,* 2009). The software uses various algorithms, ranging from matching features across the images (Lowe, 2005).

The images were pre-loaded into Agisoft Meta shape professional interface through the add tool. Three methods were involved in UAVs data processing techniques as follows: The first technique was the initial process, which is termed as camera calibration image and exterior orientation. In this case, the digital photo camera was calibrated and images captured were orientated equally. The camera auto-calibration algorithm could capture details of each pixel by estimating the optimal camera and lens calibration for each flight which include self-calibration,

photo camera focal length calculation, principal point location and radial, tangential distortions. The second method is known as point cloud densification, which contains filtering and smoothing of point clouds. Noise filtering algorithms are used to correct noisy and erroneous points.

The third approach is Digital Surface Model (DSM), orthomosaic and index details, which served as end products. These commenced from the conversion of point cloud to generate DSM, orthomosaic and index details as follows: raster DSM, grid DSM, orthomosaic and triangle model. It usually follows the algorithm of image matching, bundle block adjustment and generation of point clouds, Digital Elevation Model (DEM), DSM, and orthomosaic. Generally, the workflow of Drone2map and Pix4D Mapper software is similar to that of Agisoft Photo Scan in some steps, which include image matching, generating a dense point cloud, mesh, and DSM and orthomosaic. The images captured in panchromatic (RGB) mode. Errors including surface irregularities and geometric errors were corrected automatically within the Agisoft Photo Scan and the processing reports were generated. The Camera locations and error estimates and image overlap were generated during the capturing of the orthomosaic as it was shown in figures 1 and 2 respectively.
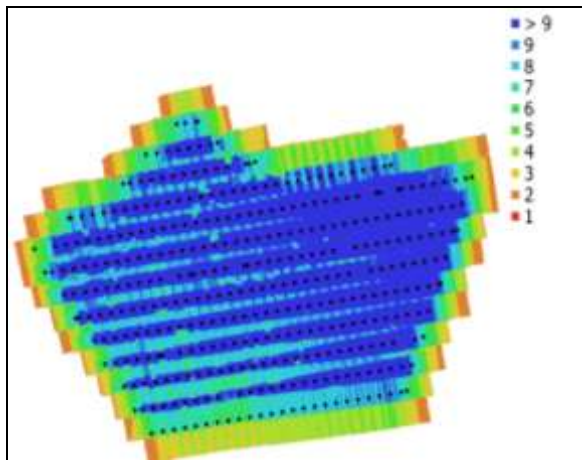

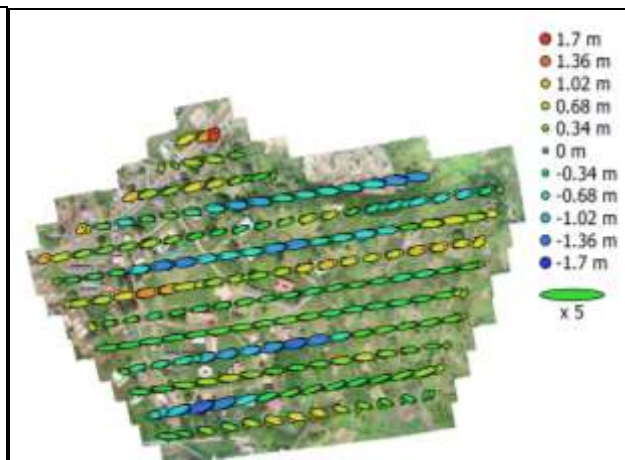Fig. 2. Camera locations and error estimates.   Fig. 3. Camera locations and image overlap.

Source: Field Study, 2019

2.4   LIMITATIONS OF DRONE DATA PROCESSING

There were some limitations encountered in the course of data processing in drone. One of them is the challenge of the duration of data processing. For instance, it took about 28 hours 39

minutes 41seconds to complete the process of images in the HP Laptop computer that was used. The computer system uses windows7 operating system, with Intel® core™. i5-3210CPU 2.50GHz processor, 4.00GB Memory (RAM) and OS: 64-bit. The data processing nearly took two days to complete the process. A high capacity computer or workstation is therefore recommended for quick data processing and delivery of imageries from drone. Another major challenge is the rechargeable battery of drone used. The battery only lasted for 35 minutes in a mission, which posed limitation to the area covered during study. Although the innovators are introducing new technology of incorporating full options of solar technology or gasoline to replace rechargeable battery, the drone used in the study was rechargeable battery. Other challenge faced in the study was the high exorbitant amount of software for data processing. The study, being self-sponsored, could not afford to purchase any of the software such as, drone2map, Agisoft Photo Scan, Drone deploy and Pix4D Mappers.

2.5 DATABASE DESIGN, CREATE AND IMPLEMENTATION

Database implementation is the next stage. This involves the creation of the database in the system via hardware and software selection based on the data storage requirement and format. Physical database creation input data into the database and graphic display of spatial data content of the database. This is where the attribute data is linked to the geographic data. Table 1 shows the attributes of Existing Buildings

Table 1. Attribute Table of Existing Building and their declaration

Building

FID	Shape *	Id	Building_Name	Building_area
0	Polygon	0	Security Post	46.862
1	Polygon	0	Security Post	37.226
2	Polygon	0	Generator House	14.71
3	Polygon	0	Administrative Block	148.056
4	Polygon	0	Generator House	65.792
5	Polygon	0	Generator House	64.061
6	Polygon	0	Generator House	4.069
7	Polygon	0	Generator House	46.827
8	Polygon	0	Administrative Block	1610.429
9	Polygon	0	Administrative Block	693.133
10	Polygon	0	Hostel	1543.841
11	Polygon	0	Hostel	159.53
12	Polygon	0	Business Centre	154.148
13	Polygon	0	Business Centre	22.502
14	Polygon	0	Business Centre	19.199

I◀ ◀ 1 ▶ ▶I | ▤ ▭ | (0 out of 87 Selected)

Building

RESULTS AND DISCUSSION

3.1   INFORMATION VISUALIZATION

In Achieving effective true loop of information both to and from on the roofs of operational building, quick inspection and actionable analytics for monitoring and condition assessment required at glance UAVs visual data. The features extraction contained eighty-seven buildings inclusive Lecture Rooms, Administrative Blocks, Library, Security post, Generator houses Business Center, Guest House, Staff Quarters, Health Centre, Hostel, Bursary Section, MTN Mask, Chapel, Mosque, Acquisition Centre, Car park, Works Section, Pavilion, Prayer-place, Sport house, Cooperative Building, Fuel Dump, sign post, SIWES Section, SUG Building, Re-creation Centre and Water Tank.

Water Tank, Building -Under construction, Hostels, Lecture Room were selected out of eighty-seven buildings created across the study area. The selected features are varying according to location, size, usage, and structure. Most of these buildings are old. In Figure 4 shows an adventure of open water tank which had been only source of water to all Quarters in Federal School of Surveying without being known to them that cover water tank had been blown off by the heavy- storm and on till recently that drone was deployed to inspecting the real situation and solution was profound by constructing another cover water tank after inspection was carried out.

In Figure 5 shows an adventure of open water tank which had been only source of water to all students who resided in Effiong Hostel without being known to them that cover water tank had been blown off by the heavy- storm also but just on recently when drone was deployed to inspecting and cover was provided by the Department of works and services of FSS.
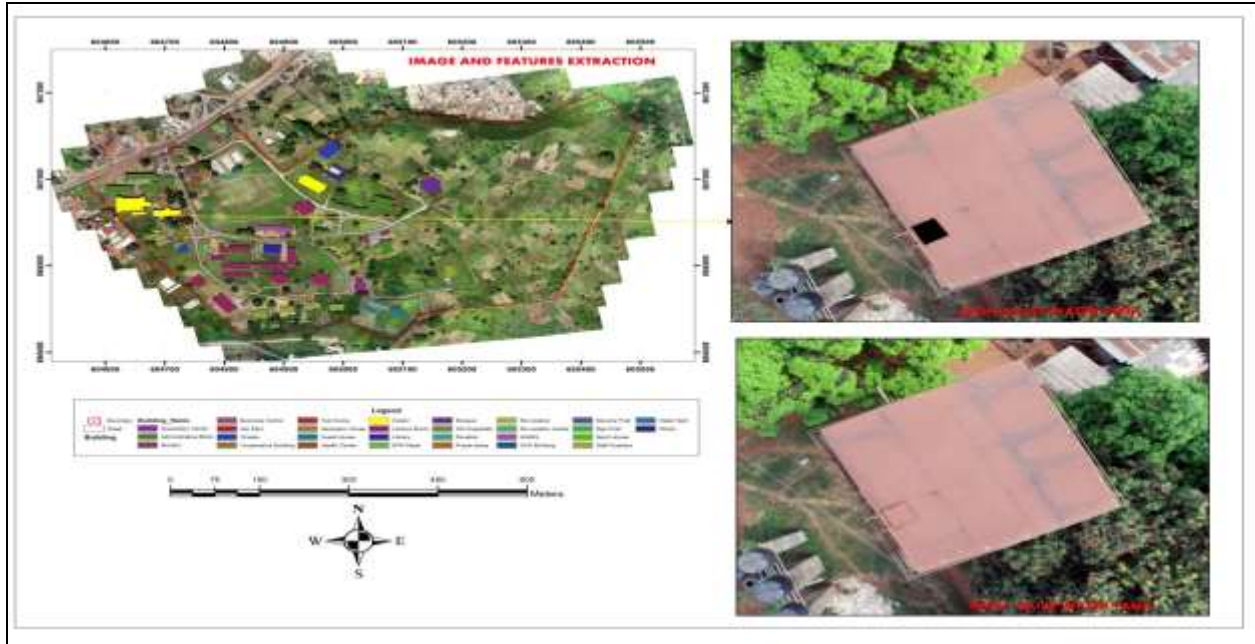
Figure 4. Open Water tank and closed water tank after inspection for Staff Quarters
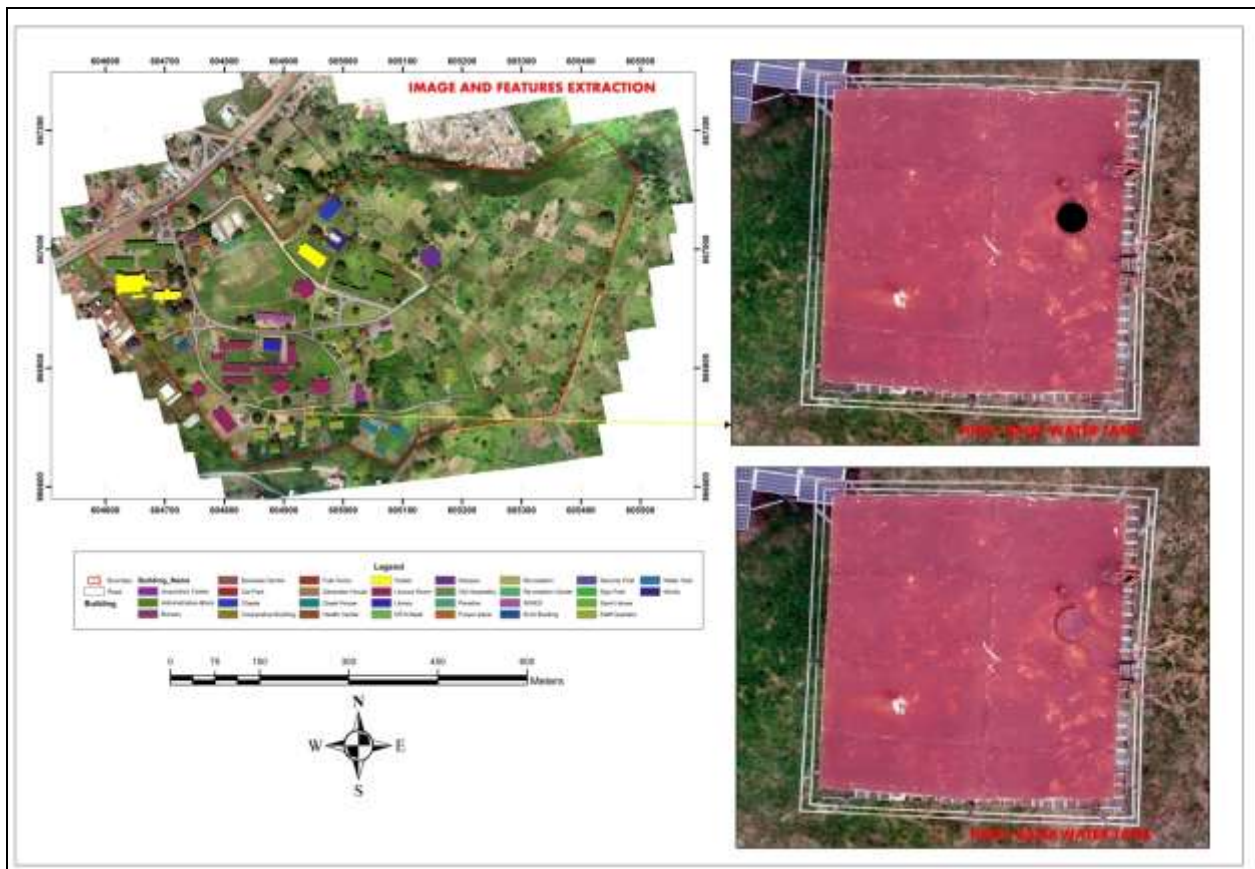
Figure 5. Open Water tank and closed water tank after inspection for students' hostels

Source: Field Study, 2019

3.2   INFORMATION ON THE LECTURE ROOM UNDER CONSTRUCTION

Building encompasses the walls, doors, windows, roofs, and skylights building through which heat energy transfers as the ambient temperature changes throughout the day. Even some of old buildings being seen that works and services section was newly constructed heavy solar panel on top some which had rightly become additional load onto them. Drone is very useful in various dimensions and it also provides a good qualitative and analytical understanding of the materials performance of major structures. It also identifies major deficiencies, and helps in describing the kind of material put on the use and that shows Figure 6 by demonstrating the levels of processing of modern lecture room is undergoing construction before and final completion and that also shows how important of inspection with drone data. In Figure 7 shows the solar powers on top of Library building, this enables deep information concerning the solar components. The bird nest was removed from the solar and also amount of dust spread over the solar which is indirectly affected the input energy generated.
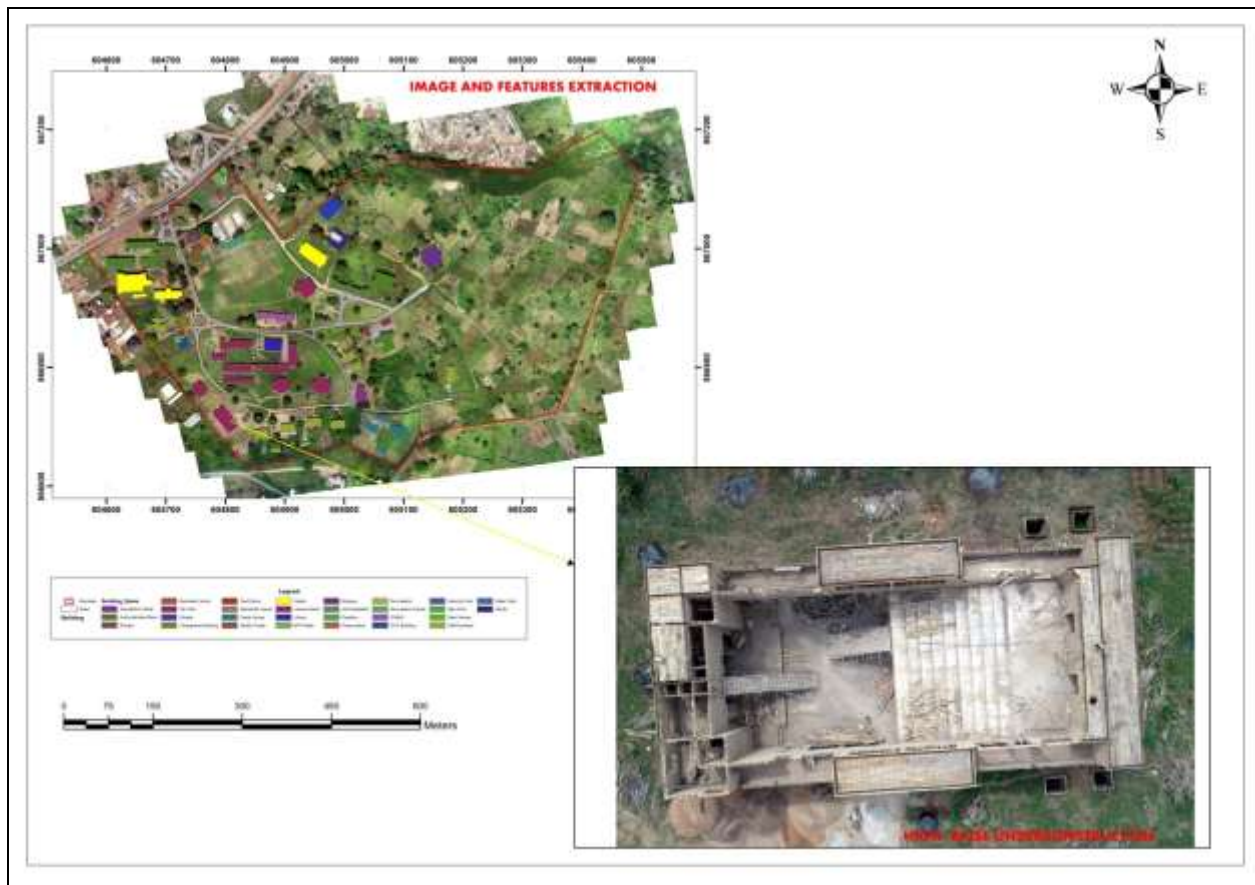
Figure 6. Modern Lecture room under construction for inspection
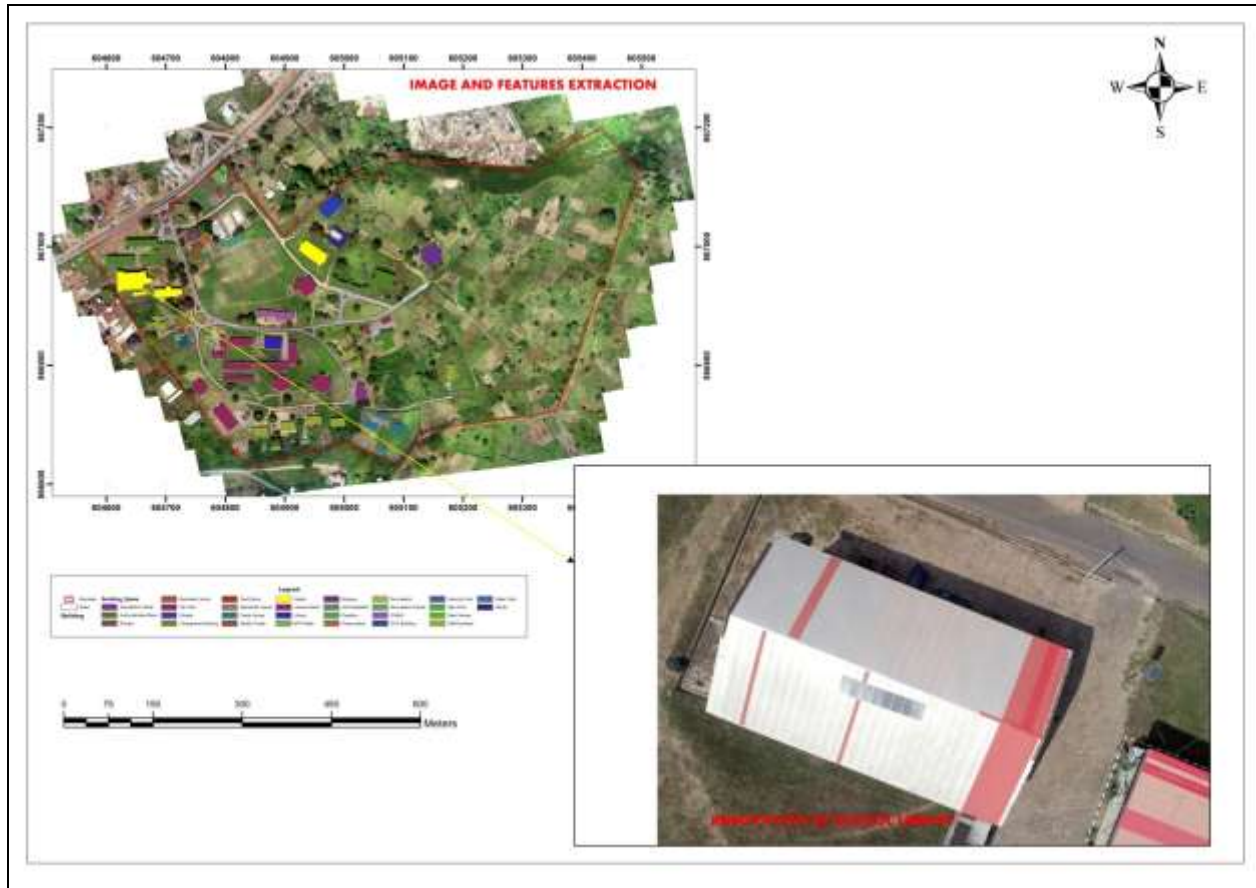
Figure 7. Solar power on top of Library building
Source: Field Study, 2019

3.3   BUILDINGS CLASSIFICATIONS AND MONITORING OF LEAKING ROOF

Physical database creation input data into the database and graphic display of spatial data content of the database had become necessary. This is where the attribute data is linked to the geographic data. Figure 8 shows the classes of existing buildings and others features also prominent to the study. This provides deep information at a glance by showing exactly the geographical location of each building, the extent of the land use and availability of land cover. A typical damage found on buildings' roofs that can be seen in Figure 9, the original photo has been processed with the edge detection method to enhance the leaking areas. This figure shows the effect of using variance in the Gaussian Blur at all level. To further analyze the leakages shown in Figure 9 as well in more details, the image has been re-inspected with the edge detection by Agis-soft (Figure 9). After the extraction, it shows clearly both small and long holes perforated surface.

However, it helps to detect clearly bigger damages, but especially for tiny surface openings, it can be seen that they are still not very visible to human eyes even if they have the opportunity of getting to the top of the roof.
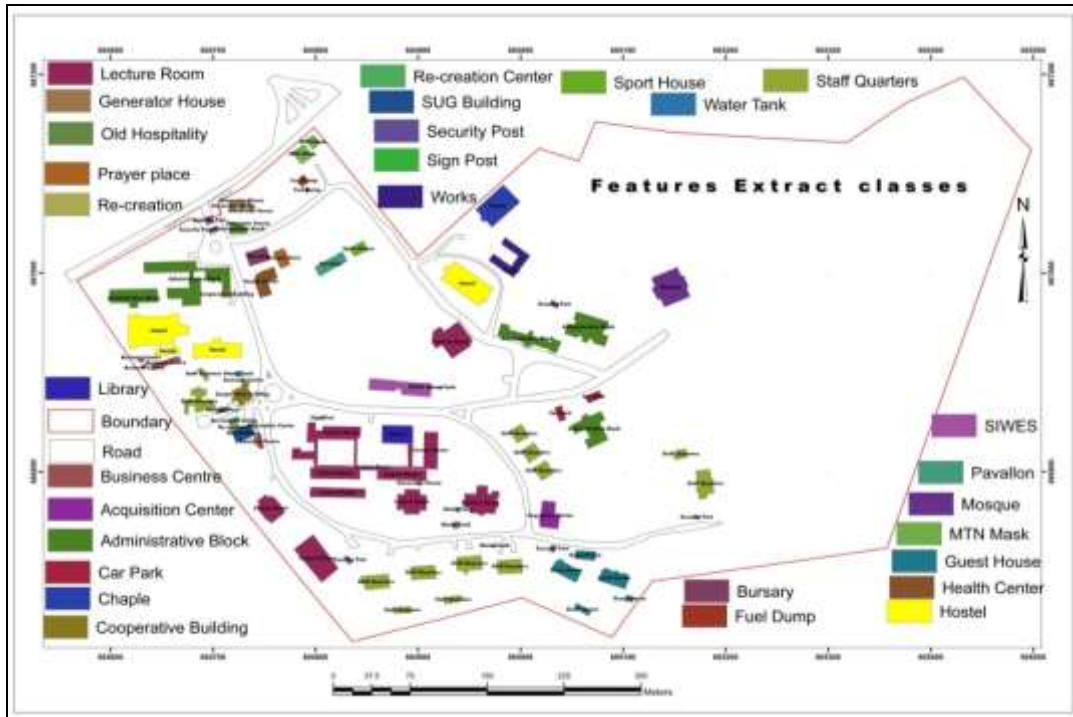
Figure 8. Feature extraction classes

Source: Field Study, 2019

Figure 9. Leaking roof detection
Source: Field Study, 2019

3.4   CONCLUSION

UAVs provide an unprecedented mechanism for inexpensive, easy and quick documentation of the as-built data; there are still numerous open problems for further research like renovation of roofs, stacking inspection, maintenance of solar panels and so on. Nevertheless, giving limitations on the scope, this paper only reviewed the most recent and relevant UAV-driven research on building inspection, construction monitoring and infrastructure condition assessment. It presents high level gaps-in-knowledge and opportunities for further research on data collection, analytics and visualization techniques. It is our hope that this manuscript can highlight some of the emerging opportunities for multi-disciplinary and interdisciplinary research on autonomous vision-based systems for construction performance monitoring and condition assessment purposes.

4.0 REFERENCES

Adejoba, O., Kleine M. and Taboada T. (2014). Reducing deforestation and forest degradation and enhancing environmental services from Forests (REDDES), with support from the *International Tropical Timber Organization* (ITTO), IUFRO-SPDC and FORNESSA, Akure, Ondo, Nigeria.

Anderson, B. (2015). *6 Ways You Could Use a Drone in Construction Projects*. Retrieved Dec., 2019, from http://www.dronethusiast.com/6-ways-you-could-use-a-drone-inconstruction-projects/

Anderson, K., & Gaston, K. J. (2013). Lightweight unmanned aerial vehicles will revolutionize spatial ecology. *Frontiers in Ecology and the Environment*, *11*(3), 138-146.

Colomina, I., & Molina, P. (2014). Unmanned aerial systems for photogrammetry and remote sensing: A review. *ISPRS Journal of Photogrammetry and Remote Sensing*, *92*, 79-97.

ENR (2015). "Drones: A Gateway Technology to Full Site Automation." Eschmann, C, Kuo, C-M, Kuo, C-H, and Boller, C. "Unmanned aircraft systems for remote building inspection and monitoring." Proc., 6th European workshop on structural health monitoring.

Lavars, N. (2015). How drones are poised to help build the cities of tomorrow. Retrieved January 08, 2019, from Gizmag: http://www.gizmag.com/drones-building-constructionindustry/ 36306/

Liu, P., Chen, A.Y., Huang, Y.N., Han, J.Y., Lai, J.S., & Kang, S.C. (2014). A Review of Rotorcraft Unmanned Aerial Vehicle (UAV) Developments and Applications in Civil Engineering, Smart Structures and Systems. Smart Structures and Systems, *13*(6), 1065–1094.

Lowe, D. (2005). SIFT Key Point Detector. Mikrokopter (2011) "Mikrokopter WIKI" http://www.mikrokopter.com.

Mansouri, A., Marzani, F. & Gouton, P., (2005). Development of a Protocol for CCD Calibration: Application to a Multispectral Imaging System. *International Journal of Robotics and Automation.*

NiMET (2016)**:** *Nigeria Climate Review Bulletin 2007*. Nigerian Meteorological Agency.NiMET-No. *013*.

Ogunrayi, O. A., Akinseye, F. M., Goldberg, V., & Bernhofer, C. (2016). Descriptive analysis of rainfall and temperature trends over Akure, Nigeria. *Journal of Geography and Regional Planning*, *9* (11), 195-202.

Siemens. (2016). *Need Construction Site Surveillance? Hire a Drone!* Retrieved July 18, 2015,from http://www.siemens.com/innovation/en/home/pictures-of-the-future/digitalizationand-software/digital-assistants-construction-site-surveillance.html

Tang, L., & Shao, G. (2015). Drone remote sensing for forestry research and practices. *Journal of Forestry Research*, *26* (4), 791-797.

Watts, A.C.; Ambrosia, V.G. & Hinkley, E.A. (2012). Unmanned Aircraft Systems in remote sensing and scientific research: Classification and considerations of use. *Remote Sens.*, *4*, 1671–1692.

Whitehead, K., Moorman, B.J., and Hugenholtz, C.H., (2013). Low-cost, on-demand aerial photogrammetry for glaciological measurement. *The Cryosphere*. *7*(6): 1879–1884. doi: 10.5194/tc-7-1879-2013.

Yu, W., (2004). Practical anti-vignetting methods for digital cameras. *IEEE Transactions on Consumer Electronics*. **50** (4), pp. 975–983.

COMPARATIVE ANALYSIS OF HOUSING AFFORDABILITY AND LIVEABILITY IN PUBLIC AND PRIVATE HOUSING ESTATES IN ILORIN NIGERIA

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Sub theme: Urban environment and cities as Ecosystem

Housing affordability and livability are identified as key tools to the wellbeing of the individuals in both public and private estates, both in developed and developing countries. This study examined housing affordability and livability in selected public and private housing estates in Ilorin, Kwara State. The data were obtained from houses within 4 different estates namely; Mandate Housing Estate (phase 1), Harmony Estate (phase III), Royal Valley Estate, Evergreen Housing Estate. The study adopted both descriptive and quantitative research approaches. A total of 400 households were sampled in the four housing estates. The findings show affordability was influenced by factors such as number of bedrooms and location of houses. The public estates, which were build and operated on partnership basis were more affordable than the privately owned estates. However, the private estates were more liveable than public estates in terms of social amenities and security. The study recommended supply of more houses for low income earners relative to demand. The government should undertake policy measures to make private estates more affordable and improve on the livability of public estates through the provision of social services and infrastructure.

INTRODUCTION

1.1   Background to the Study

Housing can be said to be more than a mare shelter as it is attached to so many issues, such as adequacy, liveability and affordability. Housing can be seen as a product and process (Jinadu 2007). As a process it is a way and means by which housing goods and services are produced through the interactive construction process of land acquisition, housing finance mobilization, materials assemblage and actual construction. Housing as a product represents a commodity traded in the housing market. It is a product of investment and a means of income generation (Jinadu 2007).

Housing plays an important role in countries' economies, and the housing sector represents a notable ratio in total economic activity of most countries (Sheibani and Havard, 2005). Housing

as man basic need cannot be overemphasized, and as such it represents one of the most basic needs of every individual, having a profound impact on health, welfare, social attitudes and economic productivity (Anofojieet *et al*, 2013). However, affordability and homeownership are important factors of urban liveability. (Elia et al 2017). Thus it can be said that the affordability and house ownership contributed to the neatness and living condition of any neighbourhood, as it plays a major factor that cannot be over looked.

One of the fundamental rights of an individual is the right to housing just like the right to life and right to freedom. When there is a deficiency in housing, it can impact negatively on the health, welfare and productivity of man. Housing is an indispensable necessity without which man's survival is impossible (Aderanmo and Ayobolu, 2010). In the world today, about 1.2 billion people live in substandard housing, while it is estimated that about 3 billion new houses will be required to cater for the population (World bank, 2016). The United Nations estimated that about 200 million people in the Sub-Saharan countries would live in a slum by 2020 (UN-Habitat, 2014). This has shown that the right to housing has eluded many people especially in the developing countries of the world and Nigeria is not an exception.

In Nigeria, 100,000 housing units are developed per year, as against an average of 1,000,000 units required per year to bridge the gap of 20, 000,000 million housing deficit by government target of 2033 (Centre for Affordable Housing Finance in Africa (CAFH), 2019). The problem of housing deficit in Nigeria is not peculiar to any zone or state, although the figures vary from state to state. Ilorin is one of the fastest growing state capital in the north central zone of Nigeria with the problem of housing deficit, a situation that is occasioned by the population growth and rural-urban migration (Bako et al., 2017). Bridging the gap of housing deficit in Ilorin has attracted investment from both the private and public housing developers; a situation that is evident from the number of housing estates developed by the private and public developers.

In a bid to provide affordable and livable housing for the people of Ilorin, efforts from both the public and private developers have led to the development of notable housing estate like the Golf estate, Harmony estate, Royale valley estate, among others. However, questions on the affordability and livability of the housing estates remain unanswered. The performance of both the public and private housing developers on the provision of affordable and livable houses in Ilorin remain a big question to be answered in the lights of all the housing units developed within

the last decade. Therefore, this study is an attempt to comparatively analyze the affordability and livability of houses developed by both the public and private housing estate developers in Ilorin.

1.2   Statement of research problem

As a result of the high demand for housing which is occasioned by rapid population growth and rural urban migration, there is a high proliferation of housing development by both the public and private housing developers across the country as a response to housing demand. In an attempt to reduce the housing deficit through the development of houses through different schemes and programmes, the houses developed are not only quantitatively inadequate but also qualitatively defective (Abdulaqadir *et al* 2017). Similarly, in an attempt to make housing affordable for the low income earners, most developers forego the provision of basic services such as water, waste management, road, among others, which are essential ingredient of a liveable environment.

Ilorin, Nigeria is one of the fast growing towns, and according to NPC (2006), it is the 6th most populated town in Nigeria. The rapid population growth in Ilorin has been attributed to its designation as a state capital and its proximity to Lagos, the commercial city and Ibadan, the ancient city. The demand for housing in Ilorin is generating attention from both the public and private housing developers. However, this development is either not affordable for the target population (low income earners) or they lack the basic ingredient of a liveable environment. Hence, the numerous scholarly articles that has been published on the subject matter (Bako *et al.,* 2017; Suhaida *et al* 2011 Copenhagen Business School, 2013).

Monthly rent or mortgage payments constitute the single biggest expenditure in most family budgets, and many low-income families have difficulty finding housing they can reasonably afford (Turner, 2008). In Ilorin town, it was noted that there is about 600% increment in the rental value of 2bedroom apartment between 2003 – 2012, the trend is also noticeable in the price of other residential properties like 3bedroom and 4bedroom apartment (Ibrahim *et al.,* 2014). This is an indication of the constant increase in rent and property value in the face of a nearly static minimum wage within the same period. Furthermore, going by the 4-6 million average value of a 2bedroom apartment as presented by Propertypro (2019), it implies that a

family living on a national minimum wage of 18000 may have to save for about 62-92 years before they can be able to afford a house.

1.3 Aim

The aim of this study is to examine the affordability and liveability of public and private housing estates in Ilorin Kwara State with a view to provide a recommendation for housing policy makers.

1.4 Objectives

The aim of the study will be achieved through the following objectives.

1. Examine the housing types and conditions within the estates
2. Determine the affordability of the houses within the estates.
3. Examine the liveability of the houses within the estates using level of infrastructure provision as indices.
4. Determine the variation in housing affordability and livability among the housing estates.

1.5 Research Questions

1. What is the housing condition of the housing units of these selected housing estates?

2. How affordable are these houses within the selected housing estates?

3. Are the houses liveable within the estates?

4. What is the variation between the public and private estates?

1.7 Scope of the work

The study will be restricted to the geographical boundary of Ilorin town; that is, only housing estates within Ilorin town will be considered for this study. However due to time constraint, only four housing estates will be selected for sampling for this study, two each from public and private estates identified. The selection of the housing estate will be based on the year of construction of the estate, this implies that the first two most recent housing estate developed by the public and private developers will be considered in other to allow for effective comparative analysis. Therefore, the housing estate selected for the study are Mandate Estate I and II of

Olorunsogo Area, and Harmony Estate phase III of Akerebiata Area along sobi Road are both public estates while Royal Valley Along Kunlende Area in Ilorin Kwara State and Evergreen Estates situated in the new GRA, along pipeline road of Tanke, Ilorin, Kwara State are both Private Estates. The names of the existing housing estates and date of construction is presented in Table 1.1.

The study will analyze the pattern of housing development in the estate with focus on the type, Design, and Condition of the housing units. The study will also determine the affordability of the housing units developed using house price to income / earning ration, housing expenditure to income ration, residual income left for housing and method of housing finance as an indicators of housing affordability. The livability of the housing will be determined using seven indicators which are housing accessibility, health, neighborhood quality, energy efficiency, economic/ educational opportunity, Transport cost/road network, and equal right.

Finally, the performance of the public and private developers will be determined on the affordability and livability.

Table 1.1: Public and Private Housing Estate in Ilorin Town, Nigeria

Names of housing estates	Developed by	Year of Construction
Kulende Estate	Public	2000
Irewolede Estate	Public	2004
Harmony phase I Estate	Public	2000
Harmony phase II Estate	Public	2005
Harmony phase III Estate	Public	2010
Mandate Estate I and II	Public	2006
Olarewaju Estate	Private	1999
Royal Valley	Private	2016
Golf Estate	Private	2010
Evergreen Estate	Private	2015

Source: Authors Compilation

1.7 Justification of Study

The issue of building sustainable cities and communities have been on the fore burner of many academic and policy debate in recent time. Hence it can be said that affordable and livable environment has a great impact on the wellbeing of people living in the neighborhood. Due to the importance attached to the development of affordable and livable housing, many scholars have directed their researches towards the direction of housing affordability and livability.

Abimaje et al (2014) conducted a study on housing affordability in Idah, Nigeria. The study measured housing affordability of household using income as the indicator for assessment. The study did not consider expenses on basic services such as water and waste management. Housing is not just having a roof over one's head; it is the totality of the structure and other services that makes the houses livable including water, energy, security and other component of the immediate environment. Therefore, extra expenses incurred by households on basic services such as water may increase the cost of housing and hence affect the affordability of the household.

For a standard livability studies to be carried out, Home environment which includes waste disposal management among others, neighborhood amenities, economic vitality, social environment and civic protection needs to be examined (Ahmed, 2000).

Rama et al (2013) carried out a study in India where the they saw livability as the living condition of a place and reflects people's perception of the place to be fit for living or not, it can be said that their study was not based on housing estates which is the major concern of this study.

This work will be of benefits to the people of Ilorin in such a way that it will serve as an instrument for formulating policies. The formulated policies will aid the provision of houses for all levels of income earners in Ilorin. It is expected that it will also guide the developers of housing estates, both the public and the private developers in the aspects of provision of affordable housing and a livable environment. In addition to this, the study will improve the livable housing pre-condition for the people of Ilorin in other to achieve a healthy living. It will also estimate the social cost and also save investment of home ownership in housing delivery within Ilorin. It is expected that this study will provide relevant information on the affordability and livability level of various housing estate. The performance of both the private and public

housing developers in the provision of affordable and livable housing estate will also be documented. This study is also expected to provide requisite information on the drivers of housing affordability and livability in the private and public housing estate.

LITERATURE REVIEW

2.1 The concept and Importance of Housing

The housing concept has seen much development over the last two decades, which has passed through various phases (Durah, 1988). According to (Sheibani and Havard 2005), It has changed from being a fairly simple concept to one that is more complex, moving initially from the need to the development of housing. In brief, the development appears as follows: A) The Narrow Concept: this refers to the dwelling where people live, or the materialistic building established from the walls and roof. B) The Broad Concept: this incorporates the narrow concept but also includes assistance services, which motivate people to live in the house with stability. This study has concentrated on three different trends used to consider the concept of housing, these being: The Marxist trend, the liberal trend, and the temperate trend (Soliman, 1996):

Marxist trends

Marxist trends can be seen in three different ways:

House as essential commodity: the house has been regarded as including essential commodities, necessary to industrial and economic development for different community classes, because there is no labor force creation to realize development without housing. Also, housing correlates with various industries, and consequently houses become one of effective factors which affect the growth and boom of functioning capital in developmental industrial processes.

House as fixed commodity: this means it is impossible to change or remove it through the time, because it must be built on a fixed location, so it is impossible to change location, since land dedicated for housing is not allowed for real estate speculation in most socialist countries, and the land price is controlled by government because the government is the rightful owner of all the land in the region.

Capitalist countries regard housing not only as commodity that has value but also one that has exchange investment value in the housing market. It may be regarded as a fixed commodity when residents build the dwelling, and they are unable to pay the costs.

It may be noticed that this approach produces public housing policies that match the trends, and that governments play a greater role in building housing units.

Liberal trends

It is confirmed in the studies analyze by (Soliman, 1996) that four principal approaches in his analysis of the liberal trend are as follows:

According to this approach, the differentiation between housing as a noun, and as a verb, is considered. If we use the first definition it will lead to a static condition, because it does not imply any increase and it will not affect the housing market, but defining housing from the point of view of a verb will introduce a dynamic situation, that will encourage development to extend to the residents' needs, and consequently this approach becomes very effective in the housing market.

It is impossible to segregate housing from the other social and economic variables which also change as time passes. In addition, it can be considered that houses are fundamental developments, comprised of elements, materials and services connected with various activities - industrial, service or productive - where capital is invested, and thus they represent progress in economic developmental in society.

The analysis of housing unites through its forming or finishing. The suitable measurement of house is not necessary to create appropriate environment for inhabitants, where the basic target in housing market mechanism is development of invested capital to gain potential great profit.

Independent housing forming: every family is different from others, due to the fact that the family has own organization and the type of housing chosen results from several factors such as family income, educational level and the area where they wish to live. Consequently, families are free to create their own appropriate housing.

It can be noticed that this trend adopts a housing policy that depends upon the private sector and personal building

Temperate trend

This trend views the family's economic situation as the main pivot for expenditure.

Betterment or development of the housing unit is connected strongly with the economic position of the family, which plays a great role in the housing market mechanism for variant social classes.

Housing must be suitable for residence, and demonstrate a sanitary and environmental situation, which is appropriate not only for the family but also for society in general, and proper facilities such as water, sewage treatment, power, etc., must be provided.

Housing is a consumption commodity for all classes in the society, and political systems must provide it to people as a part of its functions to realize the equal distribution of justice.

Each trend adopts particular policies to achieve its objectives, and countries may select

one or more policy to enable them to reach their planned housing targets.

From the trends identified, housing can be defined as "the final outcome from variant capitals entering in the housing market mechanism, by construction, distribution, or managing the market".

2.2.1 Concept of housing affordability

The idea of affordable housing recognizes the needs of households whose incomes are not sufficient to allow them to access appropriate housing in the market without assistance (Milligan et al 2004). Thus, the term 'affordable housing' describes housing that assists lower income households in obtaining and paying for appropriate housing without experiencing undue financial hardship (Milligan et al 2004). A range of publicly or privately initiated forms of housing may meet this specification (Milligan et al 2007: 27). In fact, in recent years, the term 'affordable housing' has been used as an alternative to terms such as 'public', 'social' or 'low cost' housing (Gabriel et al 2005). Affordable housing is housing that is appropriate for the needs of a range of low to moderate income households and priced so that low and moderate incomes are able to meet their other essential basic living costs (Milligan et al 2007).

Affordable housing has become a serious and considerable challenge especially for low incomes households which resulted from continue growth and expansion of the urban centre. The determinants of housing affordability include household income and house price (Olatubara, 2007). Housing affordability is the capacity of household or individual to meet housing costs

while maintaining the ability to meet other basic costs of living without any problem. This explains the extent to which the household or individuals are able to pay for housing. CIH (1992) as quoted in Onu and Onu (2012) identifies variables which determine whether accommodation is affordable or not. These variables include rent levels, household income and eligibility of households for housing benefits where practiced. House rent represents the level of payment that is required to secure housing unit (Bramley, 2011). The housing industry is composed of competitive firms. The industry's aggregate supply depends on its output price and the real price of housing structure. Limits to supply of any factor of construction and increases in demand for construction will boost the equilibrium price of houses (Lee et al 2005). This is supported by Meen (2002) who asserted that positive demand in housing leads to a temporary increase in house rents on the short-run. When this study adopts the housing and liveability framework developed by Jana *et* al 2018 as shown in figure 2.1, the framework was developed in the research report of The Liveability Index 2018, Transforming Communities for All Ages by AARP Public Policy Institute of Washington DC which has several indicators.

The Liveability indicators spread across seven categories of liveability: Housing, Neighbourhood, Transportation, Environment, Health, Engagement, and Opportunity (See figure 2.1). This is because communities across the country are enacting policies across all categories of liveability (Housing, Neighbourhood, Transportation, Environment, Health, Engagement, and Opportunity). These actions lay the groundwork to make places more liveable for people of all ages Jana *et* al 2018. It should be observed that Liveability encompasses broad human needs ranging from food and basic security to beauty, cultural expression, and a sense of belonging to a community or a place and there, the liveability indicators are the main functional key of every liveable community, which are the major driving force of every neighbourhood.

Community liveability is important, this is because it will promote, enhance an equitable and affordable housing, this will help to expand the location and efficient housing choices for people of all ages, income races, and ethnicities to lower the combined cost of housing and thereby increasing the affordability, location and diversity of housing types within a neighbourhood which can be attributed to the quality of a good environment as it is one of the indicators of a housing liveability.

RESEARCH METHODOLOGY

3.1   Research Design

This study will adopt the descriptive research design. The descriptive research design will involve survey and will rely on quantitative data to provide answers to the research questions. The study will be quantitative and cross sectional survey will be adopted.

This research design provokes the question of why, how and what on the subject matter. The research design will also help in gathering information concerning the present situation of housing affordability and liveability in Ilorin with respect to public and private estates. The data required for this study will be gathered concurrently from primary and secondary data sources. While the data collected from both the primary and secondary sources will be analysed and integrated to provide answers to the research question. The research will be deductive and interpretive than inductive.

3.2   Types and Source of Data

The data required for the study are both primary (unprocessed data) and secondary (processed data). The primary data will be gathered through the use of questionnaires and observation, while secondary data will be sourced from internet sources, ministries, department, and agencies relevant to the study. The primary and secondary data required for the study is presented in the section below.

3.2.1 Primary Data

The primary data required for this study includes the reconnaissance survey in which the photographs of the major landmarks will be taken in the study area. The questionnaire will also be administered to the residents of the selected estates by considering the type of housing, number of rooms, condition of wall, condition of floor, condition of roof, condition of door, the study will also look at the following indicators of housing affordability such as House price to income/earnings ratio, Housing expenditure to income ratio, residual income left for housing and method of housing finance , The study will require data on the following indicators of liveability: Security and safety, recreational facility, access to water, accessibility, access to clean energy, waste management, drainage facility, and educational facility.

Secondary Data

The secondary data required for the study include:

The names of registered housing estate in Ilorin which are gotten from the housing cooperation Ilorin as well as the number of units completed and the year of completion, except for the private estates, that were gotten from Ministry of Lands and town planning development authority. The geographical locations of the housing estate were also picked through the use of geographical position system. Other relevant information on the subject matter will also be gathered through published document.

3.3   Study Population

The sample frame for the study is the total population of the four selected housing estate. Table 3.1 shows the number of housing unit in the public and private housing estates selected. The Table shows that the total number of housing units in the estates is 1254. Therefore, since the study is household base, the sample frame for the study is 1254 households. Harmony estate phase III has a total of 260 housing units, while mandate I and II estate has a total of 500 housing units, making a total of 760 housing units for the public housing estate. However, the total number of housing unit in the private housing estate is 494, where royal valley has a total of 244 housing units and evergreen estate has a total of 250 housing units.

Table 3.1: Sample Frame

S/No	Name of Estates	Number of Housing Unit
	Public Housing Estate	
1	Harmony	260
2	Mandate I and II	500
	Total	**760**
	Private Housing Estate	
3	Royal Valley	244
4	Evergreen housing	250
	Total	**494**

Grand Total	**1254**	

Source: Author (2019)

3.4 Sample Size

To arrive at a sample size that will serve as a good representative for the study population, the Taro Yammane sample size formula will be adopted. The mathematical expression of the formula is presented in equation 3.1.

$$SS = \frac{N}{(1+N\,e^2)} \qquad (3.1)$$

Where, N =Sample frame, e = degree of freedom (0.05), SS= sample size. Therefore,

$$SS = \frac{1254}{(1+1254\,(0.05)^2)} = 400 \qquad (3.2)$$

Having substituted in the variables for the formula as presented in equation 2, the study arrived at a sample size of 400. Therefore, a total of 400 households will be sampled in the four housing estates. The distribution of the sample size is presented in Table 3.2. The sample size was distributed across the four selected housing estate base on the proportion of the housing unit in each estate to the total number of housing unit in all the estates. Table 3.2 shows that a total of 242 questionnaires will be administered in the public estates; 83 in Harmony estate and 159 in Mandate I & II housing estate. While in the private housing estates, a total of 158 questionnaires will be administered to the resident; 78 in royal estate and 80 in evergreen housing estate.

Table 3.2: Sample Frame

S/No	Name of Estates	Number of Housing Unit	Sample Size
	Public Housing Estate		
1	Harmony	260	83

2	Mandate I and II	500	159
	Total	**760**	**242**
Private Housing Estate			
3	Royal Valley	244	78
4	Evergreen housing	250	80
	Total	**494**	**158**
	Grand Total	**1254**	**400**

Source: Author (2019)

3.4   **Sampling Technique**

The study adopts the multistage sampling technique. First the housing estates identified in Ilorin were divided into two clusters based on the developer; that is either developed by the private or the public developer. Consequently, two housing estate was selected from each of the clusters based on the date of completion. The two most recent housing estate in each clustered were then selected for sampling. Secondly, to identify household to be selected for sampling in each of the housing estates, the systematic random sampling technique will be adopted. The samples were selected at an interval of every 3rd houses in the housing estates. The sample interval was derived by dividing the number of housing unit in the estate by the sample size of the housing estate.

$$= \frac{No\ of\ Housing}{Sample\ Size}$$

$$= \frac{260}{83} = 3 \text{ which is the sample interval}$$

The data for this study will be collected in weighted form using Likert scale. Hence, descriptive statistics will be employed as analytical tool. The description of the liveability indicators will be analysed using frequencies and percentage.

Research Findings and Discussion

4.1   Socio-Economic Characteristics of the Residents

The summary of research findings on the socio-economic characteristics of the residents is presented in Table1.   Findings on occupational status reveals that majority (37.25%) of the

respondents were civil servant, 34.25% were self-employed, 17% were artisans, Business / Trading is 7.25 % while 4.25% were farmers. This implies that majority of the respondents were civil servants and self-employed while a few were artisans and farmers.

The study reveals that almost half (69.75%) of the respondents Tertiary Education certificate, while 26.5% had secondary education. while 3.75% of them had Primary/Below education. This implies that majority of the respondents in the study area had formal education.

Table 1: Socio-Economic Characteristics of Respondents

Variables	Frequency	Percentage
Occupation		
Civil servant	149	37.25
Self-employed	137	34.25
Artisans	68	17
Farming	17	4.25
Business/ Trading	29	7.25
Total	400	100
Education level		
Tertiary	279	69.75
Secondary	106	26.5
Primary	15	3.75
No formal education/ Qur'anic	0	0
Total	400	100

Table 2: Housing affordability index

Monthly Income		
Less than N30,000	0	0
N30,001-N50,000	106	26.5
N50,001-70,000	150	37.5
N70,001- N90,000	101	25.25
Above N90,000	43	10.75

Total	400	100

House Ownership Status		
Tenant	7	1.75
Landlord	393	98.25
Squatting	0	0
Total	400	100

Source: Field Survey, 2019

Housing Finance Method		
Through Mortgage	167	41.75
Loans from banks	138	34.5
Savings	82	20.5
Loans from friends	13	3.25
Total	400	100

Source: Field survey 2019

Problems encounter during the mortgage		
Delay in access	182	45.5
Inadequacy of loans	122	30.5
Difficulty in loan repayment	81	20.25
Delay in getting the house/land documents	15	3.75
Total	400	100

Source: Field survey, 2019

Number of rooms		
Two	97	24.25
Three	206	51.5
Four	71	17.75
Five	26	6.5
other	400	100
Total		

Source: Field survey, 2019

The findings reveal that 26.5% earned between N30,001-N50,000 in a month, 37.5% of respondents earned between N50,001-70,000, 25.25% earned between N70,001- N90,000 10,.75% earned Above N90,000 in a month. The results show that majority of the residents were middle income earners.

Further analysis of the house ownership (Table 1) reveals that 98.25% owns their houses while a significant proportion (1.75) are tenants within the various estates. The findings indicated an element that housing estates has been sold out to various occupants which could lead to high rate of affordability because of the interest rate either from government or from private developers. From this table, it can be said that mortgage banks finance most of the houses in within these estates which has 41.75% while Loans from banks has the second largest percent which is 34.5%, Savings and Loans from friends has the list percentage which is 20.5% and 3.25% respectively.

Delay in accessing loan from commercial banks or mortgage banks contribute to the major problem of housing affordability which has 45.5%, inadequacy of loans is also a problem which is 30.5%, difficulty in loan repayment has 20.25% while delay in getting the house /land documents is just 3.75%.

It can be said that the majority of the houses within the estates are 3-bedroom bungalow which has 51.5% and which makes the price of most of the houses to be at the higher side for a common man t afford, two bedroom has 24.25%, fur bedroom has 17.75% while five bedroom has 6.5% which is the list in the estates.

Indices for Housing affordability for public and private estates in Ilorin

From literature, several parameters have been found to influence housing affordability in an environment which are the number of rooms, the number of toilets, the waste disposal system, the kitchen etc. which are used for this research. The building components comprises 6 variables includes; No of rooms, Toilets, Waste Disposal, Kitchen, General Housing space, Recreational facility. The rate of these housing components variables were analysed in 5-likert scale as indicated in Table 3 and Table 4.

As indicated in Table 3, it was established that Toilets ranked 5.25 (highly adequate), number of rooms ranked 4.72 (adequate), waste disposal 2.53 (inadequate) while kitchen ranked 2.68 (inadequate). Also, General housing space ranked 2.59, and Recreational facility 2.53. this implies that in public housing the housing components that is most adequate for them is toilets followed by the number of the rooms, and this are some of the indices f housing liveability.

Table 3: Respondents rating of adequacy of the following building components for public estates

| S/N | Building Components | Rating and weighted value | | | | | |
		2 ID	3 FA	4 AD	5 HA	SWV	MWV
1	No of rooms	11	6	23	202	1142	4.72
2	Toilets	113	12	17	100	830	5.25
3	Waste disposal	121	113	8	0	613	2.53
4	Kitchen	107	105	30	0	649	2.68
5	General Housing space	115	109	18	0	629	2.59
6	Recreational facilities	133	89	20	0	613	2.53
	Total					**20.3**	
	Mean of ΣMWV= 3.38						

Source: Field survey, 2019

Notes on Likert Scale rankings: Inadequate = 2, fairly adequate = 3, Adequate = 4, and highly adequate = 5

As indicated in Table 4, it was established that kitchen ranked 4.92 (highly adequate), number of rooms ranked 4.73 (adequate), waste disposal 4.91 (adequate) while Toilets ranked 4.73 (adequate). Also, General housing space ranked 4.87, and Recreational facility 4.89. this implies

that in private housing, the housing components that is most adequate for them is kitchen followed by the waste disposal, and this are some of the indices f housing liveability

Table 4: Respondents rating of adequacy of the following building components for private estates

S/N	Building Components	Rating and weighted value				SWV	MWV
		2 ID	3 FA	4 AD	5 HA		
1	No of rooms	0	0	42	116	748	4.73
2	Toilets	0	1	23	134	765	4.84
3	Waste disposal	0	1	13	144	775	4.91
4	Kitchen	0	1	11	146	777	4.92
5	General Housing space	0	0	21	137	769	4.87
6	Recreational facilities	0	0	16	142	774	4.89
	Total					**29.16**	
	Mean of ΣMWV= 4.86						

Source: Field survey, 2019

Notes on Likert Scale rankings: Inadequate = 2, fairly adequate = 3, Adequate = 4, and highly adequate = 5

Relationship among Housing affordability, Income and expenses

Status of Residents

The findings on housing affordability index provide the basis for further analysis for test on relationship between housing affordability and income; relationship between housing and affordability and income of the respondents in the study area. Analysis of correlation between each component Mean Weighted Value of housing components provided an evidence of a strong and significant relationship as established in table 3 and 4. The coefficient of determination observed was 3.8 for public housing estate and 4.86 for private housing estates. In addition, the result of Pearson Product Moment Correlation value was positive for education and negative for income as indicated in table 5 and 6.

Table 5: Result of correlation among housing affordability and income and expenditure n services

Variables	Pearson Correlation; P-value	Inference
housing/environmental quality	0.602	There is no significant relationship among the two variables.
Income	-.396	There is a significant negative relationship among the two variables

Table 6: Result of correlation among housing affordability and income and expenditure n services

Variables	Pearson Correlation; P-value	Inference
housing/environmental quality	0.602	There is no significant relationship among the two variables
Education	273	There is a significant positive relationship among the two variables.

The test of correlation between housing affordability, income and expenditure (see Table 5 and 6) shows that income is the only attribute that have significant negative relationship among the two different estates in Ilorin (-.396). The implication of this is that the less the income, the less the people will not be able to afford a house and standard of housing quality that can be assessed. Therefore, housing affordability and neighborhood livability is influenced by respondents' socio-economic attributes in the study area

Plate 1: Dilapidated septic tank

Source: Field survey, 2019

Plate 2: Blocked drainage in public housing

 Source: Field survey, 2019

Plate 3: Good road in public housing

Source: Field survey, 2019

Plate 4: Good road in public housing

 Source: Field survey, 2019

5.0 Conclusion

This research has assessed examine the affordability and livability of public and private housing estates. The study adopted both descriptive and quantitative research approaches. A total of 400

households were sampled in the four housing estates. The findings show affordability was influenced by factors such as number of bedrooms and location of houses. The public estates, which were build and operated on partnership basis were more affordable than the privately owned estates. However, the private estates were more livable than public estates in terms of social amenities and security.

6.0 Recommendations

The results of this study call for improvement in housing affordability and livability of public and private housing estates. The government and private sector should enforce the minimum standard regulation in the provision of houses for all levels of income earners

- Supply of more houses for low income earners relative to demand.

- The study further suggests for government to undertake policy measures to make private estates more affordable and improve on the livability of public estates through the provision of social services and infrastructure

REFERENCE

Abdulqadir B, István E. (2017): Housing conditions in Kano, Nigeria: a qualitative assessment of adequacy: ISSN 11222211--11227733, E-ISSN. Article nom 227722110055—774488.

Abimaje J, Akingbohungbe D.O, Baba A. N (2014): *Housing affordability in Nigeria towns, a case of Idah Nigeria.* Published by European center for research training and development. UK international journal of civil engineering and Estate Management...

Aderamo & Ayobolu (2010); Spatial structure of housing quality in Ilorin, Nigeria. Research journal of social sciences, 1 (5), 12-21

Ahmed M. Soliman, (1996), housing and sustainable development in developing countries, Dar-arrateb aljameiaih, Beirut.

Ahmed, Y.A (2000). Waste Generation and Management: A Contemporary Environmental Issue. In Jimoh, H.I. and Fabiyi, I.P (ed.) *Contemporary Issues in Environmental Studies.* Haytee Press, Ilorin.

Anofojie, A. E., Adeleye O. A., Kadiri, M. A. (2013): Housing Quality Assessment in Selected Public Residential Estates in Amuwo-Odofin L.G.A, Lagos, Nigeria:

Bako A.I, Aduloju O. T, Abubakar-Kamar A. T (2017): Livability and wellness of residence of Oloje community in Ilorin west local Government Area, Ilorin Nigeria

Bramley, G. (2011): Affordability, poverty and housing need: triangulating measures and standards. *Journal of Housing and the Built Environment,* 27(2): 133- 151. doi:10.1007/s10901-011-9255-4

CAFH (2019); Housing Finance in Nigeria, retrieved from htt//www.housing finance Africa .org/finance/Nigeria.

Copenhagen business school (2013): Housing Affordability Leverage and Risk: Master Thesis Cand.merc. Applied Economics and Finance Department of Economics

Elia S, A S, Ahmad F, M & Abdul S, A, H, (2017)**:** Housing Affordability Factors for Urban Livability: A Preliminary Study: *International Journal of Property Science Vol 7: Institute Environmental and Development (LESTARI)* Universiti Kebangsaan Malaysia (UKM)

Gabriel M, Jacobs K, Arthurson K, Burke T and Yates J (2005) *Conceptualising and measuring the housing affordability problem*, National Research Venture 3: Housing affordability for lower income Australians Research Paper No. 1, Australian Housing and Urban Research Institute.

Ibrahim R. B, Bako A. I, Raheem W. M and Abdulyekeen A. O, (2014): Journal of Sustainable Development in Africa (volume 16, No. 8

Jana L, Rodney H, Shannon G, & Brad G (2018): The livability Index 2018: Transforming communities for all ages: AARP public policy Institute.

Jinadu A.M (2007): Understanding the basics of housing: published in Nigeria by Jos University Press Ltd.

Lee, N.J., Ong, S.E. (2005): Upward mobility, house price volatility, and housing equity. *Journal of Housing Economics,* 14(2): 127-146. doi: 10.1016/j.jhe.2005.06.004

Meen, G. (2002). The Time-Series Behavior of House Prices: A Transatlantic Divide? *Journal of Housing Economics,* 11(1): 1-23. doi:10.1006/jhec.2001.0307

Milligan V, Phibbs P, Fagan K and Gurran N (2004) *A Practical Framework for Expanding Affordable Housing Services in Australia: Learning from Experience*, Final Report No. 65, Australian Housing and Urban Research Institute.

National Population Census (NPC) of 2006: National Population Commission.

Olatubara, C.O. (2007): Fundamentals of housing. (eds.), In T. Agbola, L. Egunjobi, and C.O. Olatubara (Eds.), *Housing Development and Management: A Book of Readings* (pp. 70-106). Nigeria.: Department of Urban and Regional Planning, Faculty of Social Science, University of Ibadan.

Onu, V. and Onu, A.J.C. (2012): Urban Residential Housing and Low-Income. Enugu Publishing Press.

Rama U.P, Yogesh K. G, Alka B. (2013): Understanding qualitative conceptions of livability: An Indian perspective: *International Journal of Research in Engineering and Technology*

Sheibani G, and Havard T. (2005): Housing concept, problem, and policies: *Research Institute for Building and Human Environment, University of Salford, Salford M7 1NU*

UN Habitat (2014). A new strategy of sustainable neighborhood planning. Five Principles, Nairobi, Kenya United Nations Human Settlement programmes (2014).

World bank group (2016); Housing at the centre of the substandard development agenda

SMALL SCALE BUSINESS: A PANACEA TO URBAN POVERTY AND SUSTAINABLE DEVELOPMENT IN SOKOTO METROPOLIS

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DECEMBER, 2019

ABSTRACT

Poverty is one of the most serious manifestations of human deprivation and is inextricably linked to human capital development which is an issue of global concern. Urban poverty has been a low priority area of research and development agenda of Nigerian government. Rural poverty alleviation programme dominated the urban poverty alleviation. Presently Nigeria is experiencing a serious and alarming rise in the levels of urban poverty. Most government and business circles have come to recognize the importance of small and medium scale enterprises (SMEs) and have consequently agreed that their growth constitutes one of the corner stones of economic development. This review paper was carried out in Sokoto metropolis in order to determine the role of small scale enterprises in minimizing the high rate of poverty in the city. It reviewed approaches to urban poverty alleviation due to its multidimensional nature. SDG Goal 1 and 11. will serve as the framework for this research paper.

Keywords: Small Scale Business, Urban Poverty Reduction, Sustainable Development Goals

INTRODUCTION

With a population of 203 million, Nigeria is recognised as the most populous country in Africa, accounting for 47% of West Africa's population and 2.61 of the world total population (World meter 2019; World Bank 2007). Although an oil-rich country, a significant population of Nigeria lives in poverty. Handley, Higgins and Bhavna (2009) noted that approximately 70 million people in the country, live on less than US$1/day [World Bank and Department for International Development (DFID), 2005], 54% of Nigerians live below the poverty line United Nations Development Programme (UNDP 2006) and over one-third live in extreme poverty (i.e. those who cannot afford 2900 of food calories per day) (UNDP, 2006). The country's poverty situation has grown worse. According to National Bureau of Statistics (NBS 2012) by 2010 the number of people in poverty moved to 112.5 million. With this, 69% of the population lived below the poverty line. However, the United Nations sustainable development goal (SDG) to end extreme poverty by 2030 is unlikely to be met in Nigeria. A new report by the world poverty clock shows Nigeria has overtaken India as the country with the most extreme poor people in the world. India has a population seven (7) times larger than Nigerians.

The struggle to lift more citizens out of extremer poverty is an indictment on successive Nigerian government which have mismanaged the country's vast oil riches through incompetence and corruptions. The 86.9 million Nigerians now living in extreme poverty represents nearly 50% of its estimated 180 million populations (Kazeem, 2018). As Nigeria faces a major population boom, it will become the world's third largest country by 2050. This problem is likely to be worse. But having large swathes of people still living in extreme poverty particularly in Urban setting of African countries is a very serious challenge. Similarly, Sokoto state has been rated frequently as the top poorest state in Nigeria by the national bureau of statistics of Nigeria (NBS), and most of this times are the period of MDGs exercise (Punch, 2017). According to Daniel (2019), The NBS 2019 ranking indicated Sokoto as the poorest state in Nigeria again, with 81.2% on poverty level. Its harsh climatic conditions, bad governance and insecurity has made it a 'no go' area and has prevented foreigners and foreign investors from coming for investment in the area (Ikenwa, 2019). This makes it necessity for the reliance on local small scale business as a way of providing more job opportunities in curbing/minimizing poverty in the state.

In Nigeria the Small and Medium Scale Enterprises (SMEs) have been neglected for so long with the brunt of past policy bias in favour of their large scale industries counterparts. The government consciousness needs to be jolted to the reality before us giving the pivotal role of the subsector, which can make an economy gain the required versatility and resilience, particularly in view of the abject poverty that has characterized the land (Rasak, 2015)

The task of reducing poverty in Nigeria has been herculean making the country to oscillate among several programmes. In the pre-Structural Adjustment Programme era, the country experimented with not less than 18 poverty reduction programmes. Ogwumike (2002), citing Central Bank of Nigeria (CBN, 1998) observed that these programmes could not be sustained "due to lack of political will and commitment, policy instability and insufficient involvement of the beneficiaries of the programmes". Between 1986, when the Structural Adjustment Programme came afloat and 2012, not less than seven new poverty reduction programmes have been mainstreamed in Nigeria. Out of these, four can be said to have entrepreneurial 'flavour'. It can therefore be said that entrepreneurship approach to poverty reduction in Nigeria is a latter-day development. In sharp contrast to the failure of other global attempts at poverty reduction, there is now a plethora of studies orchestrating entrepreneurship as a viable route to poverty reduction (Adebayo, et'al, 2014).

CONCEPTUAL ISSUES OF POVERTY AND SMALL SCALE BUSINESS

The problem inherent in defining poverty in itself makes the actual measurement of poverty an extremely difficult task. As there is no objective definition of poverty and no objective way of measuring how many people are poor. Olamejeye (1994) attempted to define poverty as the degree of difficulty encountered in making ends meet. Prado and Tobi (1994) observed that poverty is a multi-dimensional phenomenon with few commonly agreed definitions across the characteristics of the poor (particularly the urban poor) such as excessive labour flow, undifferentiated/unskilled persons who cannot readily be integrated into the production system, sub-culture of personalized ethical code in contrast to the norm of kindred or community behavior, scarcity of essential commodities (food, housing, clothing), growth of slums, unemployment and under-unemployment, and crimes or deviant behaviors.

Onibokun et al. (1995) perceives urban poverty as living in sub-standard and sub-human environments plagued by slums, squalor and grossly inadequate social amenities like health

facilities, schools, recreational opportunities etc. Galbraith (1968), also diagnosed poverty as having limited and insufficient food and clothing; people living in crowded, cold and dirty shelters, and people living painful and comparatively brief lives. Aluko (1975) presents a simple, limited and materialistic concept of poverty by defining it as inadequate level of consumption, giving rise to insufficient food, clothing and/ or shelter. Olowu et'al (1995) pointed out that poverty is characterized by the lack of or inadequate access to infrastructures among others, while the urban poor can easily be identified from the types of food they eat and the environment in which they live.

THE CONCEPT OF SMALL SCALE BUSINNESS
A small and medium enterprises in Nigeria is defined as any enterprises with a maximum asset of base of N500 million (including land and working capital) and with no lower or upper limit of staff. Delhi, 2004 for the first time defined small scale industry as one which is operated mainly with hired labour usually 05-50 hands (Abubakr and Ladan, 2014). In the context of Sokoto state, small scale industries may start from five or more staff (e.g Black smith, Bakery, dying, hand craft, and pure water industries). These small business have continued to contribute toward the development of Sokoto town since before independence to date, due to absence of large scale industries in the region. They play an important role in employment creation, resources utilization and income generation and have been helping to promote changes in a gradual and phase manner (Abubakar and Ladan, 2014).

EFFECTS OF URBANIZATION ON POVERTY LEVEL
Urbanization rate increased in Nigeria since the advent of colonialism, the southern parts of the country had urban centres before the colonial era, their growth and multiplication were enhanced by different government policies initiated during the colonial era and maintained by the indigenous successors. Such policies include creation of new towns along the major transportation routes, modernization of the physical structures of the existing towns, changing of the urban economic base, introduction of modern urban utilities and emergence of commercial centres (Onibokun, 1973). From 7.2% of the total population in 1921, the urban population now makes up 40% of the total population. Apart from rural-urban migration, another factor that has been responsible for high rate of urban growth in Nigeria is decline in mortality rate due improvement in medical care as proceeds from the oil boom.

The quality of life in Nigerian urban centres was influenced also by economic situation with Nigeria experiencing considerable growth during the oil boom (1973 to 1980) when Gross Domestic Product (GDP) rose by 8.2% to reach $ 1,200.00 per capital in 1982. Per capita GDP later dropped to $ 1,050.00 in 1985, plummeted to $ 240.00 in 1992 and rose slightly to $ 320.00 in 1994, this nominal increase had a 50% fall in GDP per capita between 1992 and 1994 which in real terms, both capita income and per capital expenditure in 1994 were lower than in the early 1970's before the oil boom (World Bank, 1996). In Sokoto State urbanization is in high rate presently, as the rural poverty in the state hit higher with the couple of insecurity in Zamfara and Katsina States, the city is rapidly increasing in the ghetto areas with too little job opportunities for them.

SUSTAINABLE DEVELOPMENT GOAL 1. END POVERTY

In September 2015, a new set of development goals have been agreed by 193 countries in a special summit at the United Nations (UN). These are called Sustainable Development Goals (SDGs) that aim to end poverty, achieve gender equality and ensure food security in every corner of the globe by 2030. These goals and targets (17 Goals and 169 targets) have been debated by civil society and UN member states for a considerable amount of time before finalising them. This has led the Secretary General of the UN to claim that the SDGs are people's agenda, a plan of action for ending poverty in all its dimensions, irreversibly, everywhere, and leaving no one behind (Ki-moon 2015). The SDGs are built on the foundations of the Millennium Development Goals (MDGs), and seek to complete the unfinished business (of the MDGs), as well as respond to new

challenges (UN, 2015a). Poverty eradication seems to be one of the main priorities of this grand framework as Hulme (2015) insists the SDGs have marked the *end of development* as poverty reduction. Goal-1 of the SDGs: 'End poverty in all its forms everywhere'. states that:

By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day (UN, 2015b) The change in the narrative of poverty 'eradication' in place of poverty 'reduction' has received much acclaims. Pogge and Sengupta (2015) assume that this might raise the gaze of politicians and officials beyond their usual preoccupations with short-term political advantage or narrowly defined national interest, leading them to think imaginatively about the future. However, at the same time, this might potentially turn out to be

another popular slogan and/or development under-achievement2 as there are major pitfalls for achieving this goal. See also Kammaruzzaman (2016).

INTEGRATING SMALL SCALE BUSINESS WTH SDG GOAL 11 IN POVERTY REDUCTION

The pledge of Goal 11 to make cities and human settlements inclusive, safe, resilient and sustainable provides an unparalleled opportunity for the attainment of collective and inclusive progress, and for the achievement of sustainable development in the world.

Since 2015, SDG 11 has catalyzed collaboration and partnerships between diverse groups of stakeholders at the local level, and between local, regional, and national governments. However, cities and regions continue to struggle with providing adequate housing, services, and infrastructure, especially in light of the increasing global incidence of natural disasters. A number of challenges in data availability to track progress towards implementation of SDG 11 also present significant barriers to assessing global progress on the goal.

Nonetheless, although cities are often characterized by stark socioeconomic inequalities, social exclusion, extreme poverty, unemployment, poor environmental conditions, and high production of greenhouse gas emissions, their potential for growth and development makes them strong drivers for positive change. Their density and economies of agglomeration act as strings that connect all Sustainable Development Goals together, linking economy, energy, environment, science, technology and social and economic outcomes. With nearly 54% of the world's population living in cities today—and potentially two-thirds by 2030—this critical mass of urban dwellers has an enormous potential for change both in urban and rural areas.

Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums (SDG Target 11.1, Indicator 11.1.1)

Inadequate housing impacts negatively on urban equity and inclusion, urban safety and livelihood opportunities, and causes negative health conditions. The indicator is measured by the notion of deprivation in three fundamental areas: slums, informal settlements and inadequate housing. Building on MDG methodology, and to ensure the indicator is universal, modifications were introduced to add housing inadequacy in the measurement that contemplates the use of geospatial technologies for slum identification. Data is available from UN-Habitat's urban indicators database, but mostly limited to the slum and housing informality components.

According to updated data, while the proportion of the global urban population living in slums decreased from 28% to 23%, the absolute numbers of people living in slums increased, from an estimated 807 million people in 2000 to 883 million in 2015; with higher numbers recorded in the fast urbanizing sub-regions.

Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries *(Target 11.3)*

Urban Sprawl (Indicator 11.3.1). Cities are rapidly expanding, with the rate of land consumption increasingly overtaking that of population growth rate. As of 2017, the average rate of the physical expansion of cities remains about one and a half times that of population growth. The forces driving this urban expansion include, among others: population growth, rising per capita incomes, cheaper agricultural lands, efficient transport, and the proliferation of informal settlements. There are, however, regional variations in urban sprawl. For example, urban sprawl is increasing in Western Asia and Northern Africa, Sub-Saharan Africa, Latin America, and East Asia and Oceania, while it is decreasing in South-Eastern Asia, Central and Southern Asia, Europe, North America and Japan (land-rich developed countries). Important progress has been made in the measurement of this indicator using remotely sensed data and image interpretation with the involvement of various agencies working in the field of geographic information and earth sciences.

APPROACHES TO POVERTY ALLEVIATION

Poverty may be chronic or transitional, which provide the various contexts in which approaches to poverty alleviation are relevant as poverty alleviation approaches may be applicable to either urban or rural setting, regions of country, opportunities existing in each locality or resources available. The approaches to poverty are the strategies for poverty alleviation because they constitute the building principles for the choice and design of programmes. In this paper, the approaches are not seen as alternatives but as complimentary means for tackling the wide dimensions of poverty which can be categorized as the basic needs approach, the economic growth and the rural development approach. The fundamental reason for creating a nation-state is to improve the living conditions of its citizens; this makes development a basic national objective although what constitute development is debatable (Ohiorhenuan, 1984). The following approaches were adopted from Okosun, et'al, (2012)

BASIC NEEDS APPROACH TO POVERTY ALLEVIATION

Poverty is seen in a broad perspective, policies and programmes are designed to tackle the wider causes of poverty under the basic needs approach. Firstly, is to identify the poor and their basic needs. These basic needs may be described as fundamental necessities which would, of course, differ for different types of poverty either chronic or transitional, for different parts of a country, and over different periods of time. But most components of basic needs would include all or some of such basic socio economic necessities as food and nutrition, health care, education, shelter, clothing, transport and employment. Under the prospective of the heterogeneous nature of basic needs, it is easy to see that policies and programmes for poverty alleviation under the basic needs approach also would specifically target the poor. They should also be broad-base, covering economic, social and other dimensions of poverty in an integrated fashion. The component of the basic needs programmes for poverty alleviation consists of:

1. Economic component, to promote broad-based economic growth and create employment and income generating opportunities for both poor and non-poor but, perhaps, with the poor receiving special attention. Employment-generating projects may include labour-intensive public works projects and support for micro-enterprises (for example, through credit) which are normally labour-intensive.
2. Social services component, to provide education, health and sanitation services, clean water, nutrition, physical and socio-economic infrastructure, power supply, transport and so on. These programmes are often targeted at the poor.
3. Safety-net component, to provide relief for the old, disabled and destitute and to provide targeted assistance to the transitorily poor.

ECONOMIC GROWTH APPROACH TO POVERTY ALLEVIATION

The economic growth approaches focus attention on macro- and microeconomic policies and programmes that would ensure the rapid growth of the economy as measured by rates of growth in real per capita gross domestic product (GDP) or per capita national incomes, rates of growth in sectoral indices of production, consumer price stability, rate of employment and others. Grindle (1980) agreed that political and policy analysis in the developing world has tended to focus on the national level rather than city level. The economic growth to poverty alleviation is based on the assumption that economic deprivation is at the root of all poverty and that non-

economic causes. Major macroeconomics policies that are important in this respect are fiscal (budgetary and tax), monetary (money supply and credit), foreign exchange (exchange rate), trade (import and export) and wage and income policies. Important microeconomic (or sectoral) policies involve incentive pricing, input subsidy, technology development and transfer, credit supply, efficient commodity marketing and distribution, industrialization, employment generation, and so on. There are, however, serious controversies on whether or not economic growth alone, though necessary, is a sufficient condition for poverty alleviation.

The argument that economic growth is not a sufficient condition though a necessary one for poverty alleviation is, however, corrects. It is argued that:

1. Economic growth is a long-term process, the benefits of which may take too long to trickle down to the poor, whereas the poor often require short- and medium-term strategies.

2. There is nothing inherent in economic growth that automatically guarantees poverty alleviation or poverty eradication.

3. Economic growth, even when it alleviates or eradicates poverty in some segments of the society, often creates new poverty or aggravates existing poverty in other segments of the society – a case of digging a hole to fill a hole.

4. The nominal tendency is for economic growth to be accompanied by increasing income inequality, a situation that requires additional strategies to correct.

5. Economic policies are often too untargeted to take care of the special needs of the core poor. The problems of targeting as a strategy for poverty alleviation are highlighted by Bamberger (2002).

6. Economic policies and economic growth are too inadequate to tackle the wider, non-economic causes of poverty;

7. The poor need adequate social preparation involving organization, education, health care, etc., to strengthen their ability to compete and take advantage of socio economic opportunities that may arise from economic policies and general economic growth (D'Silva and Bysouth, 1992).

CONCLUSION

It is clear from empirical results of this study that micro and small business entrepreneurship can contribute significantly in the drive for poverty reduction. Its impact on poverty reduction can be

more pronounced and contribution raised from the marginal level observed in this study, if all stakeholders, especially policy makers will recognise and implement the following recommendations which have arisen from the findings of many similar study of this work.

Firstly, the work of Adebayo et'al (2014), since it has been established from his study that micro and small business entrepreneurship can help in the poverty reduction drive, government at all levels of administration should put in place appropriate policies to encourage, stimulate and sustain entrepreneurial spirit, especially in Nigerian youths. In addition, this Entrepreneurship Education and Training should be taken a step down to the secondary school level of education. This is to capture the group of young Nigerians whose parents may not be able to afford the increasing cost of tertiary education in the country. By implication, those leaving secondary schools would in the final analysis be gainfully self-employed if this recommendation is accepted and implemented. Similarly, members of the society that are not in line with western education should be provided with means or financial loan that can guarantee them with business to offer.

Secondly, government should be more serious with financial empowerment of Nigerians of all ages who are ready to set up their own businesses. With lack of initial capital, nascent entrepreneurs with good skills and expertise in various fields may find it difficult to launch into the world of business. Politics should be eliminated from this policy formulation (Abubakar, 2014).

Thirdly, SDG 1and 11 framework should be strictly adopted as a policy and tools for poverty alleviation as well as the two approaches outline in this research paper. SDGs indicate new component of minimizing poverty which is in-line with the basic needs approaches as suggested by Okuson (2012) which include adequate health care facilities, education, transport, employment, food and shelter. This may help in reducing poverty pressure and in changing the old system of poverty reduction which have not yield any positive outcome in Sokoto state.

REFERENCES

Abubakar, S.I.; Ladan, Z. (2014). The role of small scale enterprises in poverty reduction in rural areas of Sokoto state. Paper presented at the third international conference on environmental studies (ICESR) organized by African society for the scientific research held at federal college of education (technical) pankshin, plateau state, Nigeria.

Adebayo, N.A. and Moshood, N.L. (2014). Impact of micro and small business entrepreneurship on poverty reduction in Ibadan metropolis, south western Nigeria. International review of management and business research (IRMBR) vol.3. issue 3.

Aluko S (1975). "Poverty and Its Remedies", paper presented at the Annual Conference of the Nigerian Economic Society.

Bamberger M (2002). "Key Issues in the Design and Management of Targeted Poverty Allevition Programs." The Design and Management of Poverty Reduction. Projects in Anglophone Africa. M. Bamberger A, Matovu G., eds proceedings of an EDI/Uganda Management Institute Seminar held in Kampala.Washigngton, D.C.: The World Bank.

CBN Enugu Zone (1998): "A Profile of Regional/Zonal Poverty in Nigeria; The Case of Enugu Zone" in Proceedings of the Seventh Annual Conference of Zonal Research Units". Central Bank of Nigeria, Abuja.

Daniel, K. (2019). List of 10 poorest states in Nigeria according to NBS 2019. https://www.naijaloaded.com.ng

DFID, (2005). Development for international development in Handley G, Higgins K, Sharma B, Bird K and Cammack, D (2009): "Poverty and Poverty Reduction In Africa.

D'Silva E, Bysouth K (1992). Poverty Alleviation Through Agricultural Projects. An EDI Policy Seminar Report No. 30. Washington, DC: The World Bank *Financial Review, Vol. 39, No.4.*

Galbraith, J.K. (1968). The Affluent Society, My italics. New York.

Grindle, M.S (1980). Politics and policy implementation in the third world. Princeton NJ; precention University press

Handley G, Higgins K, Sharma B, Bird K and Cammack, D (2009): "Poverty and Poverty Reduction In Africa.
http://hdr.undp.org/hdr2006/statistics/countries/countryfactsheets/ctyfs/NGA.htm/.
http://web.worldbank.org/website/external/countries/africaext/nigeriaextn.
https://sustainabledevelopment.un.org/?menu=1300, (accessed on 4 October 2015)

Hulme, D. (2015), The SDGs mark the end of development as poverty recution, Online, retrieved from
http://developmentatmanchester.com/2015/10/01/the-sdgs-mark-the-end-of-development-aspoverty- reduction/ (accessed on 5 December 2015)

Ikenwa, C. (2019). Top poorest states in Nigeria. https://nigerian infopedia.com.ng

Kamaruzzaman, P. (2016) A critical note on poverty eradication target of sustainable development goals. European journal of sustainable development. ISSN:2239-5938

Kazeem, Y. (2018) Nigeria has become the poverty capital of the world quartz African: https://qz.com.cdnampoject.org.

Ki-moon, B. (2015), Sustainable development goals 'leave no one behind' in *The Guardian* [online], Retrieved from
http://www.theguardian.com/globaldevelopment/2015/aug/03/ban-ki-moon-hails-sdgsagreed- by-193-nations-as-leaving-no-one-behind (accessed on 30 September 2015)

NBS (2012): *Nigeria Poverty Profile 2010* National Bureau of Statistics, Abuja, Nigeria.

Ogwumike, F.O. (2002): "An Appraisal of Poverty Reduction Strategies in Nigeria" *CBN Economic and Financial Review, Vol. 39, No.4.*

Ohiorhenuan J (1984). "Ideology and Method in the Theory of Development Planning." Niger. J.Econ.Soc. Stud. 26(3): 387–407

Okosun, I.; Siwar, C.; Hadi, A; and Nor, A.M. (2012). Urban poverty in Nigeria and approaches to poverty alleviation: A review. African journal of political science and international relations. Vol.6(1) pp 8-14. ISSN 1996-0832. Academic journal. https://academicjournal.org/AJPSIR.

Olamajeye, J.A (1994). "The factors that limit access to urban basic services for the urban poor" UNICEF workshop on urban poor and CEDC IITA, Ibadan.

Olowu D, Akinola SR (1995). "Urban Governance and Urban Poverty in Nigeria' in Onibokun, AG and Faniran (eds). Governance and Urban Poverty in Anglophone west Africa, CASSAD Monograph Series. 4.

Onibokun AG (1973). "Urbanization in the Emerging Nations: A Challenge for Pragmatic Comprehensive Planning "Planning Outlook, (13): 52-60.

Onibokun, A.G.; Daniel, O. (1995). Urban and Housing in Nigeria. Nigerian Institute of Social and Economic Research.

Pogge, T. and Sengupta, M. (2015), 'The Sustainable Development Goals: a plan for building a better world?', *Journal of Global Ethics*, Vol. 11, No.1, pp. 56-64

Prado R, Tobi D (1994). "Notes on poverty Focus in Country Programming", A paper presented at the UNICEF workshop on Urban Poor and CEDC. IITA, Ibadan May 3-4.

Punch, (2017). Sokoto retain its position as the poorest countries in Nigeria. See also Vanguard Jan. 6. 2013.

Rasak, M. (2015). Small and medium scale enterprises (SMEs); A panacea for economic growth in Nigeria. Department of sociology and psychology, Fountain University, Osogbo, Osun State. reduction/ (accessed on 5 December 2015)

SDG 11, (2018). High level political forum on sustainable development "2018 Review of SDGs implementation: SDG 11 – Make cities and human settlements inclusive, safe, resilient and sustainable" sustainable development UN. Org/hlpf/2018.

United Nations (UN), (2015a), *Open Working Group proposal for Sustainable Development Goals* [online], retrieved from https://sustainabledevelopment.un.org/focussdgs.html (accessed on 07 October 2015)

United Nations (UN), (2015b), *Sustainable Development Goals* [online], retrieved from

United Nations Development Programme (UNDP) (2006): „Nigeria Human Development Report 2006 Human Development Indicator Country Fact Sheets.

World Bank (1996). Nigeria: Poverty Assessment Report No. 14733 – UN

World Bank (2007): „Nigeria Country Brief". World Bank.

World meter (2019). Elaboration of the states united nations data. https:www.meters.info world?', *Journal of Global Ethics*, Vol. 11, No.1, pp. 56-64

EFFECT OF OBAJANA CEMENT FACTORY WASTE

ON ITS IMMEDIATE ENVIRONMENT

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ABSTRACT

Environmental pollution resulting from manufacturing activities is a major issue of concern, because of its intense health effects. One manufacturing industry which has increased production as a result of technological advancement, in the last one decade is the cement industry. This has led to discharge of waste into the environment. Little concern for host communities' exposure to waste from cement industries and its attendant effect on the host communities of the manufacturing companies particularly, the Obajana Cement Factory created the need for this thorough study. This study investigated effects of environmental pollution on host community of Obajana Cement Factory; the types of waste discharged into the environment as well as effects of these wastes on the environment and residents. The investigation of certain environmental parameters such as air, soil and water were carried out in different locations within the host community. Air, water and soil quality were measured using Air/Water/soil testing meter. The results showed that the air quality in some of the locations exceeded the acceptable limits set by Federal Ministry of Environment and World Health Organization. Results also showed a long term duration effect on the health of residents which could be associated to cement dust. This study highlighted the need for continuous cement dust environmental monitoring, harnessing appropriate technology for use in the cement industry would help minimize pollution.

Keywords: Cement, Environment, Waste, Host community, Health*.*

I. INTRODUCTION

Technological advancement has enabled cement companies produce higher volumes compared to the past, yet the increased production levels have been largely tagged as the principal cause of pollution (Zimwara *et. al.,* 2012). Dangote cement is Africa's topmost producer of cement with three plants in Nigeria and plans to expand in 13 other African countries (Emmanuel *et. al.*, 2015). Cement industries are very important industries as cement is a key ingredient of concrete used in constructing modern structures. Cement industries are more recognized and appreciated for its economic benefits; as it is an avenue to boost the country's economy and provides employment to its masses; however, the environmental effect is often disregarded (Mehraj and Bhat, 2013; Meo, 2004).

Industrial pollution are mostly gases like carbon monoxide, sulfur oxides, and nitrogen oxides which are the waste products of industry that end up in the air. (Gull, Ali, Hussain, Nawaz & Mushta 2013) as stated by (Ojo *et. al.,* 2017). Various components of the environment are fast degrading as a result of industrial activities and cement industries have been a major contributor of environmental pollution; which has threatened public health for a long time (Mehraj and Bhat, 2013).

Environmental pollution is an issue of major concern; the groups of people more exposed to the effect of cement waste are the workers within the production sites and the host community (Azeez 2014) as cited in (Oyinloye, 2015). Industrialization like every phenomenon is beneficial; and also has negative consequences (Ilalokhoin *et al.*, 2013).

STATEMENT OF PROBLEMS

In most developing countries, emphasis is placed more on the economic growth of industries than its environmental and health effect (Abdullahi *et. al.*, 2014). Little priority given to environmental protection, inappropriate and ineffective implementation of environmental standards and inefficient pollution control techniques are major issues challenging cities in Nigeria (Ojo *et. al.,* 2017). Hence, host communities of cement industries are left to live with the environmental problems and health risk posed by the cement waste introduced into the environment by the industries (Oyinloye, 2015). If these problems are not tackled properly and

timely, the negative environmental effects of cement industries can overshadow the economic benefits.

RESEARCH QUESTIONS

The study intends to answer the following questions;

    i. What kind of waste does Obajana Cement Factory generate?

    ii. What is the impact of the wastes generated on the environment?

    iii. What is the residents' perception of the health effect of the Cement Factory waste?

AIM AND OBJECTIVES

The aim of this study is to analyze the effect of Obajana Cement Factory waste on its immediate environment.

OBJECTIVES

    i. Examine the types of wastes generated from Obajana Cement Factory

    ii. Assess the impact of the cement wastes on air, water, soil in Obajana.

    iii. To examine residents' perception of the health effect of the Cement Factory waste.

SCOPE OF THE STUDY

The study analyses the effect of Obajana Cement Factory waste on its immediate environment. It focuses on the types of solid, gaseous and liquid waste generated by the cement factory, level and impact of these wastes on the environment.

STUDY AREA

Obajana is located between geographical Latitudes 624′N - 7 34′N Longitudes 749′E - 859′E of the Greenwich meridian. On the relative location, Obajana is about 220Km from Abuja, the Nigeria Federal Capital Territory, 43Km to Lokoja, 49Km to Okene and 40Km to Kabba. Geographically, it is located southwest of Abuja; it is located in Oworo disrtict of Lokoja Local Government Area of Kogi State (Balogun, 2016).
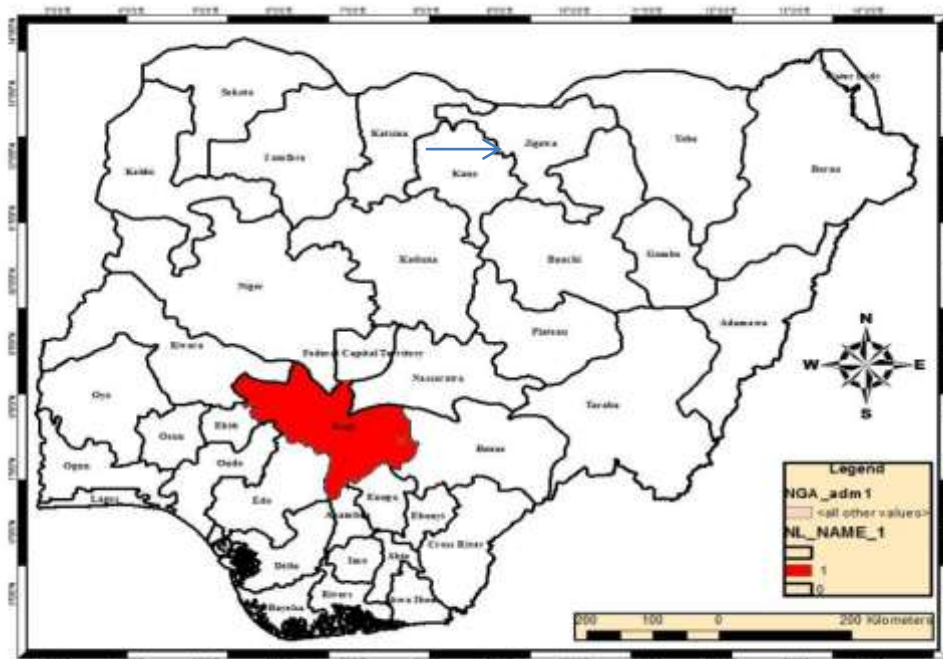
Figure 1: Map of Nigeria showing the location of Kogi State

Source: Author's work (2019).

Figure 2: Map of Kogi State showing Location of the study area

Source: Author's work (2019).

II. LITERATURE REVIEW

Hazardous waste is any liquid, solid waste that is dangerous and potentially harmful to human health or the environment. Cement Industries is a major contributor of hazardous waste (Mehta, 2018). An estimate by World Health Organization (2006) shows that 23-30 percent of global burden of disease are associated with environmental pollution. The pollution is usually due to waste discharged from these industries. Respiratory diseases, vector borne diseases; and other pollution such as lead in water, air and soil may contribute 0.9 percent and have significant impact on the general environment (World Health Organization, 2006).

Mojiminiyi *et al.* (2008) examined the effect of cement dust exposure on haematological and liver function among cement factory workers in Sokoto. The results pointed out that occupational exposure to cement dust may distraught haemopoietic function while preserving liver. However, the research focused only on factory workers. A study carried out by Mehraj, Bhat, Balkhi and Gul (2013) revealed that there was a high concentration of gaseous and particulate pollutant of cement in their environment when compared with the factory site and the standards prescribed by the Central Pollution Control Board of India, and therefore reiterated that cement dust does not only contribute to environmental pollution but also threatens health of local inhabitants.

(Mehta, 2018; Merenu *et. al.,* 2013; WHO, 2006) stated that gaseous waste discharged into the air as a result of the excessive fuel combustion is the most dominant form of pollution; this is directly affecting the environment. World Health Organization reiterated that lack of clean air has resulted in the death of at least two million people every year. Therefore there is need for intense study of the effect of cement factory waste on its immediate environment.

III. RESEARCH METHODOLOGY

Mixed method was adopted in the data acquisition process. It involved the field survey, use of equipment and questionnaire. 192 questionnaires were administered to sample residents' opinion. The methodologies adopted in the study of individual components of environment are briefly described below.

Air Quality

Portable hand held air monitoring equipment were used to measure air pollutants. MSA Altair 5X Multi-gas Detector for CO, H2S, O3; Suspended Particulate Matter 2.5 and Suspended Particulate Matter 10 were also measured.

Air quality in Obajana was assessed through a network of air monitoring locations with ten Ambient Air Quality Monitoring location in down wind direction during the study period and one control point. Air samples were measured in ppm (part per million) at a height of 2 metres above the ground at an internal of 50m using MSA Altair 5X Multi-gas Detector. Air samples were taken at 7am, 12pm, and 5pm. The following pollutants were monitored Hydrogen Sulphide (H_2S), Suspended Particulate Matter (SPM), Carbon Monoxide (CO). The results obtained were compared to WHO and FEPA standards.

WATER QUALITY

Water samples were collected using 60cl plastic bottles. Three water samples were collected from river onyi which is the major source of water supply in the study area using grab method, subjected to further laboratory analysis. The data thus collected was compared with the drinking water quality standard.

Figure 3: Map of Obajana showing water sample points

Source: Author's work, 2019.

SOIL QUALITY

Soil samples were collected using nylon bags. Two samples were collected randomly at 15cm depth and subjected to further laboratory analysis. The data thus collected was compared with the soil quality standard.

IV. SUMMARY OF FINDINGS

Wastes Generated by Obajana Cement Factory

Waste produced from the cement factory was examined; they primarily are gaseous waste and solid wastes.

Gaseous wastes identified are:

i. Suspended Particulate Matter $_{2.5}$
ii. Suspended Particulate Matter $_{10}$
iii. Carbon Monoxide
iv. Hydrogen Sulphide

Solid wastes include waste cement bags.

The average level of gaseous waste recorded is shown in table 1;

S/N	AQML	CO (ppm)	H_2S (ppm)	O_2 (ppm)	$SPM_{2.5}$ µg/m3			SPM_{10} µg/m3			Interval	Remark
					7-8am	12-1pm	5-6pm	7-8am	12-1pm	5-6pm		
1.	7.92047	2	1	-	78	310	153	65	278	78	50m	
	6.43116											
2.	7.92004	1	-	-	66	233	112	53	150	69	100m	
	6.43129											
3.	7.91961	-	-	-	53	147	98	42	108	64	150m	
	6.4314											

	5											
4.	7.91918 6.43156	-	1	-	34	89	87	35	75	59	200m	
5.	7.91875 6.43172	33	-	-	30	137	45	24	112	55	250m	Influenced by vehicular movement
6.	7.9215 6.43167	1	-	-	92	515	178		441	137	50m	
7.	7.92158 6.43212	16	-	-	79	267	128		200	121	100m	Influenced by vehicular movement
8.	7.92165 6.43257	-	1	-	73	158	104		146	107	150m	
9.	7.92172 6.43302	-	-	-	51	95	66		87	70	200m	
10.	7.92178 6.43347	-	-	-	28	78	62		75	48	250m	

Source: Author's fieldwork, 2019

The study carried out reveals that Suspended Particulate Matter is the prevalent type of gaseous waste identified in Obajana; though particulate matter complies with regulatory standard in some

locations; it is relatively high. The result obtained in some locations are slightly above the Federal Ministry of Environment Standard of 500μg/m^3 and World Health Organization's (WHO) Guidelines for Ambient Air Quality which stipulates a range of 150 μg/m3 to 230 μg/m^3 for a 24–hour average. Particulate Matter is majorly of concern as it contributes to health hazard.

Water analysis

S/N	pH	us/cm Condt	mg/l TA	mg/l TH	mg/l Cl-	mg/l Ca	mg/l Mg	mg/l Na	mg/l K	mg/l No3-	mg/l P	mg/l Pb	mg/l Mn	mg/l Fe	mg/l Zn
ST1	7.41	66	17	46	10.78	6.72	7.12	3.86	0.19	0.16	0.04	ND	0.1	0.18	ND
ST2	7.19	45	15	42	7.84	4.21	7.56	3.41	0.26	0.18	0.07	ND	0.1	0.15	ND
ST3	7.24	47	12	48	9.80	7.15	7.36	3.63	0.22	0.14	0.06	ND	0.1	0.17	ND

The analysis reveals that there is no significant impact on the surface water as parameters tested fall within the maximum level permitted by Standard Organization of Nigeria for water quality.

Soil anaylsis

S/N	pH	uS/cm Condt	TON	% OC	% OM	cmol/kg EA	cmol/kg Na	cmol/kg K	cmol/kg Ca	cmol/kg Mg	mg/l P	cmol/kg CEC	mg/l Pb	mg/l Mn	my/l Zn	FE
0-15	7.86	128	0.22	0.38	0.65	0.02	0.17	0.08	2.36	0.12	0.96	2.75	ND	0.13	0.66	1.25
15-30	7.49	116	0.18	0.26	0.44	0.02	0.12	0.05	2.14	0.12	1.14	2.45	ND	0.13	0.12	1.31

The result shows that there is no significant impact on soil as Soil Ph falls within 'slightly alkaline', it also indicate low presence of heavy metals.

Residents' perception of the health effect of the Cement Factory

The study reveals that dry cough, eye itching, eye redness, chest pain are dominant diseases among respondents as shown in figure 2. This can be linked to concentration of dust particles in the community.
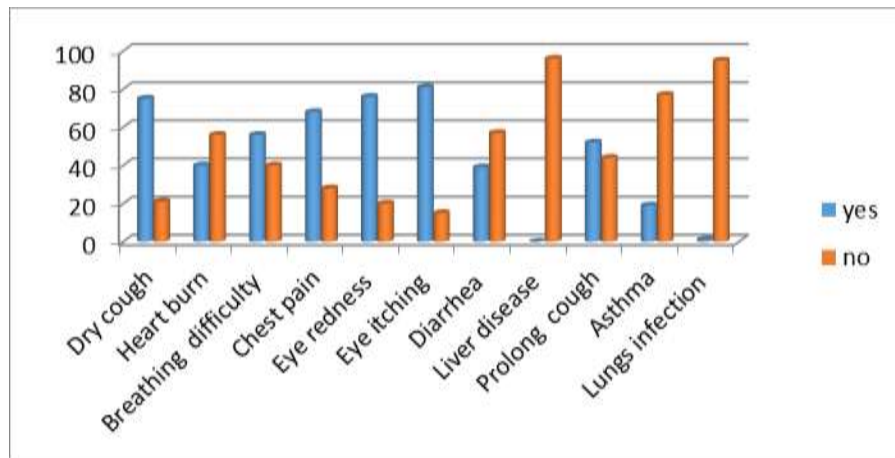

Figure 4: Disease suffered in Obajana
Source: Author's fieldwork, (2019).

The study shows that 7.3% of the respondents disclosed that they experience dry cough very often, 12.5% of the respondents disclosed that they often experience dry cough, 28.1% of the respondents disclosed that their experience of dry cough is moderate, 31.3% of the respondents rarely experience dry cough, while 20% have not experienced dry cough.

The survey revealed that 3.1% of the respondents have difficulty breathing which occurs very often, 12.5% of the respondents experience breathing difficulty often, 26% of the respondents moderately experience breathing difficulty, 37.5% of the respondents rarely have breathing difficulty, while 20.8% have never experienced breathing difficulty.

The analysis revealed that 5.2% of the respondents experience eye redness very often, 11.5% of the respondents experience eye redness often, 32.3% of the respondents moderately experience eye redness, 30.2% of the respondents rarely experience eye redness, while 20.8% do not

experience eye redness. The result reveals that the occurrence of eye redness is moderate; and rarely occurs in most respondents.

The study sought to find if there is any experience of itchy eye. 1% of the respondents experience eye itching very often, 11.5% of the respondents often experience eye itching, 36.5% of the respondents moderately experience eye itching, 35.4% of the respondents rarely experience eye itching, while 15.6% have never experienced eye itching. The analysis reveals that an itchy eye is common among respondents.

The analysis shows that 2.1% of the respondents suffer heartburn very often, 3.1% of the respondents have heartburn often, 22.9% of the respondents suffer heartburn which occurs moderately, 40.6% of the respondents rarely suffer from heartburn; while only 31.1% of the respondents have never experienced heartburn. The result shows that majority of the respondents have suffered heartburn, however it rarely occurs.

The survey reveals that 2.1% of the respondents experience chest pain often, 24% of the respondents experience chest pain moderately, and 44.8% of the respondents rarely have chest pain; while 29.2% of the respondents have never experienced chest pain. The result shows that chest pain is common among respondents, however the level of experience is moderate.

Diarrhea is not a prevalent illness, as 59.4% of the respondents have never had diarrhea, 35.4% of the respondents rarely have diarrhea, while 5.2% of the respondents have experienced diarrhea at some points.

In Figure 5, 63% of the respondents revealed that the cement factory affect their immediate environment, while 37% believe the cement factory does not affect their immediate environment negatively rather yields more economic benefits.
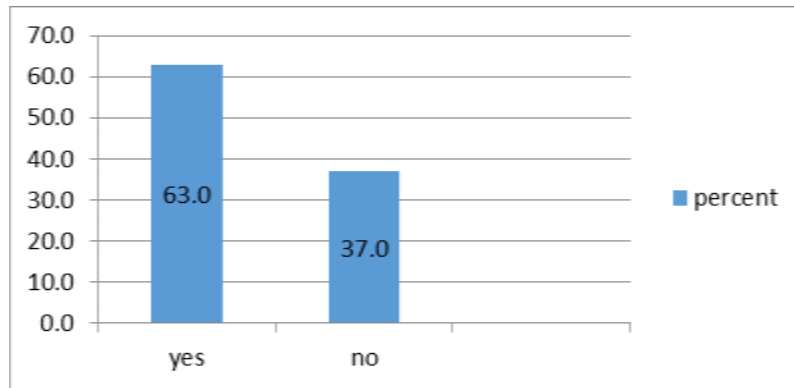
Figure 5: Does the cement factory affect your environment?
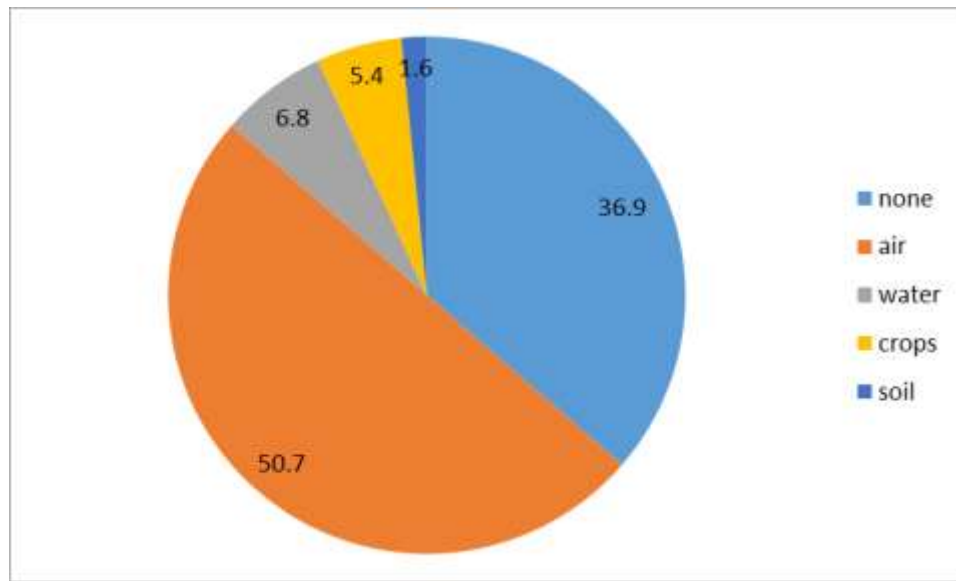Source: Author's fieldwork, (2019).

Figure 6: Element of the environment exposed to pollution from the cement factory
Source: Author's fieldwork, (2019).

As seen in figure 6, 50.7% of the Respondents revealed that the cement factory contributes to air pollution in the community, 6.8% revealed the cement factory contributes to water pollution in the community, 5.4% revealed that the cement factory affect the quality of crops, 1.6% revealed that the cement factory affect soil in the community, while 36.9% believe that the cement factory does not affect their immediate environment.

CONCLUSION

The study has analyzed the effect of Obajana Cement Factory waste on its immediate environment. While Cement industries strive to increase production; it poses serious problem for people in the host community. Obajana Cement Factory should be commended for its ability to manage toxic emissions from production; however dust particles should still be controlled to the maximum as certain locations fall above recommended limits and is unhealthy for the people in the locations. The factory therefore should improve by:

i.   Curbing pollution and ending environmentally destructive particles.

ii.   Providing health care centre to enable host community have access to quality health care.

iii.   Regular environmental monitoring/auditing should be carried out by agencies such as NESREA.

REFERENCE

Abdullahi, J., Odihi J.O, and Mshelizah, U.H. (2014), Assessment of the Effects of Ashaka Cement Company Mining Activities on the Environment, Funakaye LGA, Gombe State, Nigeria.

Azeez A.S. (2014), "An Assessment of Environmental Impact of Industrial Pollution" (An Empirical Study of Ewekoro Cement Factory, Ewekoro L.G.A., Ogun State), B.Tech. Project in URP Department, Fed. University of Tech. Akure. 2014.

Balogun E.S., (2016), An Assessment of the Impact of Obajana Cement Factory on the Socio-Economic Development of Obajana, Kogi State, Nigeria. Research work, School of Postgraduate Studies. Ahmadu Bello University, Zaria, Kaduna State.

Emmanuel, T.F., Ibiam,U.A., Okaka, A.N.C., and Alabi, O.J. (2015) Effects of Cement Dust on the Hematological Parameters in Obajana Cement Factory Workers. *European Scientific Journal* vol.11, No.27 ISSN: 1857 – 7881

Gull N., Ali M., Hussain Y.N., Nawaz A. N., & Mushta, S.K .(2013). Industrial Air Pollution and Its Effects on Human's Respiratory System, (A Sociological Study of Bhoun shugar Mill District Jhang, Pakistan)**,** *Academic Journal of Interdisciplinary Studies.* 2(3). 535-545.

Ilalokhoin, P.O., Otaru, A.J., Odigure, J.O., Abdulkareem, A.S., and Okafor, J.O. (2013), Environmental Impact Assessment Of A Proposed Cement Plant In Southwestern Nigeria. *IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT), Volume 3, Issue 5 (Mar. - Apr. 2013), PP 83-99.*

Mehraj, S.S, Bhat, G.A., Balkhi, H.M., and Gull T. (2013), Health risk for Population Living in the Neighborhood of the Cement Industries. *African Journal of Environmental Science and Technology,* Vol. 7(12), pp. 1044-1052.

Mehta J.S., Jung S.J., and Tong L. (2018), Effects of Environmental Pollution on the ocular surface. *The Ocular surface 16(2) 198-205*, 2018.

Meo S.A., (2004), Health Hazards of Cement Dust. *Saudi mei journal* 25:1153-1159.

Merenu I.A., Omokhodion F., Mojiminiyi F.B.O and Ibrahim M.T.O (2015), Effect of Cement Dust Exposure on Lung Function among Residents of Kalambaina Community in Sokoto State, Nigeria. *Journal of medical science and clinical research (*JMSCR) Vol.03 Page 7150-7160. Sokoto.

Mojiminiyi F.B.O., Merenu I.A., Njoku C.H. and Ibrahim M.T.O. (2008), The Effect of Cement Dust Exposure on Haematological and Liver Function Parameters of Cement Factory Workers in Sokoto, *Nigeria. Nigerian Journal of Physiological Sciences* 2008. 23(12):111-4.

Ojo, O.S., and Guntimehin, A.S. (2017), "Impact of Industrial Pollution on the Immediate Neighbourhood (A Case Study of Dangote Cement Ibese in Yewa North Local Govt. Ogun State.)." *International Journal of Engineering Science Invention (IJESI)*, vol. 6, no. 9, 2017, pp. 75–82.

Oyinloye, M.A., (2015), Environmental Pollution and Health Risks of Residents Living Near Ewekoro Cement Factory, Ewekoro, Nigeria. *International Journal of Architectural and Environmental Engineering.* Vol:9, No:2.

WHO, *Air Quality Guidelines - Global Update 2005*. 2006, Copenhagen.

Zimwara D., Mugwagwa L., and Chikowore T.R. (2012), Air Pollution Control Techniques for the Cement Manufacturing Industry: A Case Study for Zimbabwe. Capetown, South Africa. *CIE 42 proceedings & SAIIE*, South Africa.

ASSESSMENT OF PRIVATE HOUSING ESTATE DEVELOPMENT AND PLANNING STANDARD IN ABUJA MUNICIPAL AREA COUNCIL, NIGERIA

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Abstract

This study assesses the private housing estate development and planning standard in Abuja municipal area council, with a view to providing decent, safe, healthy and affordable housing environment. The objectives of this study are to assess the levels of conformity to local plans and building regulations by private developer and identify the challenges influencing the performance of the private housing developers in the study area. The research instruments include in-depth fieldwork, observation, questionnaire administration and interview. A total of four hundred and thirteen (413) residents of the thirteen (13) selected residential was randomly selected for the study. And thirteen (13) management staff from the selected estates were also selected purposively for the study. The questionnaire was retrieved and analyzed. Inferential statistics such as mean Value techniques were used to analyze data collected for the study. The result of the study revealed that majority of the residents in the selected estates were medium income earners. The identified difficulties experienced by the developers includes lack of secure access to land, limited access to finance, high cost of construction, high cost of land registration and titling, development control, affordability gap, slow bureaucratic procedures and Lack of awareness programmes. Also the level of conformity to local plan and planning standard was moderate. Among others the research recommends that the government should provide suitable policy for design policy that will be favorable to the developer and also make housing loan accessible to the masses. If these recommendations can be followed, it will address challenges and difficulties encountered by estate developers and residents.

Keywords: Private Housing, Estate Development, Planning Standard

1.0   Introduction

Rapid population growth in developing countries and cities around the world in the last three to four decades has had serious challenges and consequences particularly on urban housing. UN-Habitat (2003), described this problem as particularly worrying as it constitutes a crucial element that affect the long-term outlook of humanity (UNCHS, 2003). Housing is increasingly becoming a scarce commodity in many cities in the developing world because this rapid population growth concentrates in cities. In 1996, it was estimated that, about 100 million people were homeless in the sense that they lived in insecure or temporary structures or in squatter settlements (UNCHS, 1996b). As population increases in urban agglomerations, land uses intensify and urban activities spill-over into previously rural lands on the fringes. Various land use control mechanisms are designed to promote effective utilization of urban land, to maintain standards for physical development and to ensure harmonious spatial distribution of human activities in accordance with an approved master plan (Rizwan & Obaidullah, 2006). These mechanisms are designed to ensure that urban activities are organized in space with due consideration for aesthetic, health, safety, convenience, efficiency and energy conservation, environmental quality and social equity (Aribigbola, 2008).

In so doing, development controls reduce the negative effects of physical development. The principal land use control mechanisms used in most countries include planning schemes, development and building permits, covenants, zoning controls, building regulations and subdivision regulations. While development controls have been utilized with a degree of success to ensure harmonious spatial distribution of activities in advanced countries, their application has been problematic in developing countries (Tang et al 2000 and Wang et al 2010). According to (Boamah, 2010), the housing market is a set of institutions and procedures for bringing together housing supply and demand, that is, buyers and sellers, renters and landlords, builders and consumers, for the purpose of exchanging houses and housing services as resources. There are two distinct types of housing market – the public sector housing market and the private sector housing market. The participation of the private sector in housing delivery consists of individuals and corporate organizations. The sector provides houses for direct use by their staff and for rental

use or outright sale to the public. Unarguably, the private sector has been more efficient and reliable in the production of housing than the public sector.

It is observed that the housing units produced by the private sector are usually out-of-reach of the low income families. It has been observed that in many cities, especially within the developing countries, the population increases without a proportionately corresponding increase in housing supply. Aluko 2000 confirms this by asserting that, "in Nigeria the supply of new housing has not been able to match the demand". The consequences of this development are legion, including a manifestation of high occupancy ratios, high cost of rental accommodation and the emergence of derelict and blighted urban scape. (Essein etal, 2007). This study in the light of the various discourses made about housing matter, will attempt to critically examine the private housing estate development and planning standard in Abuja, Nigeria.

2.0   The Study Area

The study area which is falls within the Abuja Municipal Area Council. This study will covers thirteen private housing estate developers in Abuja Municipal Area Council, in Gwarinpa district Nigeria which are Brookemore international ltd, Urban Shelter Limited, Platinum Ltd, Efab international limited, Citel Nig limited, Badawa Engineering Ltd, Amron Global Services Limited, Trademore intl ltd. Limited, Bettadayz integrated services Ltd, Taheul Estate, Pisha Homes Ltd, and Borealis International limited. All in Abuja Municipal Area Council

3.0   Literature Review
3.1   Housing

Adeniyi (1985), writing on housing in Nigeria, national Development emphasized that housing is a basic need for mankind and that investment in housing has a prominent role to play in the economic and social development of a nation. He noted that the attitude of the government to invest in housing is far from positive and greatly inadequate in relation to the housing needs of the nation. He therefore, calls for a more positive intervention by the government in the provision of adequate housing for the citizen. He noted that the magnitude of the housing problems varies form country to country and city to city.

Berghali (1984), noted that hardly could any nation afford to subsidize low-income shelter extensively enough to meet the scale needed. Housing by is nature stands at the very core of all human activities which is generally recognized as important aspect of the environment as parts of man's environment affect his health, welfare, comfort and dignity more directly than the home in which he seeks shelter and security (Aluko, 2000).

Onibokun (1985), cited that housing in Nigeria is plagued by four (4) main problems namely: Quantitative, Qualitative, Psychological and Socio-Economic problems. He stated further that there are shortages of houses, hence subsequent problems of overcrowding in rooms, over utilization of available facilities and rapid deterioration of available facilities and physical structure of these houses. He noted that natural increase in the country demands additional dwelling units to house the increasing population. He added that the rural-urban migration which has assumed greater proportions during the last two decades has aggravated the housing needs in the urban centres. Finally, he opined that high cost of land acquisition, expensive costs of building materials are all serious problems of housing in Nigeria.

3.2   Global Nature of Housing Delivery System

Housing and its built environment setting are basically co-joined in interaction and complexity, since housing performs an important role as a basic need (UNCHS, 1993) and the built environment remains the context and setting for its existence (Rapoport,1983). To this extent, the impact of housing on the daily lives of the urban dweller becomes an issue. In most cities, housing has become an indicator of the quality of life and a status symbol of family within a society (Mlecnik, et al 2012; Harris, 1998). The economic importance of housing alongside its function and social relevance to man have been a source of intense debate in the last three decades globally Exploratory and empirical studies show that housing delivery systems transcends the fields of sociology, economics, politics, and seldom architecture. The generalized viewpoint is that the architecture of housing emanates inadvertently as a product of other related theories. It is evident in practice that the very nature of housing demands a delivery system for actualization and the product is an architectural expression of space and form, in relation to context within which certain system of activities occur (Rapoport, 2001; Aradeon, 1991).

3.3   Housing Delivery Systems (HDS)

This research as previously stated concentrated on housing the less vulnerable. Those who form the middle income of society with the capacity to translate aspiration into effective demand but are constrained to achieve this objective. Generally, Turner (1972) had reflected similar opinion earlier when he asserted that HDS depends on several organized and institutional services; and this is with variability in the number and complexity of the context of the particular housing. These two definitions expose the complexity of the housing problem. Three factorial variables relevant to HDS identified in the open literature are:

i). the policy objectives; this is in relation to, affordability, viability, accessibility, availability, and adequacy (UNCHS, 2003).

ii)-the process function; in relation to project initiation, land provision, planning and design, financing, authorization, infrastructure provision, building construction, access to occupancy, management and maintenance (Prins, 1994).

iii)-the settings; this is in relation to the housing activity and environment. This is in specific terms of culture and society and in relation to the quality of housing environment (Rapoport, 2001).

3.4   The Nigerian housing market

This is described as general market of houses being purchased and sold between buyers and sellers either directly by owners or indirectly through brokers (Investor world, 2011). It is also defined as the supply and demand for houses, usually in a particular country or region (Housingmarket, 2008). The Real estate marketing involves the sales of the property. The Nigerian housing market is highly untapped and undeveloped despite lot of opportunities that abound in the sector (Akeju 2007). This is basically due to many reasons amongst which include: lack of finance; government policy; lack of infrastructural development and high level of poverty. There is continuous increase in the average price of houses due to increase cost of building materials and inflation in the economy.

3.5   The Concept of Housing Demand and Supply in Nigeria

3.5.1 Housing Need and Effective demand

There is a gap between need for housing and the capacity to acquire the desired housing type, resulting in an effective demand crisis for affordable housing in the country. While it is clear there is a housing deficit, it is crucial to recognize that people can only acquire what they can afford. Affordability analysis shows that low-income earners can afford housing units at N2 million ($13,333.33). This is based on assumption that the borrower is on an average monthly income of - N34,000 ($226) and should spend a maximum of 33% of his gross income on housing. For a 30 year NHTF mortgage at 6% per annum and a down payment of 10%(N200,000 = $1,333) of the cost of the house, the monthly payments will be N10,792 ($71.94). Analysis of the stock of dwelling units helps to understand affordability. As at 1991, the total dwelling units in Nigeria was estimated at 15.2million and more than 70% was in tenement rooms (called face-me-I-face-you). Unfortunately, there is no more recent data available.

3.5.2 Housing Demand

Demand is influenced by several economic factors, such as increased economic activity that has led to increased demand for labour and rural-urban migration. The result is that there are 14 million units of housing deficit in the country. This is about a hundred percent increase when compared to the deficit in 2001.

3.5.3 Housing Supply

Supply of housing units in Nigeria can be viewed from the formal and the informal sectors. The formal refers to supply from the private sector and the various elements of the public sector.

Three major reasons for the inadequate housing supply in Nigeria:

    (i) The shortage of qualified and experienced tradesman has made it impossible for the Nigerian building industry to meet the demand for housing;

    (ii) Difficulty in acquiring land for new construction; and

    (iii) Public housing has not been able to meet the housing demands of Nigerians

3.6 The Current Housing Delivery Approach in Nigeria

In 2003, the federal government also established the Federal Ministry of Housing and Urban Development, and Proposed a Housing Reform, in view of the fact that there were not many affordable houses in Nigeria. There was an illusion that houses were available. But most of them were high-priced. Mabogunje (2004) opined that a number of other legislation needs to be amended substantially to bring their provisions in line with the new housing regime. The touchstone in such reviews is to reduce red-tape and ensure that various legislations are compatible with demands of a free and robust market economy. The period 2003 – 2004 witness a Housing policy that recognized the private sector on the driving seat of housing delivery in the country, the key features of this policy include the placement of the private sector in a pivotal position, for the delivery of affordable houses, on a sustainable basis; assignment to government of the responsibility for the development of primary infrastructure for new estate development; and review and amendment of the Land Use Act to ensure better access to land and speedier registration and assignment of title to developers. Others are the development of a secondary mortgage market, involving the FMBN and the establishment of a new mortgage regime, under the NHF, to facilitate more favourable mortgage terms; and a five-year tax holiday for developers (Thisdayonline, 2009).

3.7 Major Private Actors in Urban Housing Provision in Nigeria.

The public sector alone cannot meet the housing needs for all in the country. The licensed private developers are also major providers of housing to all levels of society in the country. The private sector as broadly referred to here is the amalgam of individuals, small-scale builders, commercial estate developers/agencies, banking and non-banking financial intermediaries, and industrial and commercial organisations that invest in housing with a view to making profit. Therefore, its usage here essentially covers most other forms of housing provision that are not delivered by the government agencies. Major Private Actors in Urban Housing Provision in Nigeria are no others, but the multi-nationalists. These actors include contractors include G. Cappa, Jr Boygues, Taylor Woodrow, Julius Berger and some indigenous contracting outfits.

Recently, some large-scale estate developers (among others: HFP, CITEC, Aima Beach Estate Developers, and Seagate Estate Developers) have joined these in production of residential houses in Nigeria. They also develop serviced plots in especially in Lagos, mostly for the high-income groups. There are quite a number of smallscale contractors that have contributed tremendously to the housing delivery process. Their efforts have been geared towards the production of housing for the middle- and low-income groups. Other private-sector actors include commercial banks like the United Bank for Africa, the Union Bank Nigeria etc. They also include insurance companies like British American Insurance Company PLC and large-scale department stores and trading organizations like United African Company, SCOA etc. Some oil companies have also engaged in the provision of residential houses, either for their staff or for commercial rental purposes. These actors normally cater for the middle-and high-income groups and absolutely no plans for the general masses.

3.8   Implications of Private Sector Involvement in Housing Delivery

The private sector has been responsible for the provision of over 90% of the housing stock in Nigeria (CASSAD, 1993). This is provided in the main by the popular sector (private individuals) rather than the organized private sector. The organized private sector in most cases supplies the middle and upper income groups. It has done little in meeting the housing needs of low-income earners. The popular sector (the informal private sector) provides housing for the poorest households. The greater part of housing provided by the popular sector is non-conventional. They do not comply with established procedures, and are usually constructed outside the formal institutions, and frequently contravene existing legislation.

4.0   Methodology

In carrying out this study, both primary and secondary data sources were employed. After the reconnaissance survey, A total of four hundred and thirteen (413) residents of the thirteen (13) selected residential was randomly selected for the study. And thirteen (13) management staff from the selected estates were also selected purposively for the study. The questionnaire were retrieved and analyzed. Inferential statistics such as mean Value techniques were used to analyze data collected for the study.

5.0 Findings and Discussion

5.1 Levels of Conformity to Local Plans and Building Regulations by Private Developer

This section of the paper reports the results of analysis carried out in pursuance of one the objectives of the study which is to assess the levels of conformity to local plans and building regulations by private developer. The levels of conformity to local plans and building regulations by private developer as shown in Table 1, was gauged through the use of Mean Score analysis. Relative Importance Index (R.I.I.) was also performed to provide further evidence of the levels of conformity to local plans and building regulations.

The results of analysis revealed that developers most complied with levels of conformity to local plans and building regulations are in respect of (i) Standards for residential area (high, medium and low density plots) and (ii) Minimum plot coverage, which were ranked 1st and 2nd. Conversely, least complied with levels of conformity to local plans and building regulations were (a) Education facility and (b) Recreational facility, which were ranked 8th and 9th. It was observed that the general level of conformity was moderate; all eight variables had Mean Score (MS) ranging between 3.83 and 3.69. The overall levels of conformity to local plans and building regulations was 3.69, which corresponded to "moderate" of level of conformity to local plans and building regulations.

Table 1: Level of Conformity to Local Plans and Building Regulations

Levels of Conformity	Mean Score	Std Dev	RII	Rank
Standards for residential area (high, medium and low density plots)	3.83	0.65	0.77	1
Minimum plot coverage	3.81	0.66	0.76	2

Road right of way (access path /foot path , access road (residential)local distributor(residential)	3.72	0.78	0.72	3
Water utilities	3.69	0.73	0.74	4
Solid waste collection	3.67	0.91	0.72	5
Health facility	3.65	0.79	0.73	6
Public facility	3.65	0.87	0.72	6
Education facility	3.63	0.91	0.73	8
Recreational facility	3.62	0.82	0.72	9
Overall level of conformity	**3.69**			

5.2 Challenges Influencing the Performance of the Private Housing Developers

The results in Table 2 revealed that Lack of Secure Access to Land was the most influential Challenges Influencing the performance of the private housing developers (MS = 3.98, ranked 1st). Limited Access to Finance was also considered to be an influential challenge (ranked 2nd, MS = 3.87). Slow Bureaucratic procedures and lack of awareness programmes was the least influential challenge (MS = 3.57 and MS = 3.54, ranked 7th and 8th respectively). The fact that the overall level of challengesdeveloperswas computed as 3.75 was an indication of "High extent" of influence challenges on the performance of the private housing developers

Table 2: Challenges Influencing the Performance of the Private Housing Developers

Challenges	Mean Score	Std Dev	RII	Rank
Lack of Secure Access to Land	3.98	0.73	0.80	1

Limited Access to Finance	3.87	0.79	0.77	2
High Cost of Construction	3.84	0.86	0.75	3
High Cost of Land Registration and Titling	3.79	0.85	0.76	4
Development Control	3.73	0.79	0.75	5
Affordability gap	3.65	0.87	0.72	6
Slow Bureaucratic procedures	3.57	0.98	0.70	7
Lack of awareness programmes	3.54	1.01	0.68	8
	3.75			

5.3   Conclusion

This study concluded based on the findings that majority of the residents in the selected estates were medium income earners. The identified difficulties experienced by the developers includes lack of secure access to land, limited access to finance, high cost of construction, high cost of land registration and titling, development control, affordability gap, slow bureaucratic procedures and Lack of awareness programmes. Also the research concluded that there is moderate level of conformity to local plan and planning standard. Among others the research recommends that the government should provide suitable policy for design policy that will be favorable to the developer and also make housing loan accessible to the masses

References
Adeniyi E.O (1985). "*Housing and the construction industry in Nigeria*" in Nigeria, (Niger publishers), Ibadan.
Akeju, A.A. (2007). *"Challenges to Providing Affordable Housing in Nigeria"*, Paper presented at the 2nd Emerging Urban Africa International Conference on Housing Finance in Nigeria, Abuja, Oct. 17-19, 2007
Aluko, (2000). *"Housing provision and Development in Nigeria: The Dashed Hope of the Hope"*, Paper presented at the National Conference and Exhibition on Challenges of Shelter and Environment for Nigeria in coming Decades (CEE NACCN) organized by college of Engineering and Environmental Sciences, Imo State University, Owerri

Agbola, T. (2004) "Readings in Urban and Regional Planning" *Published by Macmillan Nigeria Limited, Ibadan, Oyo State*, Nigeria. Pp. 179

Aradeon.D.(1991), Architecture and Lifestyle, in Frank Aig-Imoukhuede (ed); A handbook of Nigerian Culture, pp.92-96, Dept of Culture, Federal Ministry of Culture and Social Welfare, Lagos Nigeria.

Aribigbola, A. (2008). "Improving urban land use planning and management in Nigeria: The Case of Akure". *Theoretical and Empirical Researches in Urban Management 3 (9): 1 - 14*

Baffour-Awuah, K.G. and Hammond, F. N. (2014). Determinants of low land use planning regulation compliance rate in Ghana. *Habitat International Elsevier 41: 17-23*

Berghali, O. (1984). "*Formulation of Shelter Strategies*" Proceeding on National Seminar of Formulation of Shelter Strategies Lagos. pg 143-145.

Boamah, A. N. (2010). Urban Land Market in Ghana. A case study of the Wa Municipality. *Urban Landmarks Conference 3(3): 1 – 17*.

Centre for African Settlement Studies and Development. (CASSAD) (1993). Impact of structural adjustment programme (SAP) on housing investment, environmental quality and urban productivity in Nigeria. Research Report. Ibadan, Nigeria: CASSAD.

Essein, G. A., Musa A. and Yacim J. A. (2009). Development Control as a Tool for Sustainable Management of the Federal Capital Territory Abuja .Accessed on 7th October 2012 from http://www.scribd.com/doc/20682227.

Frankfort-Nachmias, Chava ,and David Nachmias(1992). *Research methods in social sciences*, 4th ed. New York: west publishing.

Harris. R(1998) The Silence of Experts: "Aided Self-help Housing"1939-1954.Habitat Int.Vol22, No.2, pp165-189

Housingmarket.org, (2008). Definition of Housing Market. Retrieved from: www.housingmarket.org.uk/ housing /......housing market/08/,).

Investorworld.com, (2011). Definition of Housing Market. Retrieved from: www.investorworld.com/7650/ housing.html

Jiboye, A.D. (2009). Evaluating Tenant's satisfaction with Public Housing in Lagos, Nigeria" *Town Planning and Architecture* 33(4) 239-247.

Jiboye, A. D (2010). Correlates of Public Housing in Lagos, Nigeria. *Journal of Geography and Regional Planning* 3(2) 017-028

Mabogunje A.L. (2004): "Future Planning for Housing and Urban Regeneration-Global Trend" A paper delivered at Kuramo conference, Lagos.

Mba, H.C. (1992). The Dilemmas of Housing Programmes in Nigeria in H. C. Mba, J.U. Ogbazi &K. O. Efobi (Eds.) *Principles and Practice of Urban and Regional Planning in Nigeria*,
Awka: Mekslink Publishers Nigeria, 52-62.

Mlecnik, E., Schütze, T., Jansen, S. J. T., De Vries, G., Visscher, H. J., & Van Hal, a. (2012). End-user experiences in nearly zero-energy houses. *Energy and Buildings*, 49, 471–478. doi: 10.1016/j.enbuild.2012.02.045

Morenikeji, W. (2006). Research and Analytical Methods for Social Scientists, Planners and Environmentalists. Published by Jos University Press Ltd. Jos, Nigeria

Olatubara, C. O. & Agbola, S. B. (1992). Cost Recovery in Nigeria Public Housing. Habitat International, 16(1), 83-94

Olatubara, C.O. and Fatoye, E.O. (2007). Evaluation of the Satisfaction of Occupants of the 279 Abesan Public Low-Cost Housing Estate in Lagos State, Nigeria. The Nigerian journal of Economic and Social Studies 49 (1).

Onibokun, A.G. (1985). Housing in Nigeria, Nigerian Institute for Social and Economic Research (NISER), Ibadan.

Prins, WJ.M. (1994),Urban Growth and Housing Delivery; Past and Present. University of Leiden

Rizwan, H. and Obaidullah, N. (2006). Challenges of Implementing Urban Master Plans: The Lahore Experience. *World Academy of Science*, *24: 101 – 108*

Rapoport A. (1983), Development, culture change and supportive design. Habitat Int. Vol.7, No.5/6 pp 249-268.

Rapoport A. (2001), Theory, Culture and Housing. Housing, Theory and society, Vol.17, pp.145-165.

Tang, B., Choy, L.H.T. and Wat, J.K.F. (2000). Certainty and Discretion in Planning Control: A case Study of Office Development in Hong Kong. *Published by SAGE on behalf of Urban Studies Journal Foundation 37(13): 2465 – 2483*

Thisdayonline (2009): Mortgage Institutions in Nigeria

Turner J.F.C. (1972) Uncontrolled Urban Settlement: Problems and policies; in The City in Newly developing conditions, Breese, G (ed) Prentice Hall.

Ukoha, O.M. and Beamish, J.O (1997). Assessment of Residents Satisfaction with Public Housing in Abuja, Nigeria. *Habitat International* 21(4) 445-460.

UNCHS (1993) National trends in Housing-Production Practices Vol.4.Habitat, Nairobi, Kenya.

UNCHS, (1996). An Urbanising World: Global Report on Human Settlements 1996, Oxford University Press,

UNCHS, (2003). The Challenge of Slum: Global Report on Human Settlement 2003, First published in the UK and USA in 2003 by Earthscan Publications Ltd, Nairobi, Kenya

UN-HABITAT (2003). "The Challenges of Slums." *UN-HABITAT's new Global Report on Human Settlements.* http://www.unhabitat.org/global_report.asp

Wang, H., Tao, R., Wang, L. and Su, F. (2010). Farmland Preservation and Land Development Rights Trading in Zhejiang, China. *Habitat International 34: 454-465*