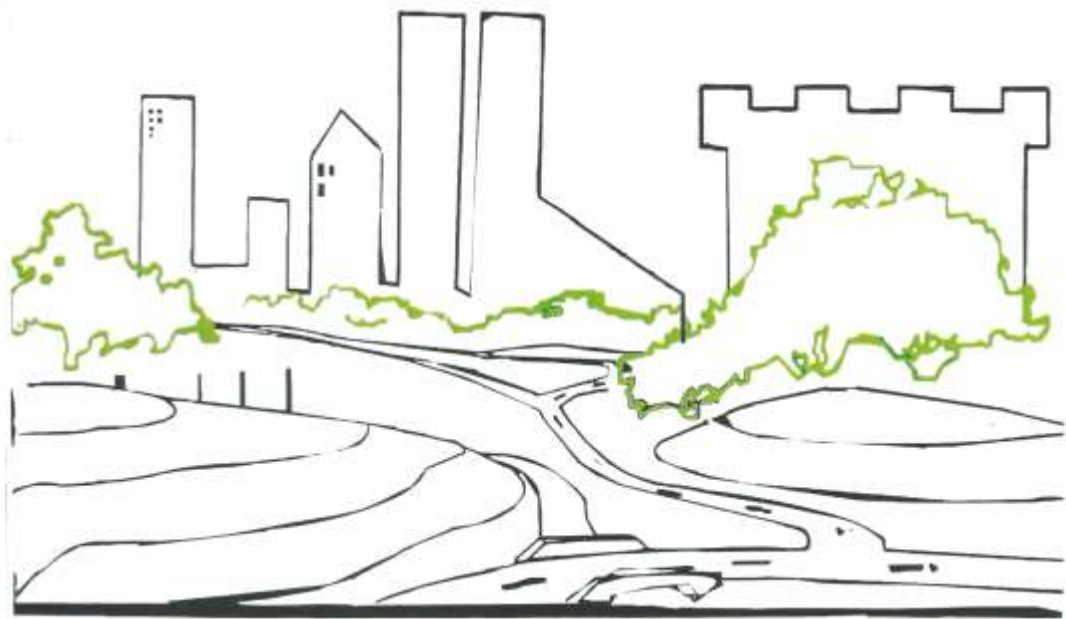


# JOURNAL

## OF ENVIRONMENTAL DESIGN (JED)

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*A Journal of Faculty of Environmental Studies, University of Uyo, Uyo, Nigeria*  
Vol. 18, NO. 1, February, 2023



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**Faculty of Environmental Studies,  
University of Uyo, Uyo, Nigeria**

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## **EDITORIAL COMMENTS**

Welcome to yet another volume of the Journal of Environmental Design. Volume 18 of the JED contains several thought-provoking well researched papers on the various dimensions of the built environment. It must be stated that environmental problems in general have become intricate phenomena requiring a wide range of interests and experts in their planning, management and design. The JED continues in its 17th volume to highlight the works of these experts and presents their informed views and cutting edge research findings for the benefits of policy makers and students of environmental studies. The papers have been peer-reviewed and carefully selected to ensure intellectual balance and intelligent discourse.

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**Biography:** The manuscript should include; on a separate page or the "first" title page described above a sentence listing each author's name, and affiliation.

**Abstract:** Include a one-paragraph abstract *not exceeding 250 words* and place it on the first page of the text. The abstract describes the issue(s) or question(s) the paper addresses and states the major findings, conclusions and recommendations.

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## EVALUATION OF TRICYCLE USAGE AS A MEANS OF FREIGHT TRANSPORTATION IN MINNA

<sup>1</sup>Ajiboye, A. O.; <sup>2</sup>Ohida, M. E.; <sup>3</sup>Ezeh, B.; <sup>4</sup>Yakubu-Wokili, H. & <sup>5</sup>Abubakar, I.D.

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### ABSTRACT

*The importance of moving cargo from the point of production to the point of demand cannot be overstated. Tricycles are now commonly used to move freight due to the shift of taxi services and issues affecting freight carriers in the hinterland. The aim of this study is to assess tricycle operations as a means of freight carrier in Minna. The authors gathered information from 120 operators in Minna through a convenience sampling. In addition, in-depth interviews were conducted among tricycle freight operators. The data gathered was analyzed with the aid of chat and percentages while product moment correlation were used to test the hypothesis. The findings of this study, among other things, show that parking issue, high fuel prices, and high cost of spare part acquisition are the challenges faced by tricycle freight operators. Other challenges face is that most of the time they are ignored by the prospective customers. Furthermore, the study result indicate that there is a statistically significant relationship between the problem faced by operators and 4-key service performance of tricycle freight operations in Minna. In conclusion, tricycles as a freight carrier are prospering in Minna despite the challenges face in their operations. The authors concluded with a suggestion, among others, that price regulation policy should be enacted by the government in other to control cost of spare-parts, fuel and other tricycle relating expenses in other to keep cost of freight transport at a minimal level, through regulation and cooperative enforcement.*

**Keywords:** Operators, Freight, Carrier, Customers, Service, Parking

### INTRODUCTION

Over the years, man has moved from one location to another in search of comfortable life and transport has always made man to achieve the desire of changing vicinity. In the same manner, economic growth has been fascinated with the advent of improved transport. Rodrigue (2017) commented that people, goods, and information have always moved around in society, and this has made transportation an essential part of its economic and social life. As urban area continues to expand so the need for mobility become changing and increasing in mobility challenges in the urban area. Recently, there is a shift in road mode from the use of taxi to tricycle usage for passenger and freight movement as a result of the economic situation in the country (Ajiboye, et. al, 2021). In fact, the traditional motorized road vehicle utilized for transporting cargoes were vans, trucks and trailers. However, the paradigm shift has led to the use of tricycle as a mean for freight carrier within the urban areas.

Three-wheeled cargo cycles, referred to as freight tricycles, can be wholly pushed by a human being, motorized engines, or electric aid. They are different from conventional passenger bicycles and tricycles in that they are made to transport goods in open or closed containers or on a flatbed (New York State Energy Research and Development Authority (NYSERDA), 2014). These vehicles can move a wide range of small items over short distances. Although freight tricycles have been a typical mode of transportation in western countries since the 1800s, they have received little attention as a distinct mode of travel. However, they exhibit several qualities that are advantageous for operation in modern cities: they emit less carbon monoxides, take up little space for parking and movement, and travel at slow speeds that are safe for pedestrians and bicycles. As a result, they have recently grown in popularity worldwide, including Europe and the United States.

Tricycle use in Nigeria began with the introduction of the tricycle as a means of passenger transportation in Lagos state by General Mohammed Marwa's led administration. Later, tricycle use becomes commonplace in the majority of Nigerian cities. Although the regime of the former Governor of Niger State, Babangida Aliyu Talba in 2013 was the first to introduce the use of tricycles in Minna, there are over 3000 tricycles operating in the city (Ajiboye, et. al 2021; Niger State



Ministry of Transport). Many works have been done on tricycles as a means of public transportation generally across the globe and in Nigeria in particular (Ajiboye, et. al 2021; Abdul-Azzez and Ajiboye, 2019; Isaac et. al, 2020; Muktar et. al 2015 and Nwaogbe et. al 2012).

In Europe for instance, the United Kingdom, Netherlands, and Germany, tricycles are used for delivering mails (Becker and Behrensen, 2021; Gruber et. al, 2015; Choubassi et al. 2016). In fact, the three-wheeled Christiana bike in Copenhagen, Netherlands has been revived to strengthen freight operations (Becker and Behrensen, 2021). It can be claimed that the transition from taxi to tricycle operation led to the usage of tricycles as a mode of freight carriage and cargo distribution in Nigeria. There is a state of vehicular congestion because most freight vehicles that can transport goods into or out of the city can be found near the commercial areas of Minna. Such as Mobil, Kpakungu, Kure Market, Gidan-Kwano, Garatu, and Tunga.

Minna has experienced many traffic issues relating to tricycle operations particularly in the areas of accidents, congestion, high cost of spare parts acquisition, load capacity, moderate operating speed, parking and other issues resulting to ineffective operations of tricycle (Ajiboye, et. al, 2021; Mohammad, 2009; Raji, 2012). However, effort has been made by the government through her agencies (VIO and FRSC) to reduce these issues particularly in the area of traffic accidents and congestion but government endeavors are yet to achieve the required results as the problem of high cost of fuel and its impact on operational performance, higher cost of acquiring spare part/scarcity, parking difficulties and inaccessible to customers are still common among tricycle freights carriers. It is significant to know that an effective tricycle freight carrier operation will enable ease of accessibility and delivery of freights like groceries in Minna hinterlands. It is against this background this study seeks to evaluate tricycle usage as a means of freight transport in Minna. The study proposed one null hypothesis which was stated as follows; there is no significant relationship between the problems faced by tricycle freights operators and four key service performance of tricycle freight operations in Minna.

## **REVIEW OF RELEVANT LITERATURE**

Despite the need to promote lighter freight vehicles like tricycles over heavy ones, which are notorious for being major contributors to traffic jams, accidents, and other types of vulnerabilities, these three-wheelers also present environmental and social challenges like noise, fine particle emission, inadequate load factor, and a lack of parks and terminals on designated routes for hitch-free conveyance of freight (Ismail et al, 2018). According to Ogunsanya (1983), on average, 1% of freight vehicles cause around 2% of the problems with delays. However, freight tricycles have a number of significant drawbacks. The cargo and volume capacity of a tricycle are constrained. When the cargo weight, volume, or both exceed the trike's carrying capability, freight cannot always be transported by tricycle. Additionally, its range of movement is constrained, and under free-flow conditions, its travel speed is considerably slower. The inadequacy of terminal facilities for the loading and unloading of cargo has been noted by Ojekunle (2004) as a significant issue in managing and controlling freight traffic in metropolitan areas. Because of this, tankers, trailers, and other large vehicles are frequently parked on the sides of the road, blocking traffic. Another significant impact of freight vehicles in urban transportation has been noted as traffic accidents.

According to the Federal Motor Carrier Safety Administration (2007), large trucks have relatively low crash rates, they can nevertheless cause severe injuries to other road users when they do crash, which results in relatively high expenses per vehicle mile. Tipagornwong and Figliozzi (2014) compared freight tricycles, which are low-capacity delivery vehicles, to diesel vans in Portland's metropolitan neighborhoods to determine which was more competitive. The findings offered fresh perspectives on the characteristics of last-mile delivery and the logistical limitations that can compromise the competitiveness of tricycles. Urban legislation and design elements like on-street speed restrictions and parking regulations were responsive to the competitiveness of freight tricycles.

In order to determine the level of preference for tricycle services, operational trend, and inadequacies, Ismail et al (2018) sought to evaluate the operation of tricycles that have grown over the years in

Lokoja. Their findings showed that the respondents highly preferred tricycles due to their adaptability, cost, and inter-street services. The impact of tricycle transportation business system to the growth and development of the local economy of Wa Municipality in Ghana was researched by Sulemana et al (2019). According to the findings, tricycle transportation increased mobility for the underprivileged and vulnerable populations who do not have access to their own personal transportation. Distributors have used it as a way to save costs on final delivery. The final project report by New York State Energy Research and Development Authority (NYSERDA, 2014) aimed to fill the knowledge gap on cargo cycles and freight tricycles in North America and in New York City (NYC). The study's findings show that cycles and tricycles operators believe that, on average, freight tricycles spend much less of their journey time halted than trucks do, despite the fact that delays for freight tricycles are often higher than average in areas with a high density of intersections.

However, reviewed literature have shown that there exists a gap in the area of condition of tricycle freight carriers, travel time, customers' demand for service per day, high cost of fuel and higher cost of acquiring spare part/scarcity. Which this study has come to fill. And also showing the linkage between the problems faced by tricycle freights operators and the performance of tricycle freight operations in Minna.

## **METHODOLOGY**

### ***Population and Sample size***

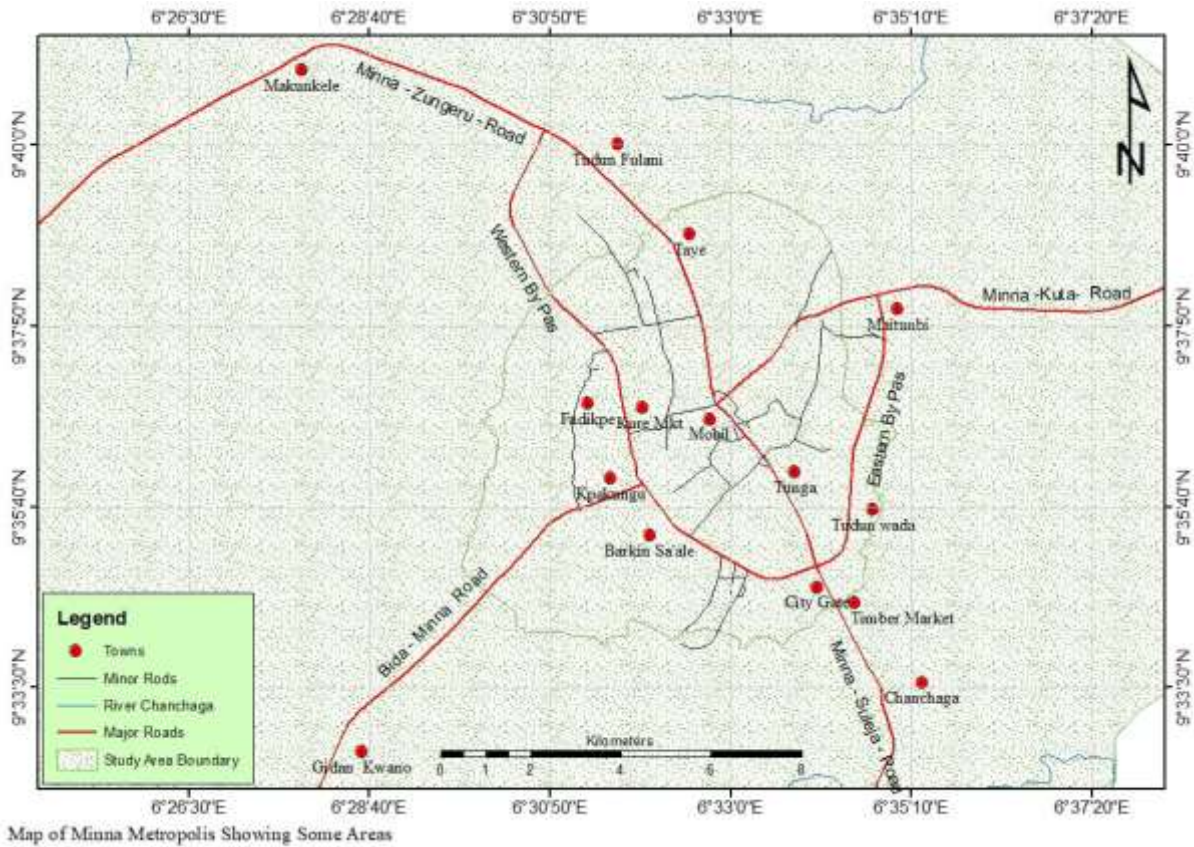
The population of this study comprises of tricycle freight operators in Minna. Systematic sampling method was utilized to pick 10 neighborhoods (i.e., Fadikpe, Tudun Fulani, Tunga, Barkin Sa'ale, Katerin gwarri, Bosso low cost, Tudun wada, Gidan Kwano, Kpakungu, and Taye) in Minna Local government area. Also, convenience sampling was finally utilized to administered 120 questionnaire to the chosen respondents.

### ***Method of data collection and Analysis***

This study utilized questionnaire survey for the data collection. The questionnaires used comprises of three sections (I, II, and III). The first section comprises of sociodemographic features of the tricycle freights operators, section II consists of performance of tricycle operations while the section III comprises of the problems and challenges faced by freight tricycle operators in Minna. The sections II and III were rated on 5-point Likert scale, in the scale 5 represents strongly disagree and 0 represents strongly disagreed. The data used for this study was gathered from tricycle freight operators. However, figures, frequency, and percentage was used to analyze the data gathered while Pearson product moment correlation were utilize to test the test the hypothesis.

### **The study area**

Minna is a city in North-central Nigeria and the capital of Niger state. Nupe and Gwari's are the two major ethic groups in Minna. The economy of Minna is supported by cotton, guinea corns, ginger, and yam. Cattle business, brewing, shea-nut, and gold mining also provide an underpin to Minna economy. As at 2006, the population of Minna was at 305,000 peoples (NPC, 2006). Traditional industries and crafts in Minna include leather work and metalworking. In the aspect of transport, Minna is connected to neighbouring cities by road. Minna is also connected by railroad to both Kano in the north and Ibadan and Lagos in the south which is also bordered by Ilorin city. The city is served by Minna airport. Because of the developed agricultural business in Minna as well as the growth in population have increased the need for freight transports around Fadikpe, Barkin Sa'ale and so on. Figure 1 below shows the map of the study area.



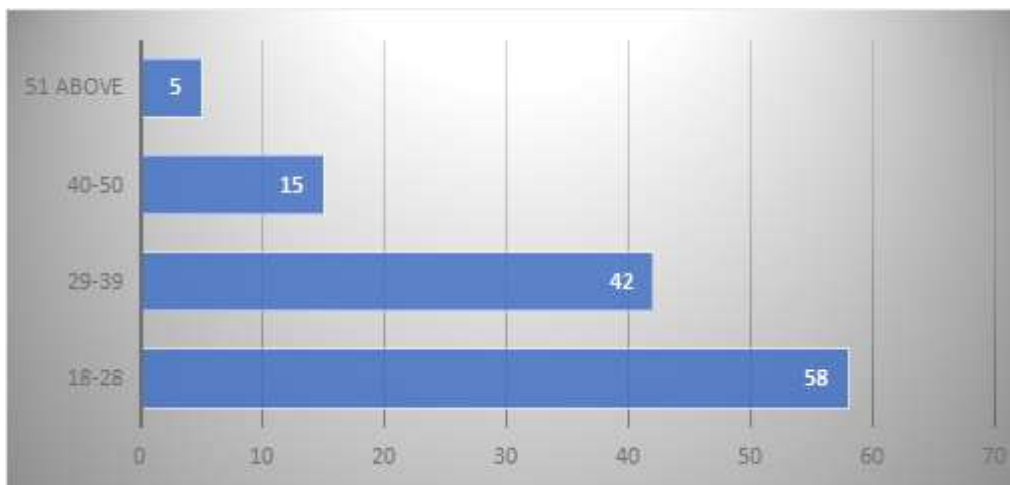
**Figure 1:** Map of Minna Showing some areas.

**Source:** Authors field survey

**RESULT AND DISCUSSION OF FINDINGS**

The analysis of the socio-demographic features of the operators, the problems faced by operators in operating tricycle for freights-carrying, challenges of tricycle freight operation, tricycle freight transport performance in Minna, the condition of tricycle and freight carried and hypothesis testing was discussed in this section.

*Analysis of Socio-demographic features of Operators*



**Figure 2:** Age of the Respondents

**Source:** Authors’ Survey

The age distribution of the operators is displayed in figure 2. According to the statistics, the majority of operators (i.e., 58 respondents) fell into the 18–28 age range, followed by those in the 29–39 age range (i.e., 42) of operators. Only 5 operators were over the age of 51, with about 15 operators falling in that age range. The analysis on the age of the tricycle freight operator is an indication that majority of freight operators were in their youthful age of 18 and 39 years.

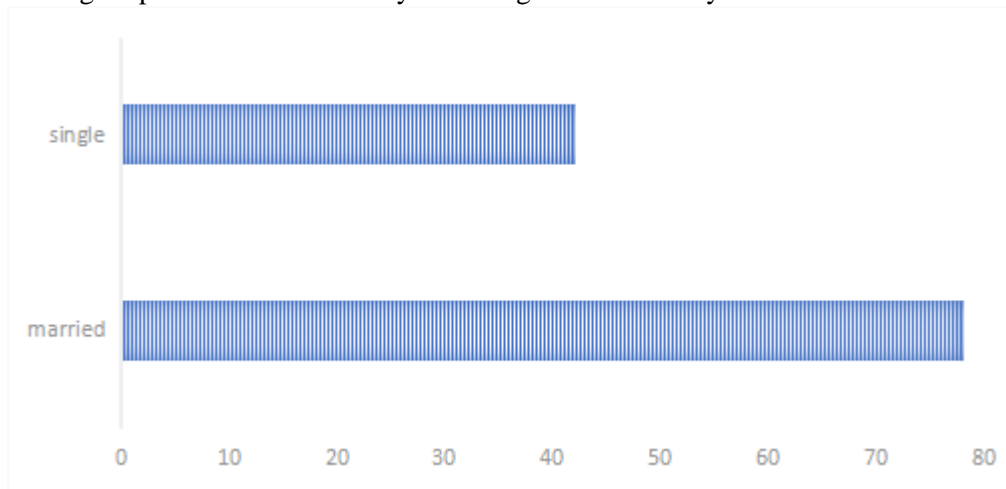


Figure 3: Marital Status of the Respondents  
Source: Authors' Survey

The marital status of the operators is shown in figure 3. According to the figure 3, only 35% (i.e., 42) of the operators were still single, while as many as 65% (i.e., 78) of the operators were married. This outcome is a revelation that there are more married people operating tricycle freight carriers in Minna.

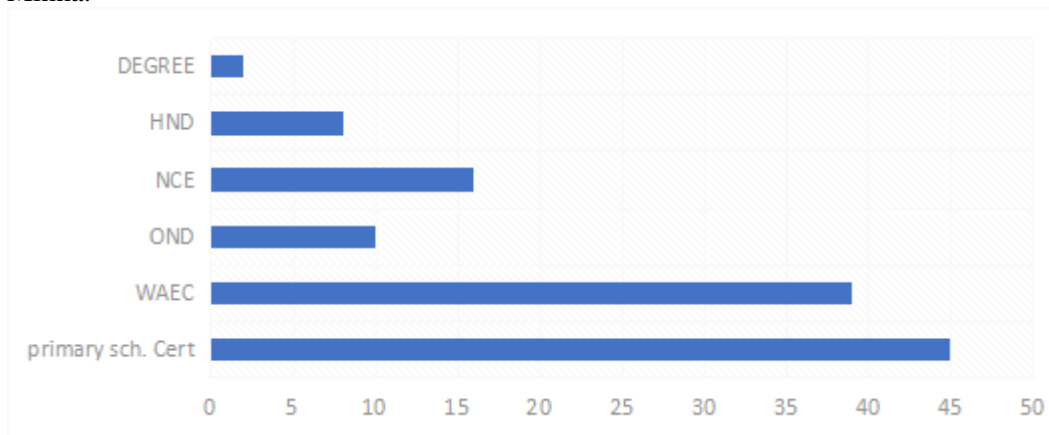


Figure 4: Educational background  
Source: Authors' Survey

The respondents' educational background is shown in figure 4. However, the data shows that 45 respondents had a basic school certificate, 39 respondents who operate a tricycle to transport goods had a West Africa Education Certificate, 10 respondents had an OND, 16 respondents had an NCE, eight respondents had an HND, and only two respondents had a degree certificate.

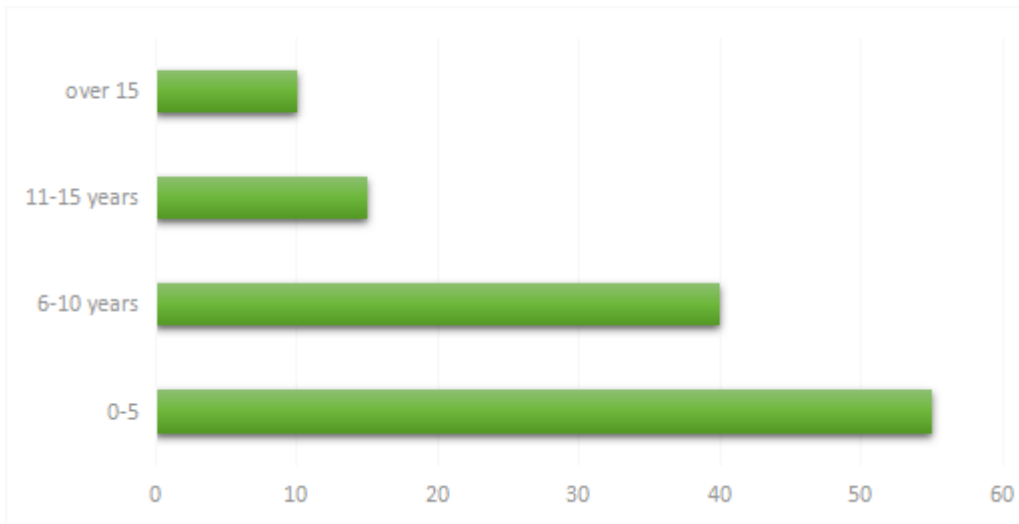


Figure 5: Years of riding experience  
Source: Authors’ survey

The respondents' years of experience are listed in figure 5. It shows that fifty (55) operators had less than five years of trike riding experience, 40 respondents had between six and ten years, 15 respondents had between eleven and fifteen years, and 10 respondents had more than fifteen years.

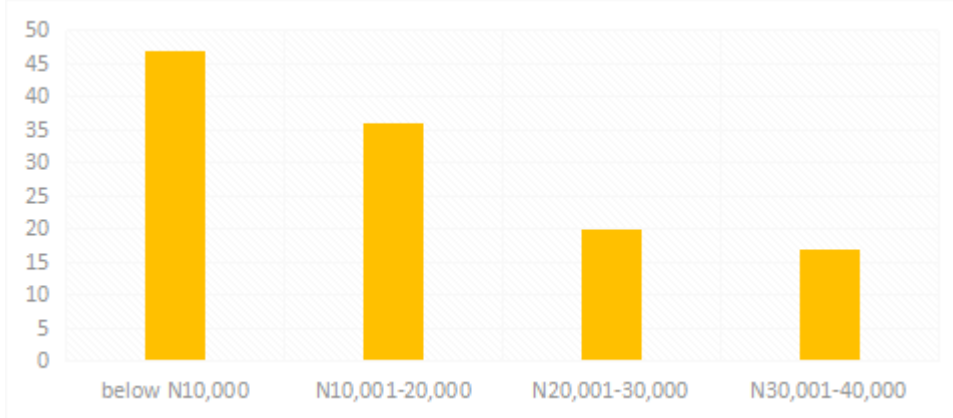


Figure 6: Amount Earned Monthly  
Source: Authors’ Survey

According to figure 6, which displayed the respondents' monthly incomes, about 47 respondents believed that their monthly incomes fell between N50,000 and N10,000, 36 operators believed that they earned between N10,000 and N20,000, 20 respondents believed they earn between N20,000 and N30,000, and only 17 respondents believed they were between N30,000 and N40,000.

*Analysis of the Problems Faced by Operators in Operating Tricycle for Freights-Carrier*

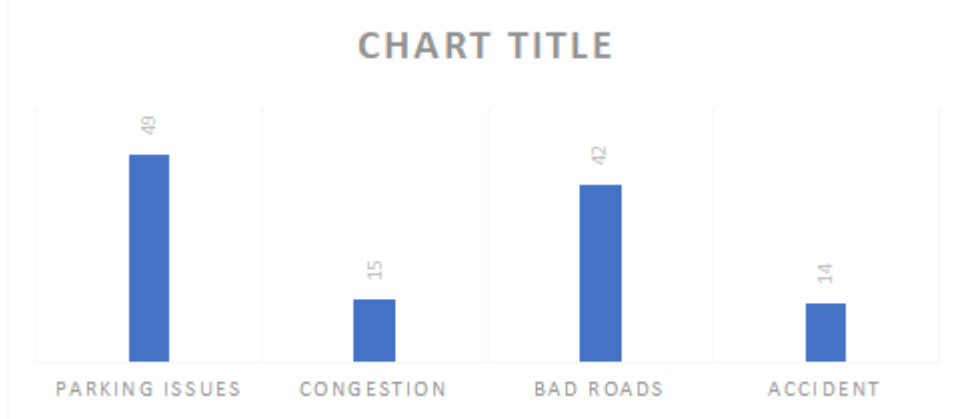


Fig. 7: Issues of Tricycle Freights-Carrier  
Sources: Authors’ Survey

The issue with tricycle freight-carrier operations was depicted in Figure 7. It is clear from the data that the majority of the respondents (49) said they had parking issues, while 42 claimed poor roads were the biggest issue. Congestion (15) and accidents (14) had the lowest proportion of respondents who said they had problems during operations.

**Challenges of Tricycle Freight operation.**

The analysis in Table 1 reveals the challenges of tricycle-freight carriers. 56 respondents concluded that they face the challenge of high cost of fuel and it impacts the cost of freight transport in Minna. This revelation is in line with the work of Hanif and Kaluwa (2016) that Malawi faced logistics challenges resulting from high transportation cost.

Table 1: Distribution of Respondents Responses on the Tricycle Freight Operations Challenges

CHALLENGES	Options	Frequencies
High cost of fuel and its impact on operation	Strongly Agree	43
	Agree	56
	undecided	18
	Disagree	3
	N	120
Higher cost of acquiring spare part/scarcity	Strongly Agree	49
	Agree	61
	Neutral	10
	N	120
Parking difficulties	Strongly Agree	15
	Agree	44
	undecided	13
	Disagree	21
	Strongly Disagree	27
	N	120
Inaccessible to customers	Undecided	40
	Disagree	46
	Strongly Disagree	34
	N	120

Source: Authors’ Survey

The cost of transportation for cargoes constitutes 50% of logistics cost in South Africa, this cost is considerably higher than the world average cost of transportation (Havenga et. al, 2009; Rodrique et. al, 2009). Tricycle freight carriers distribute freight to the interior of Minna and for customers to get their cargoes on time they tend to pay higher. Similarly, table 1 above shows that 61 respondents agree that the cost of acquiring spare parts is high in Minna. This is supported by Ajiboye et. al (2020)

findings that tricycle spare parts in Minna are expensive and not readily accessible in Minna. Furthermore, table 1 above recorded that about 44 tricycle-freight operators agree that they face parking difficulties in Minna. However, tricycles are parked on the streets in Minna and this constitutes traffic congestion around the study area. On-street parking exist as a result of inadequate space for vehicle parking. Parking problem is a complicated and long-term issues in developing countries which cannot be totally eliminated but managed (Asiyanbola and Akinpelu, 2012). Moreover, majority (46) of the response recorded on table 1 indicate that tricycle-freight carriers are easily accessible.

***Analysis of Tricycle freight transport performance in Minna.***

The analysis of freight tricycle travel time per trip in Minna can be seen in table 2. From the analysis 35% of freight tricycle operators agreed that they spent an average of 10-20 minute for each trip, 30.8% of them said they spent between 21-30 minutes for each trip, 20.8% of them spent less than 10 minutes per trip and only 12.6% of them spent more than 31 minutes for each trip.

Table 2: Respondents distribution on freight Tricycle Travel Time per trip in Minute

<i>Tricycle travel time per</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Less than 10</i>	25	20.8
<i>10-20</i>	43	35.8
<i>21-30</i>	37	30.8
<i>Above 31</i>	15	12.6
<i>Total</i>	120	100.0

Source: Authors' Survey

Table 3: Respondent Distribution on Numbers of Customers Demanding for their services per day

<i>Numbers of demand for their services per day</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Below 15</i>	19	<b>15.8</b>
<i>15-20</i>	28	<b>23.4</b>
<i>21-25</i>	24	<b>20.0</b>
<i>Above 26</i>	49	<b>40.8</b>
<i>Total</i>	120	<b>100.0</b>

Source: Authors' Survey

The analysis in table 3 reveal that about 40.8% of the operators had over 26 customers demanding for their service per day, 23.3% of them said they have between 15-20 customers demanding for their services per day, 20% of them had between 21-25 customers per day and only 15.8% of them had less than 15 customers demanding for their services per day.

Table 4: Respondents distribution on Amount Delivered/Made weekly

<i>Amount Delivered per week</i>	<i>Frequency</i>	<i>Percentages</i>
<i>Below N5000</i>	3	2.5
<i>N6000-10,000</i>	17	14.2
<i>N11,000-15,000</i>	30	25.0
<i>N16,000-21,0000</i>	50	41.7
<i>Above N22,000</i>	20	16.6
<i>Total</i>	120	100.0

Source: Authors' Survey

From table 4, it can be observed that 41.7% of the operators deliver/make ₦16,000-21,000 weekly, 25% of them deliver/make between ₦11,000-15,000 per week, 14.2% of them deliver/make around ₦6,000 and ₦10,000 per week. Similarly, it was recorded in table 4 that 16.6% of the operators deliver/make over ₦22,000 weekly and only 2.5% deliver/make less than ₦5,000 per week.

Table 5 Respondents Distribution on Numbers of deliveries made per day.

<i>Numbers of deliveries made per day</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Less than 10</i>	14	11.7
<i>11-20</i>	32	26.7
<i>21-30</i>	21	17.5
<i>More than 31 deliveries</i>	53	44.1
<i>Total</i>	120	100.0

Source: Authors' Survey

The analysis in table 5 indicate that 44.1% of the operators had more than 31 deliveries per day, 26.7 of them have 11 and 20 deliveries per day, 17.5% of them had between 21-30 deliveries per day and only 11.7% of them has less than 10 deliveries per day.

***Analysing the Condition of Tricycle and Freight carried***

In Minna, tricycles are employed as freight-carriers to move agricultural items (such as rice, beans, pepper, and corn), building supplies, firewood, baked goods (such as bread and cakes), and a variety of other goods across the city's markets, construction zones, and interiors. In Minna Metropolis, tricycles (Suzuki Model) are primarily used to transport agricultural products, firewood, and building supplies. Although the operators had a market they already served, unlike passenger tricycle-carriers who are trying to operate both freight and passenger service, they are not used for passenger service. Compared to the Bajaj model, which is used as a passenger carrier, the Suzuki tricycle model is larger. In truth, the outward appearance of the freight carrier tells the whole story; some are covered to shelter the freights, while others are left uncovered when carrying fire-related cargo or freights unaffected by weather conditions (such as rain)—see Plate 1



Plate1: The Physical Condition and Nature of Freights Carried

Source: Authors' Survey

Additionally, a significant portion of the Suzuki Model Tricycle freight-carriers in Minna are outdated, noisy, and have slower acceleration, which deters customers. In fact, operators claim that the Mini pickup known as the Hijet, with its acceleration and ease of maneuvering in curves while laden, is their main rival when it comes to moving average-sized freight. On the other hand, Bajaj



tricycles, which drivers use to transport both passengers and freight, are generally used to transport light construction freights like asbestos (see Plate 2).



Plate 2: Tricycle used for transporting Asbestos to the construction Zones  
Source: Authors' Analysis

Although the design is for a passenger-carrier with a shelter to give its clients protection. This passenger tricycle was primarily utilized for the delivery of the company's products by some bread bakers in Minna's interiors (see plate 3). In contrast, market vendors, particularly those involved in the sale of peppers, sweet potatoes, and vegetables, used passenger tricycles to transport themselves and their wares from the market to residences and vice versa (Plate 4).



Plate 3: The Physical Condition and Nature of Freights Carried  
Source: Authors' Survey



Plate 4: Showing the Physical Condition and Nature of Freights Carried  
 Source: Authors’ Survey

#### 4.7 Test of Hypothesis

The study tested one null hypothesis which was stated as follows; there is no statistically significant relationship between the problems faced by tricycle freights operators and four key service performance of tricycle freight operations in Minna. The four key service performance utilized for testing the hypothesis are customer demand per day (i.e., customerdp), travel time, amount made per week (i.e., Amountmpw) and numbers of deliveries per day (Deliveriespd). The outcome of the hypothesis can be seen in table 6.

Table 6 recorded the correlation outputs. From table 6, it can be concluded that there exists a statistical link between Problems faced and the four key freight tricycle performances (i.e., Customer demand per day, Travel Time, Amount made per day and Deliveries per day) since the P-value (0.05) is greater than table Values (Customerdemandpd= 0.003; Travel time =0.005; Amount madepd=0.008; and deliveriespd= 0.002). Then the alternative hypothesis is accepted that there exists a statistical correlation between the problem faced by tricycle freight carriers and its performance.

Table 6: Test Results

	<b>Probfaced</b>	<b>Customerdp</b>	<b>Travel Time</b>	<b>Amountmpw</b>	<b>Deliveriespd</b>
<b>Probfaced</b>					
Pearson correlation	1	-.195**	-.102**	-.231**	.042**
Sig. (2 Tailed)		.003	.005	.008	.002
N	120	120	120	120	120
<b>Customerdd</b>					
Pearson Correlation	-.195**	1	.873**	.677**	.304**
Sig. (2 Tailed)	.003		.000	.000	.000
N	120	120	120	120	120
<b>Travel Time</b>					
Pearson Correlation	-.102**	.873**	1	.788**	.497**
Sig. (2 Tailed)	.005	.000		.000	.000
N	120	120	120	120	120
<b>Amountmpd</b>					
Pearson Correlation	-.231**	.677**	.788**	1	.567**
Sig. (2 Tailed)	.008	.000	.000		.000
N	120	120	120	120	120
<b>Deliveriespd</b>					
Pearson Correlation	.042**	.304**	.497**	.567**	1
Sig. (2 Tailed)	.002	.000	.000	.000	
N	120	120	120	120	120

Source: Authors’ Survey

## CONCLUSION AND RECOMMENDATIONS

This study on evaluation of tricycle usage as a means of freight transport in Minna focused on identifying the problems facing tricycle freight operations, its challenges, service performance, the nature of freight and physical condition of the tricycle. The study also determines the relationship between the problem faced during operation and service performance. From the analysis, it was concluded that the parking issues and bad road are the major problems facing the use of tricycle as freight carriers in Minna. It was also concluded that high cost of fuels, high cost of spare-parts, poor condition of township roads, parking difficulties and inaccessible to customers are the challenges facing tricycle freight operation. Despite these challenges, tricycle as a freight carrier is thriving in Minna.

The authors therefore recommended the following solutions:

1. Price regulation policy should be enacted by the government in order to control cost of spare-parts, fuel and other tricycle relating expenses in order to keep cost of freight transport at a minimal level.
2. The government of Niger state through its agency should maintain roads in Minna. Potholes should be filled so that tricycle freight carrier can have smooth operations.
3. Parking difficulties at major junction in the city can be reduced by state government through the eradication of on-street business and road side parking.
4. Taxi services should be encouraged and re-introduced so that long distance journey made by tricycle is reduced. This will further reduce accident rate among tricycle operations in major roads.

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## GIS-BASED RISK ASSESSMENT IN THE TRANSPORTATION OF HAZARDOUS PETROLEUM PRODUCTS BY ROAD ACROSS A DENSELY POPULATED URBAN CENTRE IN NIGERIA

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### Abstract

Hazmat products transportation requires safe condition without significant risk to human and environmental health. This research employed Geographical Information System (GIS) a risk-based model for the identification of the least-risky routes in the transportation of hazardous petroleum products across the city of Ogbomoso, Oyo State, Nigeria. The risk considered in the model is basically population exposure since the safety of lives and properties is paramount. Global Positioning System (GPS) device was used to track the freight route to identify potential risk points in the study area. ArcGIS 10.5 was used to plot the tracked point data, performed buffer operation to determine the different risk level at 800meters (m) and query distance measurement. The produced risk map was overlay over Land Use Land Cover (LULC) types to determine the level of population exposure. Kernel density was used to calculate a magnitude per-unit area from point or polyline features using a kernel function to fit a smoothly tapered surface to each point or polyline. Valued attributes were selected and assessed using a buffer area of 800metres. The results revealed that substantial number people living within the exposure area are at risk of hazardous material disaster in addition to loss of properties of high economic value. The study developed alternative routes to reduce the population exposure risk to be use in the transportation of hazardous materials across the city. The result of this study could enhance sustainable planning of transporting hazardous hydrocarbon products within metropolis at minimal risk level.

**Key words:** Hazardous; Materials; Road; Transport; Risk; Assessment; GIS; Population

### Introduction

Over the years, the rate of domestic consumption of refined petroleum products has increased in Nigeria. According to the Nigerian National Petroleum Corporation (NNPC) annual report (2014), the average daily refined petroleum product distribution increased from 29.9 million litres in 2008 to 58.6 million litres in 2013. The 2008 figure was more than doubled in 2014, giving an average of 64.4 million litres. In Oyo state where the study was carried out, the total distribution to the state in 2014 was 1.35 billion litres, giving an average of 3.7 million litres daily (NNPC 2014 Bulletin). In Nigeria, the distribution of dangerous petroleum products to the various filling (gas) stations is mainly done by road. This is as a result of poor connection of rail transport with consuming areas. In Nigeria, refined petroleum products are transported from the refineries through a network of pipelines, coastal (marine) vessels, road trucks and rail wagons to the Twenty One (21) regional storage/distribution depots, spread across the country. It is from these depots that the various marketing companies obtain their supplies. The major marketers account for 70% of products distributed in 2008, according to data from the Nigerian National Petroleum Corporation (NNPC, 2008). Given the volume of petroleum product consumed in the country and the use of road as major mode of transportation, societies have become a source of concern, considering the hazards associated with the product freight. Cases of burn arising from frequent accidents of the vessels are now a common scenario resulting in loss of life and alteration of the environmental chemistry including soil and water resources (Chen, Wood, and Zhao, 2019).

Dangerous goods are hazardous substances defined by the Dangerous Substances Act as dangerous (Workplace Health and Safety Act, 2008). Dangerous and hazardous goods are classified on the basis of immediate physical or chemical effects that may impact on people, property or the environment – explosive, flammable, corrosive, chemically reactive, highly combustible, acutely toxic, radioactive or infectious. These hazardous and dangerous goods pose a certain risk either to people, property or the environment.

Risk is the probability (likelihood) of harm or damage occurring from exposure to a hazard, and the likely consequences of that harm or damage. Dangerous goods are a specific part of all goods. A lot of dangerous goods in Nigeria are transported as transit goods by different modes. According to Batarliené (2008), about 25% of goods transported by roads are hazardous. In case of rail, it is about 55%; by pipeline, it is 100 %; by water transport, it is 55 % while only about 1% of goods transported by air are dangerous.

Hazardous or dangerous goods are such goods that have the potential to cause harm to people, property, or the environment (Erkut, et.al., 2007; Khan, et.al., 2021). They include highly flammable petroleum products like petrol, diesel liquefied natural gas, corrosive substances like acids, factories' toxic wastes, and various air and water pollutants (Oasmaa, et.al., 2012). In Nigeria, the movement of hazardous petroleum products is known to be associated with several life-threatening risks. An account that perfectly captures this situation was the Ibadan tanker truck explosion, one of the worst ever multi-vehicle accidents, killing about 200 people near Ibadan on November 5, 2000. The accident occurred outside Ibadan, on a stretch of motorway connecting Ibadan and Ife to the Eastern Nigeria. Another recent tanker explosion accident happened in Nigeria in the megacity of Lagos on the Otedola Bridge where nine (9) lives were lost with fifty four (54) vehicles burnt beyond recognition on July 2, 2018 (FRSC, 2018).

Considering the Nigeria tanker traffic situation as highlighted earlier, statistics show that whilst the number of deaths from crashes involving buses fluctuates each year, estimates of casualties of tanker explosions have remained on the increase in recent times. Transportation risk analysts have blamed this scourge on the over-reliance of the Nigerian National Petroleum Corporation (NNPC) and Pipeline and Products Marketing Company (PPMC) on the road mode for the distribution of petroleum products without giving due consideration to the environmental consequences.

Fuel tanker transportation, otherwise known as fuel trucking, is an important dimension of cargo transport in Nigeria. It has become, more or less, an indispensable medium for transporting domestic and industrial fuel. Therefore, tankers and other trucks provide important freight transport services across Nigeria with a greater number carrying highly inflammable products like kerosene, petrol diesel, liquefied natural gas, ethanol, thinner, and other spirits (Okoli and Atelhe, 2015). The near collapse of alternative means of cargo transport such as railway and pipeline systems has necessitated the dominance of tank-truck transport in Nigeria. Therefore, tank trucking is a non-negotiable imperative.

### **Statement of the Research Problem.**

Transportation of petroleum products by road truck creates numerous opportunities for hazardous materials to be accidentally released into the environment. Depending on the volume upon Loss of Containment (LOC), chemical properties, sensitivity to the host environment and proximity of human presence, such releases have safety and environmental consequences (Ambituuni et al., 2015). This is especially a problem in developing countries where towns and villages are often situated very close to major roads serving as key transport corridors, thereby increasing accident vulnerability. Furthermore, when these accidents occur and the transported products spilled, the closest settlement to the road becomes more vulnerable depending on the chemical composition of the transported products (Huang, Wang, Pei, Xu, Huang, and Luo, 2018; Chen et al., 2019; Mrozik, Rajaeifar, Heidrich, and Christensen, 2021). This accident resulted to the contamination of the immediate environment of the scene of the occurrence.

According to Ajide (2020); Sa'ad, Omaye, Adama, Dotti, and Usman (2022), about 80% of freight movements are done by road and there has been a steady growth in number of heavy goods vehicles. An average of about 5,000 tankers are involved in wet cargo haulage, moving about 150 million litres of fuel and 2,500 trailers in dry cargoes plying Nigeria roads daily (Olagunju, 2011). In case of the

study area, at least about 200 fuel tankers each carrying 33,000 litres of refined petroleum products move across the city daily.

Fuel tanker explosion has been a common occurrence of road transport mishap in Nigeria. The incidence and prevalence of this phenomenon have been alarming over the years. Most flammable fluids (usually gasoline, diesel, fuel oil, and other related liquid hydrocarbon compounds) are transported in tanks of articulated vehicles. It compromises the structural integrity of the road thereby making it susceptible to rapid degradation. In effect, fuel tanker disaster has been identified as a major contributor to road collapse in Nigeria (Dare et al, 2009). Apart from violating the structural integrity of the road, fuel tanker disaster leads to physical destruction of road infrastructure. This includes damage of road signs, lightening facilities, and buffer-divide. These damages translate into huge material values and financial costs (Sumaila, 2013).

There has been growing concern regarding the safety of Nigerian roads for transporting petroleum products to the retail points in recent times. Amidst this concern, many and, more human lives and economic resources are being lost daily. While other stake holders opined the need to develop a sustainable means of transporting petroleum products in the country, the alternative of pipe line transportation is already failing from the recent figures of the NNPC report on the crude theft and activities of bunkering on the existing pipe line network. Thus, the use of pipeline transportation is not suggested as a better and viable alternative to road transportation in addition to the poor door-to-door limitation as a medium of transportation (Hongfang, Xin, Huang, Fu, Lingdi, and Mohammadamin 2020). Literatures from the scientific community including; Merem, Twumasi, Wesley, Isokpehi, Fageir, Crisler, Romorno, Hines, Ochai, and Leggett (2018); Ofualagba (2020); Olujobi, Olujobi, and Ufua (2020); Sa'ad et al. (2022) implemented varying measures that could improve the safety of transporting petroleum products in Nigeria with degree of success. However, safety in terms of spill and contaminations of the environment and population exposure risk were not critically examined. To effectively manage the risk associated with this scenario, the chemistry of the transported products, the environments and water resources is considered to determine the spatial risk aspect of the affected communities.

Emerging from the limitation of the existing studies was the application of Geographic Information System (GIS) technique that has an excellent spatial analysis capability. The application of GIS based techniques in accessing the risk of petroleum product transportation provides the potency of the spatial information about areas likely to be affected. Studies in this dimension include; Njoku and Alagbe (2015); Chukwuma, Okey-Onyesolu, Ani, and Nwanna (2021); Zhang, Cheng, and Gai (2022); Wang, Roy, and Zhang (2023) among several others. These studies effectively provide methods in applying GIS in studying transportation of petroleum product to assess its risk. However, aspect of population exposure risk spread associated with the petroleum products is less presented. The spatial extent of petroleum product spill during freight and accident is critical to effectively manage the risk associated with the product on the environments, community and population.

Ogbomoso area have been experiencing high rate of petroleum products tanker accidents which has resulted in loss of life and properties as well as gridlock on the major road (Adagunodo, Sunmonu and Oladejo, 2014; Korter, Olubusoye and Salisu, 2013). The aim of this research is to assess the exposure to risks associated with the transportation of petroleum products in Ogbomoso, Nigeria using geospatial technology.

The specific objectives of the research include:

- i. To identify the major freight route of petroleum products in the metropolis,
- ii. To determine the risk areas of the petroleum product spills area during freight using geospatial buffering operation and
- iii. To develop an alternative freight route in the metropolis using GIS and results from (ii).

## **Review of Related Literature**

### ***The Research Model of assessing the Impact Area***

The impact area is considered from the point of view of the affected population centre. This is modeled as a point on the plain, where all inhabitants of the population centre experience the same impact from a hazmat incident on a road segment nearby. The impact point depends on the distance

between the point and the incident location. A GIS enables these researchers to represent the spatial distribution of population density more accurately within different concentration levels rather than using aggregate points.

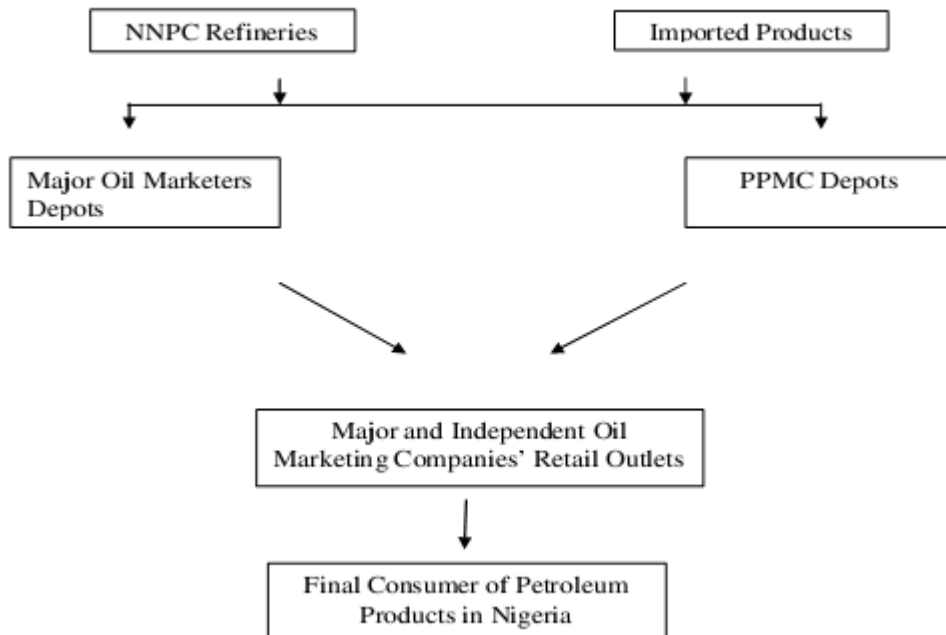


Figure 1: Physical flow of petroleum product Framework in Nigeria (NNPC/PPMC Bulletin, 2010).

### ***Risk Theory of the Research***

The research is based on risk theory, which has also been used in describing accident causation. Risk can be defined as the effect of uncertainty on objectives whether positive or negative. Its management is followed by coordinated economical application of resources to minimize, monitor, and control the probability and impact of unfortunate events or to maximize the realization of opportunities. Risks can come from uncertainty in financial markets, project failure, legal liabilities, credit risk, accidents, natural causes and disasters, and deliberate attacks from an adversary.

Risks can also be seen from four perspectives: These are the rationalist, realist, constructionist and middle positions. The rationalist sees risks as real-world phenomena to be measured and estimated by statistics, prioritized by normative decision theory and controlled by scientific management. The realist sees risks as objective hazards or threats that can be estimated independently of social and cultural processes but that may be distorted or biased through social and cultural frameworks of interpretation. Rather, the constructionist sees what we understand to be a risk as the product of historically, socially and politically contingent ways of seeing. Proponents of the middle positions between realist and constructionist theory see risk as an objective hazard or threats that are inevitably mediated through social and cultural processes and can never be known in isolating from these processes. Therefore, the research work intends to assess the risk involved in the daily movement of volumes of petroleum products across Ogbomoso, Nigeria.

According to Okoli and Atelhe (2015), hazardous or dangerous goods are such goods that have the potential to cause harm to people, property, or the environment. They include highly flammable fluids like petrol, corrosive substances like acids, radioactive materials like uranium, toxic wastes from factories, and various forms of air and water pollutants. Petroleum products constitute a typical instance of hazardous goods in view of their highly flammable nature. The haulage of these products by road through tank trucking has been associated with series of mishaps with disastrous outcomes in Nigeria. In this regard, Oluwatuji and Ileri (2013) observed that in recent time, especially in the developing countries such as Nigeria, cases of petrol tanker disaster are rampant. The aftermath of petrol disaster has led to loss of life and properties worth millions of Naira. Fuel tanker explosion



disaster has been a recurring occurrence in Nigeria over the recent years. It has virtually become an every-year occurrence.

Zhang *et. al* (2000) modeled the probability of an undesirable consequence as a function of the concentration level, using the traditional expected consequence representation of transport risk. They adopted a raster GIS framework that approximates the plane with a set of discrete points. Thus, the concentration level was constructed without making the linearity assumption which ignores atmospheric stability conditions. This method assumes a pre-specified wind direction and speed. Verma and Verter (2003) used the Gaussian plume model in estimating spatial distribution of the toxic concentration level. It was found that concentration increases with release rate of the hazardous materials and decreases with distance from the accident site and wind speed. At a given distance from the point of release, the maximum concentration is observed at the downwind location. In addition, Verma and Verter (2003) also used the Immediately Dangerous to Life and Health (IDLH) concentrate level of the hazmat materials being transported to determine the threshold distance for fatality and injuries. According to the model, the impact area around the accident site depends on the type and volume of hazmat released. In light of the foregoing, it is evident that fuel tanker disaster poses a serious risk to road safety, public safety and human security in Nigeria. The implication is that such a phenomenon threatens Nigeria's national security and must be properly acknowledged as such (Okoli and George, 2015).

The application of remote sensing data, ground control points data and GIS ushered in a nexus for assessing the risk factor of a scenario on a spatial scale. The application of GIS-Based risk factor assessment is largely favored by the ability of the system to accommodate heterogeneous spatially referenced multilayer information and the advances in the development of computer technology that allowed for the processing of large amount of information. Application of GIS-based risk mapping is evident in the work of Zhijun, Jiquan, and Xingpeng (2009); Leite, Mantovani, Dokic, Yan, Chen, and Kezunovic (2019); Huang, Li, Li, and Zhang (2019); Noguchi, Omachi, Seya, and Fuse (2021) in hydrocarbon transportation risk assessment, Three-Dimensional (3D) GIS for the simulation of fire hazard from hazardous product transportation along highway and grassland fire disaster with high level of success. Furthermore, Chukwuma, Okonkwo, Ojediran, Anizoba, Ubah, and Nwachukwu (2021); Zhou, Su, Arnbjerg-Nielsen, Ren, Luo, Ye, and Feng (2021); Chen (2022); Gupta and Dixit (2022) applied GIS-based technique in mapping of flood risk areas with high degree of reliability. Recent advances in geospatial technology is the combination of geospatial technology and computing power of the computer algorithm that provides highly versatile literature for the integration of multilayer information in risk assessment studies.

Many of these applications offer a useful conceptual framework for relating phenomenon to a spatially referenced point and the spread of this scenario into the outer space with higher efficiency. The possibility of the geospatial approach in this dimension is largely favored by the development of spatial analysis tools including *kridgin*, various kinds of surface interpolation techniques and different methods of image processing that offered a robust data for such studies. Many GIS practitioners have since utilized this window in developing a risk assessment and mitigation for sustainable environmental management. Inference from the foregoing indicated that GIS is a suitable tool for risk mapping using spatially referenced data that aid mitigation and emergency response.

### **Methodology**

For the purpose of this research, geospatial analysis map of the study area was generated from a topographic map of Ogbomoso on a scale of 1:500,000. The topographic map was scanned using a 3D lesser scanner as arcmap document in TIF format. The scanned image was georeferenced on geographic coordinate system on World Geodetic System (WGS) to allow validation from Google earth image. Four control points were created and mapped coordinates were inscribed and a Root Mean Square Error of the entire process was evaluated at 0.000012 (0.0012%) representing 99.99% accuracy of the entire process. The Area of Interest (AoI) was extracted by mask and features of interest were then digitized in the study area map. The road networks were digitized as; access road coverage and routes of petroleum products within the metropolis and for the overlay of other features considered critical to this study.

A Handheld Global Positioning System (GPS) device was used to tracked enroute spill point in the study area. The collected GPS points were imported into ArcGIS environment as dbf file. ArcGIS 10.5 was used to subset Ogbomoso regions from the whole Oyo State's administrative and local government map on a scale of 1:500,000 and WGS 1984 projection. To analyze the human population exposure risk associated with the transportation of hazardous petroleum products, a buffering operation analysis tool in ArcGIS 10.5 was used over the generated points to identify the risk extent. The implemented buffer size used for the study was adapted from Lownes and Rahman (2013) who adopted the 1996 HazMat Routing Guide (USDOT 1996). With petroleum products being the focus of this study, a buffer size of 800m (0.5miles) was selected for analysis.

The obtained result from the buffering operation was further overlaid on the classified satellite imagery in ArcGIS environment. To complement the overlay results of the buffering operation, Sasplanet imagery was used to subset the high-resolution imagery of the study area to determine the accuracy of the classified remote sensing imagery. A good impression of the combination is given at a glance. A buffer operation creates zone of exclusion among and between spatial features. Feature to point creates a feature class containing points generated from the representative locations of input features. Kernel density was used to calculate a magnitude-per-unit area from point or polyline features using a kernel function to fit a smoothly tapered surface to each point or polyline. Query operations were carried out using the designed database. Valued attributes were selected and assessed. To achieve this, a conversion tool extension of ArcGIS 10.5 was used to convert the building polygons to point as seen in the map above. Furthermore to generate a vulnerability map for the area the point feature was deployed into the Kernel density tool which calculates a magnitude-per-unit area from point or polyline features using a kernel function to fit a smoothly tapered surface to each point or polyline. The result is the severity of exposure map which shows areas of low, medium and high densities.

#### ***Location of the study area***

This study considered the transportation of petroleum products from Ibadan depot across the densely populated city of Ogbomoso, Oyo State, South-Western Nigeria, located on latitude 8<sup>o</sup>08'N and longitude 4<sup>o</sup>15'E (Figure 1). The population of the city was approximately 299,535 according to 2006 population census and currently estimated to be 395,386 using an annual growth rate of 3.2%. The Federal highways which crisscross through Ogbomoso city is known for the heavy presence of tankers carrying petroleum products to other towns outside the city.

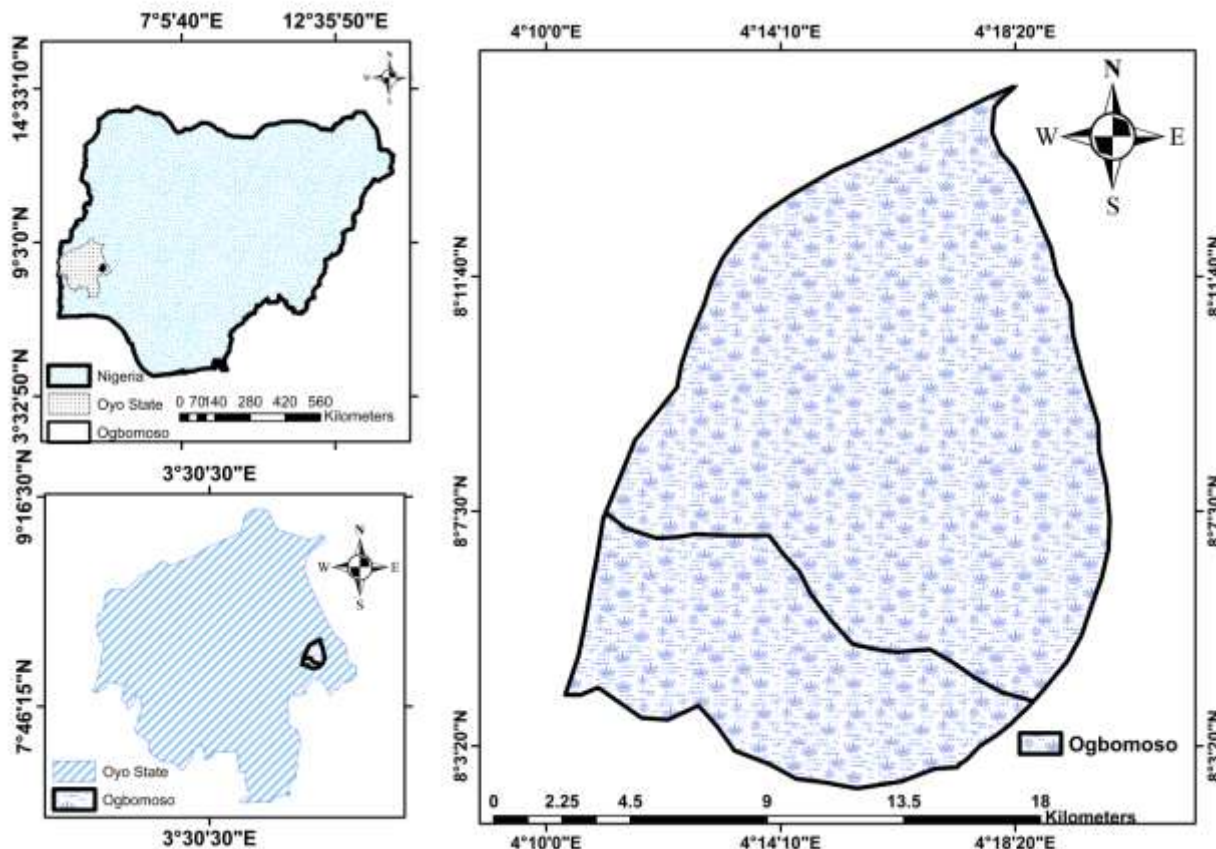


Figure 1: Map of Nigeria, inset Oyo state and Ogbomosho as the study area

#### 4.0 Result and Discussion

##### 4.1 Identification of the Major Freight Route of Petroleum Products in the Metropolis

The results from this study identified different kind of petroleum products spills in four major routes in Ogbomosho metropolis (Figure 2). The study shows the existence of two major spill as; enroute petroleum spills and spill due to accident on the routes that constitute population exposure risk. Another hazard identified by this study is the case of a fire outbreak that is common either along the routes, during accidents and collusion with other going vessel on the routes. It was observed that there is a high population of people living in high density areas compared to areas with low number of buildings.

The result revealed that most of the spills are most common along the metropolitan route that the petroleum tankers pass through with their products which provides a link to the state capital and other neighboring areas. Furthermore, the study revealed that enroute spill were of less significant in terms of the product quantity spilled but tend to be more volatile during accidents on the route resulting to the spill of high quantity of the products thereby affecting wider area close to the routes within the metropolis. The severity of the risk of the spilled products on the metropolis was observed from the evidence of the spot and trace on the properties along the route. The effects could also be observed from the quality of the environments where affected spilled region were completely devoid of any urban grasses thereby exposing the metropolitan surfaces and population to the direct effect of acidic precipitation that could transport the spilled products away from the point occurrences (Kanno and McCray, 2021; Ukhurebor, Athar, Adetunji, Aigbe, Onyancha, and Abifarin, 2021; Dong, Asif, Shi, Zhu, and Chen, 2022).

The impact of rainfall in the transportation of the spilled products exert significant threat to both human live, environment, water resources (surface and subsurface) and biodiversity either terrestrial or aquatic lives. Furthermore, amidst global climate change scenario, this is an indication that food

security may be threatening and population socioeconomic activities is likely to be affected thus, hampering economic growth of the metropolis (Akinro, Opeyemi, and Ologunagba, 2008; Ukhurebor *et al.*, 2021; Dong *et al.*, 2022). The study further revealed risk associated with ownership of properties along these major routes of petroleum product freight to include destruction of properties by fire which sometimes occurred with high casualty of lives and properties and sometimes caused structural damages to both nearby buildings and the road network in the metropolis.

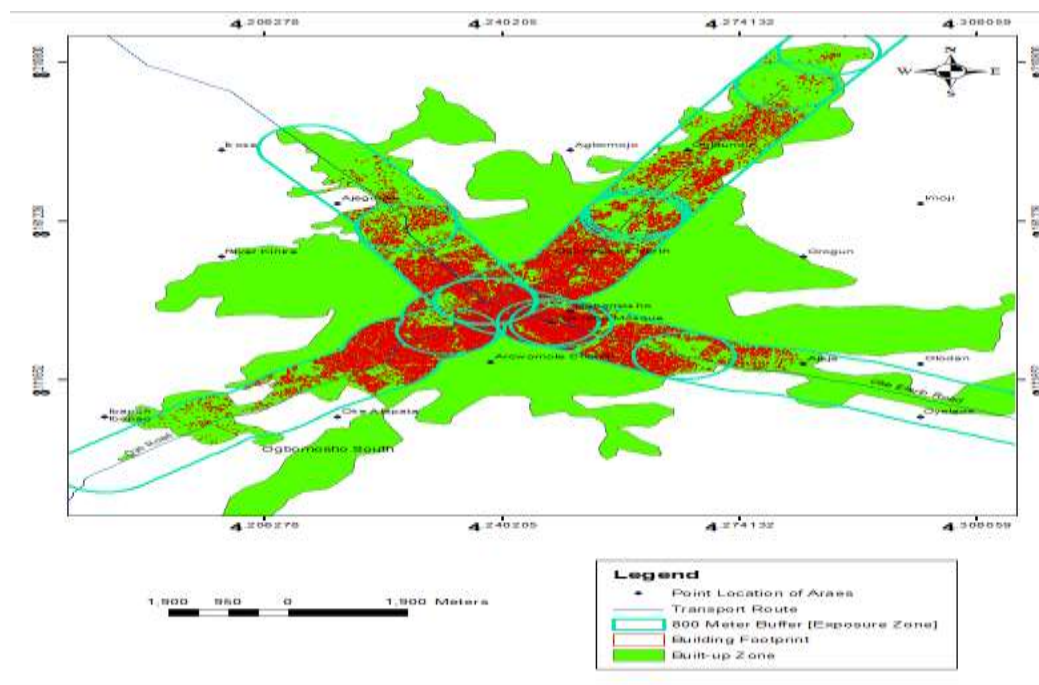


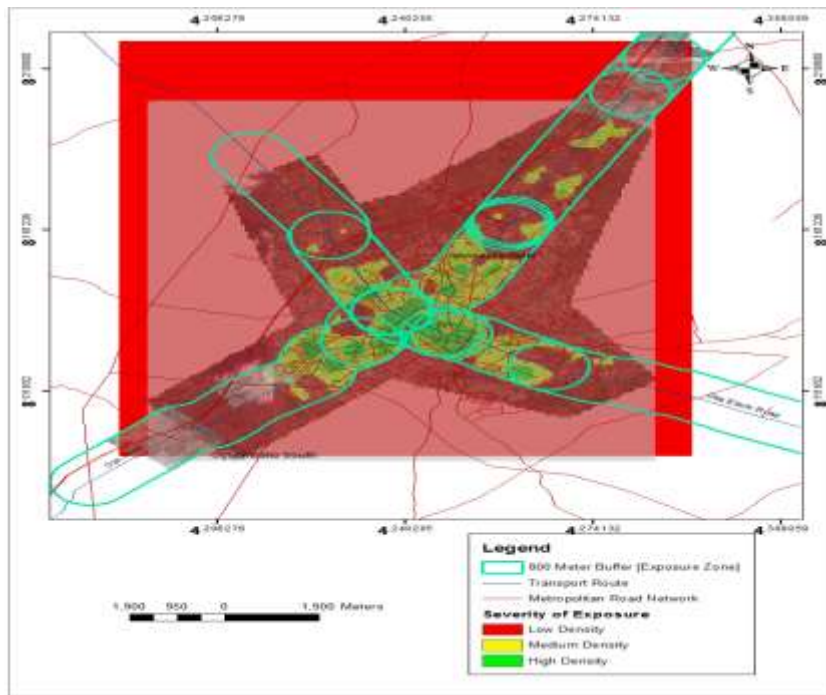
Figure 2: Major freight route of petroleum products in the metropolis

### ***The risk of the petroleum product spills area and exposure during freight using geospatial buffering operation***

To assess the level of risk in the metropolis through population exposure, the result of 800 metres (m) operation from the two main roads running through Ogbomoso city were used as presented in Figure 3. The major thoroughfares are Oyo road running from the South-West towards the North-East and Oke-Elerin road running down from North-Western side to South-Eastern part of the map. These highways are plied by tankers to supply commodities in and out of Ogbomoso. A buffer analysis was employed to visualize the exposure zone from the centre of the highways both right and left; the map above shows the pattern exhibited by the buffer. The final vulnerable result was classified into three (3) discrete categories from low density vulnerable areas to highly vulnerable zones of hazard within the 800m exposure zone considering the closeness and population of building properties.

The result of the 800m buffering analysis shows many of the structures along the freight routes to be vulnerable to petroleum products spill. The level of vulnerability increases as one move closer to the route and reduces outward. The low density vulnerability zones conformed to the 800m fringes usually farther away from the routes. This zone is mostly occupied by residential areas and some small isolated commercial shops within the neighborhoods with low economic impacts during hazards. The next level of risk is the medium vulnerability usually between 400 to 600m zones away from freight route in the metropolis towards the North East route. This zone have dominant of commercial and residential buildings with some isolated educational centers. Although, risk level and population exposure at this zone appeared to be moderate, hazard such as fire and spilling of products exert the potency of spreading to this area except early emergency response is in place to cut the menace of the hazard. Due to the difficulty in decongesting these developed areas arising from Nigeria's land use act system and the cost of resettlement, the study revealed the need for route

diversion through the development of alternative path that will cope with the impact of the oil spill during freight.



**Figure 3: Population exposure zones along road transport route in Ogbomoso.**

#### **4.3 Development of an Alternative Freight Routes in the Metropolis**

The research based on the result of the 800m buffering operation performed develop an alternative route for freighting of petroleum products as a measure for reducing risk associating with the products. Three alternative routes were developed based on the buffering operation (Figure 4). The major route is the use of Oyo road passing through Ogbomoso North, the second route is a road linking the Oyo road through the North West and the final route is an adjoining route on Oyo road passing through Ogbomoso South and connecting the Oke-Ilorin road.

The major route passing through Ogbomoso North will provide inlet through which petroleum products can be delivered to the metropolis at lesser hazards while the metropolis enjoyed adequate supply. The advantage of this route is based on the fact that only waybill meant for the metropolis supply will play this route. Thus, reducing the number of petroleum products transporting trucks at the metropolis ensures safety of lives and properties. The second route that passes through the Oyo Road will divert freight meant for distribution to the neighboring South-West State while other distribution to the Northern part of Nigeria will use the Oyo route through the Ogbomoso South and connect the Oke Ilorin route.

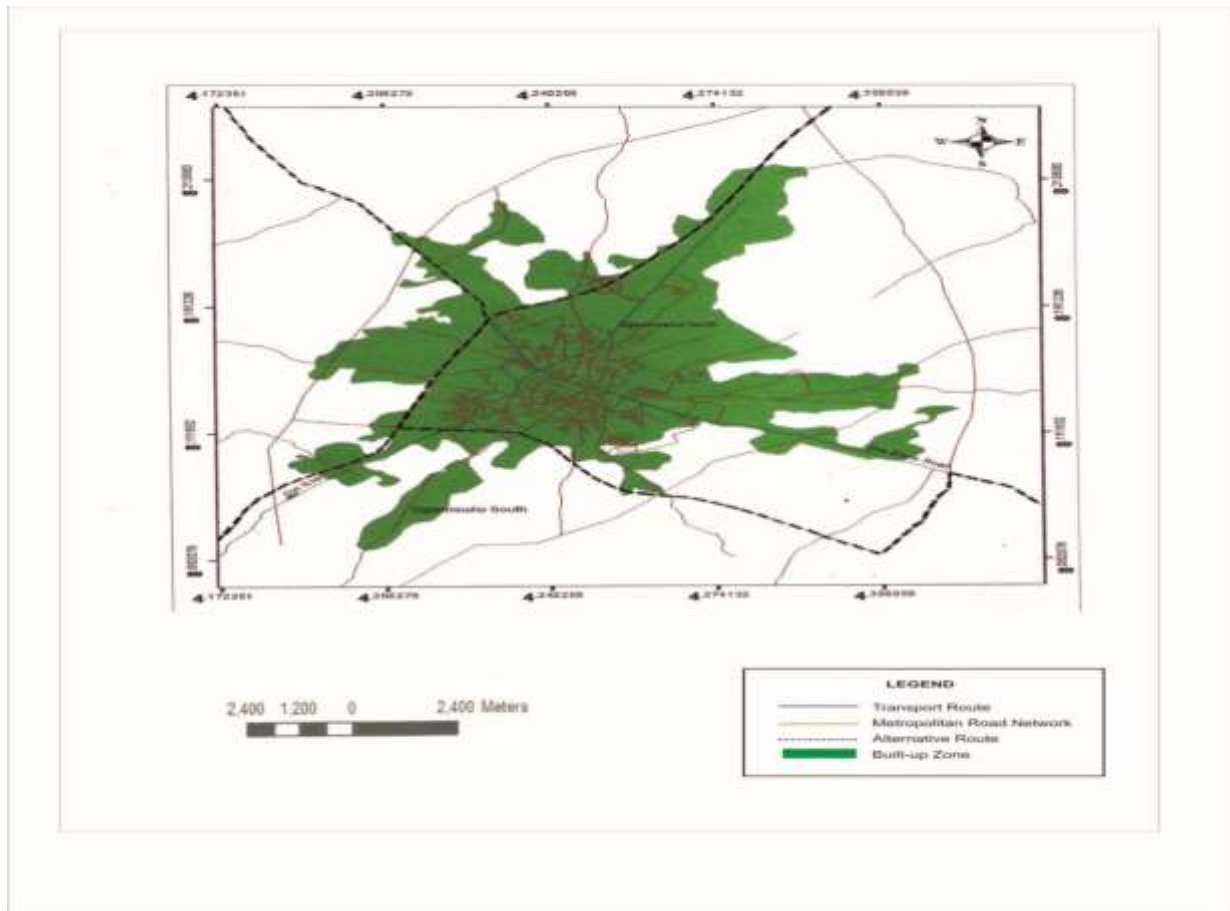


Figure 4: Alternative routes for the transportation of petroleum products across Ogbomosho

#### 4.4 Summary of the Research Findings

From the result of the overlay of the 800 metres buffer over the satellite imagery, it made it possible to digitize out all the building footprints which fall within the buffered area i.e 800 metres both left and right of the transport route. This gives us an idea of the buildings exposed to hazards along the major transport route. A number of 27,478 buildings were successfully traced out and identified as at risk of hazard should there be any disaster in the ring of incidence at any point on location of the route. Using the World Bank Standard of 6 - 7 occupants per dwelling unit, we can therefore estimate the average number of people or the average population living within the 27,478 buildings digitized. Thus 27,478 buildings multiplied by 7 gives 192,346. Therefore, an average number of 192,346 represent the population of people living within the exposure zone. The same process was carried out along the alternative routes that pass through Ogbomosho-Ilorin expressway and link up with Oke Elerin-Owode road, bypassing the densely populated city centre. The average population exposed to risk was reduced to 71,078.

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## Conclusion

The assessment of the population of people at risk evidenced some critical situations of the road transportation on the highways crossing the city of Ogbomosho. There is need to speed up the completion of the on-going construction of Oyo-Ogbomosho expressway running parallel to the highway. This will serve as alternative route for the trucks and heavy vehicles. The government should make provision for emergency management through the provision of prompt action vehicles such as fire service vehicles to cater for eventuality. Heavy toll can be introduced to restrict movement of goods along densely populated areas. There is need for urgent reformation of other modes of transportation such as rail and pipelines for the movement of hazardous materials in Nigeria. It is important to note that this analysis treats population exposure as a static parameter and does not account for the movement of people throughout the day. A further research investigating daytime, evening and weekend population movement would provide a more complete picture of the hazmat risk exposure. Finally, attempt can be made to analyse the cost-risk trade off in the context of road Transportation as well as identifying the environmental risks associated with the trucks.

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## **FINANCIAL MANAGEMENT PRACTICES AND CONSTRUCTION FIRMS' PERFORMANCE IN DELTA STATE OF NIGERIA.**

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### **ABSTRACT**

*Financial management practices are the activities that ensure effective control of scarce resources. The net profit will be adversely affected when there is poor implementation of financial management practices.. This study investigated financial management practices and performance of construction firms in Delta State of Nigeria. The objectives were to assess the level of use of financial management practices, evaluate the factors enhancing the use of these practices, assess the factors that inhibit the use of these practices. The data was obtained through the use of structured questionnaire administered to 202 respondents in construction firms in Delta State through random sampling. It was analyzed using mean item score and Mann Whitney U. The results revealed that formal planning, Corporate governance control, monitoring activities, enhancement of management of resources and control activities are top financial practices in these construction firms. The key factors enhancing the quality of the practices are experience, good governance, good financial education\literacy, staff strength, staff remuneration, presence of accountant, good accounting practice and good financial policies. Key factors inhibiting quality are poor remuneration, poor governance, bad financial policies, low moral value, inexperience, poor organizational culture and lack of proper financial awareness. The key financial performance indicators are net profit, adequacy of staff, staff remuneration and dividend payouts. Based on these results, the study concluded that the financial management practices required from construction firms are formal planning, corporate governance control, monitoring activities, enhancement of management of resources and control activities. It is recommended that construction firms should develop these practices to improve their financial performance as well as overall performance.*

### **INTRODUCTION**

Financial management has been defined as the strategic planning, organizing, directing and controlling of financial undertakings in an organization or institution (Mehta, 2018). Njeri *et al* (2020) held that profitability and the returns of a firm will be negatively affected if there are inherent poor financial management practices. They asserted to the fact that financial management is a critical factor in business management. A business will never mature if it cannot plan very well through its policy to effectively manage its working capital base. Odongo (2018) held that financial management has to do with activities and processes that culminate into effective control of funds and resources of a firm. Accordingly, Lohrey (2021), defined financial management practices as set of common methods or standard operating procedures developed for accounting, financial reporting, budgeting among other business finance activities. It follows that financial management practices has to do with the planning, leading, organizing and control of all business or firm finance activities using set of common methods or standard operating procedures. Finance activities including accounting, recording, reporting, budgeting, auditing, checks and balances, monitoring, Bills of Quantities (B.O.Q.) preparation and so on.

Lohrey (2021) asserted that effective financial management practices adhere to accounting best practices and federal/state compliance regulations while staying in touch with any long term goals and future growth plans of a firm. It has been noted that financial management practices have effect on the financial performance of business entities. (Jain *et al*, 2013).

Financial management practice is key to the survival of any business firm. How a firm conducts its finances has a lot to do with its total output, profit and survival in the midst of harsh economy with severe scarce economic resources as well as competitions. Oke *et al* (2020) identified construction contractors as entrepreneurial managers of construction firms whose duty in modern construction firm management involves decision taking that has to do with final account reporting.

Adams (2008) advocated that accounting, financial management, entrepreneurial studies and project management should be treated as most important in contractor training. This training is of paramount importance as contractors are entrepreneurs and owners of most of these construction firms, their actions and decisions determine a lot of the financial management practices in these construction firms.

Some of the factors of survival practices of construction firms has been identified to include human resources management, marketing, bid strategy, financial management, organizational culture, smart work methods and firm strategy as survival practices of construction firms (Ogbu, 2017). Financial management factor is of importance to this work. It is of note that construction firms must take financial management of their firms serious if they want to survive and it is on this note that Nketsiah (2018) concluded that a firm's age has a lot to do with its efficiency in financial management and that most firms that are better established tend to have a better financial management practice.

The great need for efficient financial management cannot be over emphasized. The number of abandoned capital intensive projects in the country show that financial management practices need to be better appreciated by construction firms. The client need value for his money. Every client or contractor will be very happy to find out that his or her money has been well managed by the managers of construction firms. Finance is an important aspect of any management especially in construction firms that usually handle very capital intensive works. A problem in finance can end the firm and it may cease to exist. Many construction firms lack optimal profitability, dividend payouts e.t.c. These affects the financial performance of these firms negatively. Financial management practices need to be better handled for good financial performance of these construction firms (Atagboro, 2015, Ditkaew,2018, Rahman,2020, Olanrewaju and Anahve,2015).

The aim of the study is to investigate the application of financial management practices among construction firms in Delta State with a view to improving the firms' performance. The stated aim will be achieved through the following specific objectives which are to:

- i. assess the level of use of financial management practices among construction firms in Delta State, Nigeria.
- ii. evaluate the factors that enhance the use of financial management practices among construction firms in Delta State, Nigeria.
- iii. assess the factors that inhibit the use of financial management practices among construction firms in Delta State, Nigeria.
- iv. determine the effect of financial management practices on construction firms' performance in Delta State.

### **Research Methodology**

The study focused on financial management practices and construction firms' financial performance in Delta State, Nigeria. It focused on four (4) important financial management practices which are Financial Recording /Reporting, Working Capital Management, Internal Control and Financial Planning. It focused on both indigenous and foreign firms in the major cities within the three Senatorial Districts of Delta State. Financial indices such as net profit, adequacy of staff, staff remuneration, dividends, financial frauds & scandals, strength of employment per year, total assets were used to measure the performance of construction firms.

Questionnaire was the instrument for data collection. Data collected from this research tool was computed and analyzed utilizing percentages, Statistical Package for Social Science (SPSS) Software, 2013, Mean Item Score and Mann Whitney U test at 5% significance. Accountants, quantity surveyors, construction managers in the construction firms in Delta State, Nigeria were the respondents to the questionnaires.

**Research Design**

The design of the study was the survey type. This design enabled the researchers to forecast the decision that should be taken to get maximum valid results. It was designed to be a survey one with a questionnaire that was given to respondents and collected back. Survey type of research can also be called descriptive research. It is based on data collected from questionnaires, interviews, inventories, ratings, reports and observations.

Descriptive research can be utilized to get meaning and understanding of today’s condition of things. Results obtained can be analyzed using statistical methods or tools. In survey researches, small or large populations can be studied or appraised using samples to ascertain the relative incidence, distribution and interrelations of variables. All these makes survey research method very suitable for this empirical research work. Research design is a conceptual structure for carrying out research study. It gives the blueprint or outline for data collection, measurement and analysis. It is a good arrangement for a research study. It aids quantitative researching. (Iwuji *et al.*, 2006).

**Research Population**

The population for this study was derived from data available at the Open Contracting Portal of the Delta State Public Procurement Commission (DPPC) and the Contractors Registration Board. 356 construction firms are registered and execute works for the Delta State Government and the general public. Out of these, 20 of them are foreign firms while the remaining 336 are indigenous firms. The financial managers of these firms will respond to the questionnaires.

**Table 3.1: Population**

Firm	Population
Foreign	20
Indigenous	336
Total	356

**Source: Author’s Field Survey (2021)**

**Sampling Technique**

This study adopted random/probability sampling technique. It used this technique to choose a smaller sample to represent the population. The characteristics of a sample need to be same as the population it is representing. The population for this research are the construction firms operating in Delta State of Nigeria. Random sampling is a basic form of probability sampling. Each construction firm has an equal and known chance of being selected.

It started by enlisting all possible samples on paper-slips. The name of each element from the population is written on a slip of paper. The paper-slips are then put into a box or bag and mixed very well. They were drawn, without looking, one after another without replacement making sure that each has the same chance of being selected. Thus, there is same probability value for each possible member of sample. The sample size of the foreign firms is 19. The sample size for the indigenous firms is 183 firms. Thus, the sample size (n) for this study comprise of 202 construction firms. The method used for the selection of the sample size (n) was the Yaro’s formula.

Applying the Yaro Yamane formula, given as

$$N = N/1 + N (e)^2 \text{ ----- (1)}$$

- Where n= sample size
- N= finite population
- e= level of significance (0.05)

1 = Unity (Yamane, 1967).

**Table 3.2: Sample Size (n)**

<b>Firm</b>	<b>Number</b>
Foreign	19
Indigenous	183
Total	202

**Source: Author's Field Survey (2021)**

### **Data Collection**

Questionnaire was used primarily to collect data. Data was collected from a structured questionnaire on a five point (5) likert scale. The respondents responded to each question based on a five point likert scale of 1-5, where 1= very low, 2= low, 3 = moderate, 4 = high, 5 = very high. Objective 1, questions were factored into 4 groups of financial management practices ( Financial Records/Reporting, Working Capital Management, Internal Control and Financial Planning) and 32 sub group questions for indicating level of use of financial management practices on a scale of 1-5, where 1= very low, 2 = low, 3 = moderate, 4 = high, 5 = very high.

Objective 2, consisted of 17 questions on factors enhancing quality financial management practices for the respondents to tick on a scale of 1-5, where 1= very low, 2= low, 3= moderate, 4= high, 5= very high. Objective 3, consisted of 18 questions on factors inhibiting quality financial management practices.

### **Validity and Reliability**

This refers to the suitability of the items of measurement in the questionnaire. It ensures that the items of measurement are valid enough to serve the purpose for which it is made. Validity tests are therefore carried out to test the suitability of the instrument of measurement. Kinds of validity tests of instrument include context, face, criterion – referenced, predictive, construct validity tests.

Content validity tests the level of coverage of the items on the study. It should show aspects that are supposed to be covered in the right order of importance and quality. Face validity tests the external appearance of the instrument. It depends on external judgment of the observer. Face validity measures how clear instructions appear, the state of structuring of items, consistency of numbering or rubrics, sectioning and so on.

Construct validity is all about testing how well the instrument questionnaire describes a person in terms of his or her psychological traits.(National Teachers' Institute, N.T.I., 2015). From the above, the instrument for this research was validated on face, content and constructs validation by three (3) experts in the construction industry. Their advice and comments will be utilized for the modification of instrument and final establishment in face, content and construct validities.

The reliability of an instrument is important. For an instrument to be judged good, it needs to prove itself reliable. The instrument must be able to measure what it is intended to measure in a consistent manner. A test is reliable if a candidate scores similar marks on parallel forms of tests. The methods used to estimate reliability are test-retest method, alternate-form method and split-half method. Test-retest method involves an identical test being given to the same groups of people at different times. For us to get the reliability of the instrument for this appraisal study, it was given initially to 10 respondents who were not part of the sample of our study using a test-retest method of reliability test. The test was given two times at different cases. Pearson product moment correlation statistical tool was used to test the reliability and a coefficient of 0.810 was obtained which pointed to a good reliability of our instrument of appraisal study.(N.T.I., 2015).

## Data Analysis

The Statistical Package for Social Science (SPSS) software, 2013 was used to compute and analyze data collected from respondents. The collected data was also analyzed using Mean Item Score. The results show five bands of mean item scores i.e. 1.0 to 1.8 (Very Low), 1.8 to 2.6 (Low), 2.6 to 3.4 (Moderate), 3.4 to 4.2 (High) and 4.2 to 5.0 (Very High).

**Table 3.3: Summary of Data Collection and Analysis Matched to Objectives**

Technique for Data Analysis			
S/N	Objectives	Method of Data collection	Method of Data Analysis
1.	Assess the level of use of financial management practices among construction firms in Delta State of Nigeria	Questionnaire	Mean Item Score Mann Whitney U Test
2.	Assess the factors that enhance the use of financial management practices among construction firms in Delta State	Questionnaire	Mean Item Score Mann Whitney U Test
3.	Assess the factors that inhibit high level of use of financial management practices.	Questionnaire	Mean Item Score Mann Whitney U Test
4.	Assess the performance of construction firms over financial management practices.	Questionnaire	Mean Item Score Mann Whitney U Test

**Source: Author's Survey (2021)**

## Results and Discussion

The study in this section explores detailed synthesis of the results of data analysis done. This gives inference of the statistical, theoretical and practical implications of the various objectives. The following sections presents these.

*Level of Use of Financial Management Practices*

Budgeting Process	3.44	10th	2.88	5 <sup>th</sup>	3.16	8th	Significant
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<b>Financial Management Practice</b>	<b>Foreign Firm Mean Score</b>	<b>Foreign Firm Rank</b>	<b>Indigenous Firm Mean Score</b>	<b>Indigenous Firm Rank</b>	<b>Aggregated Mean</b>	<b>Aggregated Ranking</b>	<b>Remarks</b>
Formal Planning	4.15	1 <sup>st</sup>	3.29	1 <sup>st</sup>	3.72	1st	Significant
Corporate Governance Control	4.12	2 <sup>nd</sup>	2.72	13 <sup>th</sup>	3.42	2nd	Significant
Monitoring Activities	4.04	3 <sup>rd</sup>	2.75	10 <sup>th</sup>	3.39	3rd	Significant
Enhancement of Management of Resources	3.54	6 <sup>th</sup>	3.09	3 <sup>rd</sup>	3.32	4th	Significant
Control Activities	3.45	9 <sup>th</sup>	3.11	2 <sup>nd</sup>	3.28	5th	Significant
Financial Record Keeping	3.62	5 <sup>th</sup>	2.82	7 <sup>th</sup>	3.22	6th	Significant
Establishing Working Capital Requirements	3.64	4 <sup>th</sup>	2.73	12 <sup>th</sup>	3.19	7th	Significant
Filing of Financial Records	3.50	8 <sup>th</sup>	2.66	8 <sup>th</sup>	3.12	9th	Significant
Offline Operations Planning Process	3.17	16 <sup>th</sup>	2.96	4 <sup>th</sup>	3.07	10th	Significant
Filing of Financial Records Online	3.33	11 <sup>th</sup>	2.81	8 <sup>th</sup>	3.07	10th	Significant
Segregation of Duties	3.52	7 <sup>th</sup>	2.57	25 <sup>th</sup>	3.05	11th	Significant
Managerial Capability in Financial Planning	3.24	12 <sup>th</sup>	2.83	6 <sup>th</sup>	3.04	12th	Significant
Compliance with Government Regulations	3.23	13 <sup>th</sup>	2.78	9 <sup>th</sup>	3.01	13th	Significant
Adoption of Int'l Financial Reporting System(IFRS)	3.21	14 <sup>th</sup>	2.70	14 <sup>th</sup>	2.96	14th	Not Significant
Clearing Off	3.22	15 <sup>th</sup>	2.58	24 <sup>th</sup>	2.90	15th	Not



Debts							
Management of Daily Cash	3.03	17th	2.68	16th	2.86	16th	Significant
Checks and Balances	3.01	18th	2.69	15th	2.85	17th	Not Significant
Risk Assessment	2.88	20th	2.74	11th	2.81	18th	Not Significant
Strategic Planning Process	2.86	21st	2.67	17th	2.77	19th	Significant
Reflection of Financial Reporting Quality	2.82	22nd	2.62	22nd	2.72	20th	Not Significant
Flow of Information and Communication	2.76	25th	2.64	20th	2.70	21st	Not Significant
Bill of Quantities(BOQ) in Use	2.99	19th	2.41	32nd	2.70	21st	Not Significant
Reduction of Fraud and Scandals	2.71	7th	2.65	19th	2.68	22nd	Not Significant
Frequent Financial Disclosure	2.77	24th	2.56	26th	2.67	23rd	Not Significant
Monitoring of Cash Conversion Cycle	2.70	28th	2.61	22nd	2.66	24th	Not Significant
Transparency Improved by Adoption of IFRS	2.66	30th	2.63	21st	2.64	25th	Not Significant
Financial Account Disclosure	2.69	29th	2.55	27th	2.62	26th	Not Significant
Setting in Order of Inventory Turn Over	2.65	31st	2.59	23rd	2.62	26th	Not Significant
Final Audits	2.80	23rd	2.42	30th	2.61	27th	Not Significant
Environmental Assessment	2.75	26th	2.44	31st	2.59	28th	Not Significant
Incorporation in Financial Planning							
Compliance with Policies	2.64	32nd	2.45	28th	2.55	29th	Not Significant
Average Total	3.16		2.71		2.94		

**Source: Author's Field Survey (2022).**

The results in this objective gave some insightful premise that can aid us in giving instruction about level of use of financial management practices in Delta State of Nigeria. 14 financial management practices dimensions was validated significant to show that the level of use of financial management practices can be shown or explained using all or some of the validated dimensions. Descriptive validity wise, formal planning(3.72), corporate governance control (3.42), monitoring activities(3.39), enhancement of management of resources(3.32) and control activities(3.28) are top five practices in which construction firms are most proficient. Firms also exhibited high level of use of financial record keeping, establishing working capital requirements, budgeting, filing of financial records offline, operations planning, filing of financial records online. Also, segregation of duties, managerial capability in financial planning and compliance with government regulations made it to significant mark above 3.00.

The construction firms also showed some competency relevant to their educational degrees. It can be said that the high level above 3.00 cut off mark is due to their high level of education in cognate construction fields and professional training. Technical expertise and educational qualification could jointly explain the level of competent use of these financial management practices in the study area. Even though this position can be inferred, the results of the analysis are inadequate to affirm this postulation.

The top ranking practices sets in the study shows that construction firms in the study area have good formal planning practice. They understand the value of a good plan of action financial wise. The validated practices likewise show that corporate governance control is serious. This is also same with monitoring, resource management, control, financial record keeping both offline\online, establishing working capital requirements, budgeting, operations planning , segregation of duties all receive good attention in the study area.

The other variables are not too low as they all can be made significant by approximation to the 3.00 cut off mark. However, they all need more attention for better improvement. The results show that the foreign firms have a higher level of use of these practices than their indigenous counterpart. It follows that the indigenous firms should move up for better improvement to meet up their foreign counterpart and can even surpass them in future investigations or studies.

When juxtaposed with past studies, the results of the study agrees with Odongo (2018), Jain *et al* (2013), Muguchia (2018), Njeri *et al* (2020) and Otali *et al* (2018).

#### ***Factors Enhancing Financial Management Practices***

Factors Enhancing Quality	Foreign Firm Mean	Foreign Firm Ranking	Indigenous Firm Mean	Indigenous Firm Ranking	Aggregate d Mean	Aggregated Ranking	Remark
Experience	3.66	1st	2.73	2 <sup>nd</sup>	3.19	1st	Significant
Good Governance	3.20	5th	2.84	1 <sup>st</sup>	3.02	2nd	Significant
Good Financial Education\Literacy	3.30	3rd	2.60	5 <sup>th</sup>	2.95	3rd	Not Significant
Staff Strength	3.44	2nd	2.45	14 <sup>th</sup>	2.95	3rd	Not Significant
Staff Remuneration	3.22	4th	2.52	11 <sup>th</sup>	2.87	4th	Not Significant
Presence of Accountant	2.99	7th	2.62	3 <sup>rd</sup>	2.81	5th	Not Significant
Good Financial Policies	3.10	6th	2.46	13 <sup>th</sup>	2.78	7th	Not Significant
Good Organizational Culture	2.79	11th	2.56	8 <sup>th</sup>	2.68	8th	Not Significant
Presence of Quantity Surveyor(Q.S.)	2.91	9th	2.44	14 <sup>th</sup>	2.68	8th	Not Significant
High Moral Standard	2.89	10th	2.42	16 <sup>th</sup>	2.66	9th	Not Significant
Financial Checks and Balances	2.77	12th	2.55	9 <sup>th</sup>	2.66	9th	Not Significant
Prompt Audits	2.72	14th	2.57	7 <sup>th</sup>	2.65	10th	Not Significant
Financial	2.75	13th	2.47	12 <sup>th</sup>	2.61	11th	Not Significant

Competence							
Timely Budgets	2.62	15th	2.58	6 <sup>th</sup>	2.60	12th	Significant Not Significant
Bill of Quantities (BOQ) Preparation	2.61	16th	2.53	10th	2.57	13th	Significant Not Significant
Prompt Communication	2.58	17th	2.40	17th	2.49	14th	Not Significant
Overall	2.97		2.55		2.76		

**Source: Author's Field Survey (2022).**

The results in this objective gave some insightful premise that can aid us in giving instruction about the factors enhancing quality financial management practices in Delta State of Nigeria. Two factor dimensions was validated significant to show that the enhancement of quality financial management practices can be shown or explained using these validated dimensions. Descriptive validity wise, experience(3.19), good governance(3.02), good financial education\literacy(2.95), staff strength(2.95), staff remuneration(2.87), presence of accountant(2.81) are top five factors in which construction firms are most proficient. The construction firms also showed some competency relevant to their educational degrees. The level of enhancement of quality is in cognate with their education in their construction fields and professional training. Technical expertise and educational qualification could jointly explain the level of enhancement of quality financial management practices in the study area. Even though this position can be inferred, the results of the analysis are inadequate to affirm this postulation.

The top ranking factor set in the study shows that construction firms in the study area have good experience. They understand the value of experience financial wise. The validated factors likewise show that good governance is serious. They receive the best attention in the study area.

The other variables are not too low as they all can be made significant by approximation to the 3.00 cut off mark. However, they all need more attention for better improvement especially prompt communication that stood at 2.49. The results show that the foreign firms have a higher level of enhancement of quality than their indigenous counterpart. It follows that the indigenous firms should move up for better improvement to meet up with their foreign counterpart and can even surpass them in future investigations or studies.

When juxtaposed with past studies, the results of the study agrees with ACCA(2017), Rahim (2019), UN (2021), Onyechere (2009), Asuquo and Akpan (2017).

#### *Factors Inhibiting Financial Management Practices*

Factors Enhancing Quality	Foreign Firm Mean	Foreign Firm Ranking	Indigenous Firm Mean	Indigenous Firm Ranking	Aggregated Mean	Aggregated Ranking	Remark
Poor Remuneration	3.11	2 <sup>nd</sup>	4.20	1 <sup>st</sup>	3.66	1 <sup>st</sup>	Significant
Poor Governance	3.10	3 <sup>rd</sup>	3.98	5 <sup>th</sup>	3.54	2 <sup>nd</sup>	Significant
Bad Financial Policies	3.00	4 <sup>th</sup>	3.97	6 <sup>th</sup>	3.49	3 <sup>rd</sup>	Significant
Low Moral Value	2.86	8 <sup>th</sup>	3.99	4 <sup>th</sup>	3.43	4 <sup>th</sup>	Significant
Inexperience	2.76	9 <sup>th</sup>	4.04	2 <sup>nd</sup>	3.40	5 <sup>th</sup>	Significant
Poor Organizational Culture	2.68	13 <sup>th</sup>	4.02	3 <sup>rd</sup>	3.35	6 <sup>th</sup>	Significant

Lack of Proper Financial Awareness	2.99	5 <sup>th</sup>	3.59	8 <sup>th</sup>	3.29	7 <sup>th</sup>	Significant
Poor Accounting Practice	2.96	7 <sup>th</sup>	3.33	12 <sup>th</sup>	3.15	8 <sup>th</sup>	Significant
Poor BOQ Prep.	2.63	14 <sup>th</sup>	3.60	7 <sup>th</sup>	3.12	9 <sup>th</sup>	Significant
Poor Communication	2.98	6 <sup>th</sup>	3.20	13 <sup>th</sup>	3.09	10 <sup>th</sup>	Significant
Incompetence	2.73	11 <sup>th</sup>	3.39	11 <sup>th</sup>	3.06	11 <sup>th</sup>	Significant
Poor Audits	2.70	12 <sup>th</sup>	3.40	10 <sup>th</sup>	3.05	12 <sup>th</sup>	Significant
Poor Education\Training\Literacy	3.21	1 <sup>st</sup>	2.88	18 <sup>th</sup>	3.05	12 <sup>th</sup>	Significant
Absence of Quantity Surveyor	2.64	15 <sup>th</sup>	3.02	14 <sup>th</sup>	2.83	13 <sup>th</sup>	Not Significant
Absence of Accountant	2.60	18 <sup>th</sup>	2.97	15 <sup>th</sup>	2.79	14 <sup>th</sup>	Not Significant
Untimely and Poor Budgets	2.62	16 <sup>th</sup>	2.96	16 <sup>th</sup>	2.79	14 <sup>th</sup>	Not Significant
Absence of BOQ	2.61	17 <sup>th</sup>	2.89	17 <sup>th</sup>	2.75	15 <sup>th</sup>	Not Significant
Overall	2.83		3.49		3.16		

**Source: Author's Field Survey (2022).**

The results in this objective gave some insightful premise that can aid us in giving instruction about the factors inhibiting quality financial management practices in Delta State of Nigeria. 14 factor dimensions was validated significant to show that the inhibition of quality financial management practices can be shown or explained using these validated dimensions. Descriptive validity wise, poor remuneration(3.66), poor governance(3.54), bad financial policies(3.49), low moral value(3.43), inexperience(3.40) are top five factors inhibiting quality financial management practices in construction firms in the study area. The construction firms also showed some inconsistency as regards their educational degrees. The level of inhibition of quality is not in cognate with their education in their construction fields and professional training. Technical expertise and educational qualification could not reduce the level of inhibition of quality financial management practices to the bearest minimum in the study area. Even though this position can be inferred, the results of the analysis are inadequate to affirm this postulation.

The top ranking factor set in the study shows that construction firms in the study area have poor remuneration, poor governance, bad financial policies, low moral value, inexperience, poor organizational culture etc. in the study area.

The other variables are not too low as they all can be made significant by approximation to the 3.00 cut off mark. However, they all need more attention for better improvement. The results show that the foreign firms have a moderate level of inhibition of quality than their indigenous counterpart. The indigenous have high level of inhibition. It follows that the indigenous firms should move up for better improvement to meet up with their foreign counterpart and can even surpass them in future investigations or studies.

When juxtaposed with past studies, the results of the study agrees with Nyakamba *et al* (2017), Dachi *et al* (2021), Nirwana (2018) and Sami (2021).

*Construction Firm Financial Performance*

Financial Performance	Foreign Firm Mean	Foreign Firm Ranking	Indigenous Firm Mean	Indigenous Firm Ranking	Aggregated Mean	Aggregated Ranking	Remarks
Net Profit	3.20	2nd	2.67	3 <sup>rd</sup>	2.94	1 <sup>st</sup>	Not Sig.
Adequacy of Staff	3.11	3rd	2.70	2 <sup>nd</sup>	2.91	2 <sup>nd</sup>	Not Sig.
Staff Remuneration	2.98	6th	2.62	4 <sup>th</sup>	2.80	3 <sup>rd</sup>	Not Sig.
Dividends	2.99	5th	2.60	5 <sup>th</sup>	2.79	4 <sup>th</sup>	Not Sig.
Financial Frauds & Scandals	2.75	7th	2.72	1 <sup>st</sup>	2.74	5 <sup>th</sup>	Not Sig.
Strength of Employment per year	3.35	1st	1.85	6 <sup>th</sup>	2.60	6 <sup>th</sup>	Not Sig.
Total Assets	3.01	4th	1.80	7 <sup>th</sup>	2.41	7 <sup>th</sup>	Not Sig.
Overall	3.06		2.42		2.74		

**Source: Author's Field Survey (2022)**

Not Sig. = Not Significance

The financial performance of construction firms has many advantages for them and the society at large. This can be better assessed from the business perspective as construction firms or contractors are mainly in business for gain or profit. Seven financial performance indicators typical businesses use were used for this financial performance rating. The top most three in the ranking are net profit (2.94), adequacy of staff (2.91) and staff remuneration (2.80). Others are dividends pay outs (2.79), financial frauds & scandals (2.74), strength of employment per year (2.60) and total assets (2.41).

None of these made the 3.00 cut off mark for significance but can all be approximated to make it with the exception of total assets that stood at 2.41.

The results indicate that the level of financial performance is at par with the level of use of the financial management practices. The level of use of these practices has a direct and significant effect on the financial performance of the construction firms in the study area.

When these results are compared with previous studies, it agrees with many such as Otali *et al* (2018), Taouab and Issor (2019), Selvam *et al* (2016), Thang (2010), Odongo (2018), Muguchia (2018).

### Conclusion

Financial management practices are financial recording\reporting, working capital management, internal control and financial planning. Construction firms are expected to produce efficiency in formal planning, corporate governance control, monitoring activities, enhancement of management of resources and control activities. These sets of financial management practices are objectives to produce efficiency in transforming the financial fortunes of construction firms in the study area. The implication of this finding is that construction firms must focus or optimize actions in these areas for an enhanced financial performance.

Construction firms are critical in experience, good governance, good financial education\literacy, staff strength, staff remuneration and presence of accountant. These factors define the archetype of enhancement of quality of financial management practices in the research environment. It shows that construction firms can transform their financial fortunes using these factors. The implication of this finding is that, construction firms seeking to upscale their financial management practices level must target improvement in their human resources along these lines to avoid jeopardizing their financial fortunes.

Construction firms are critical in poor remuneration, poor governance, bad financial policies, low moral value and inexperience. These factors define the archetype of inhibition of quality of financial management practices in the research environment. It shows that construction firms financial fortunes are adversely affected when these factors inhibit or limit the level of use of the financial management practices. The implication of this finding is that, construction firms seeking to upscale their financial management practices level must target improvement in their human resources along these lines to avoid jeopardizing their financial fortunes.

The financial performance of construction firms is important not only to them but also to the society at large. Our society cannot be better without the financial fortunes of these construction firms. The financial fortunes of these firms are determined by the level of use of the financial management practices. Critical in the performance indicators are net profit, adequacy of staff, staff remuneration and dividend payouts. The implication of this finding is that construction firms in the study area must ensure that they optimize their level of use of the financial management practices so as to avoid jeopardizing their financial performance.

### **Recommendations**

The following recommendations can be made

- i. For us to sustain and improve on the level of use of these financial management practices, top management must ensure that they are strict over the use of these practices. Only competent hands should be on deck as this enhances the use of these practices.
- ii. The factors enhancing quality financial management practices should be improved upon. This ensures that there is high level of use of these practices.
- iii. The factors inhibiting quality financial management practices should be reduced to the bearest minimum. This encourages quality financial management.
- iv. For a better construction firm financial performance, it is recommended that the above be strictly adhered to, for an improved financial performance.

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## CONSTRUCTION STAKEHOLDERS' PERCEPTION OF PUBLIC BUILDING ACCESSIBILITY BY PERSONS WITH DISABILITIES IN SELECTED STATES IN SOUTH-EAST, NIGERIA

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### ABSTRACT

*Construction stakeholders in Nigeria rarely construct public buildings that satisfy general users' requirement, as they always negate the features and facilities for accessibility of persons with mobility disabilities (PWMD). Therefore, this study assessed construction stakeholders' knowledge and practices on ensuring accessibility for PWMD in public building in three selected states in south east Nigeria, with the view to enhance inclusive design, management and construction of public buildings. An exploratory survey approach was employed, which utilized close ended questionnaire and direct observation record based on pilot survey of the construction stakeholders and case study of public buildings respectively. Stratified random sampling techniques was used in selection of 240 construction stakeholders', while census method of sampling was employed for the selection of 15 observed buildings. Results from the study revealed that the mean ranges obtained for the level of awareness of construction stakeholders is above 2.45-3.44 which is within the average point from set decision. While, the level of conformance of observed public building is below 41% - 60% which is within the moderate level of conformance of public building in this study. From the result obtained in this study, it was concluded that construction stakeholders are aware of the functional requirements of accessibility features of public buildings for PWMD. But the observed public buildings in south east Nigeria are inaccessible by PWMD in accordance to Americans with Disabilities Act of Accessibility Guideline (ADAAG) standard.*

**Key words:** *Accessibility, Disability, Inclusive design, Construction stakeholder', Mobility Disability.*

### INTRODUCTION

Construction stakeholders in Nigeria rarely construct public buildings that satisfy the general users' requirement, as they always negate the features and facilities for accessibility of persons with mobility disabilities (PWMD) (Ubani and Ugwu, 2013); and at some times where the accessibility facilities are constructed in public buildings, they do not function as to provide independent accessibility for PWMD. Moreover, public buildings without an articulated means of entrance, circulation and exit limits the effective participation and contribution of PWMD (Romanyuta, 2011).

In order to ensure access in public buildings which will promote participation of PWMD in the society, many Acts have been promulgated. One of such Acts is the United Nations Convention on Right of Persons with Disabilities UNCRPD (UNCRPD, 2006). However, Article 9 of the UNCRPD mandates the provision of physical access for the PWD in public buildings on equal basis with other citizens, in order to enable them live independently and participate fully in all aspect of life (UNCRPD, 2006). Fortunately, Nigeria signed and rectified the UNCRPD and its optional protocol on 30<sup>th</sup> March 2007 and 24<sup>th</sup> September 2010 respectively which has made her a party to the convention (Onyekwere, 2018). On this note, the Nigeria President on 23<sup>rd</sup> January, 2019 signed the Discrimination against Persons with Disabilities (Prohibition) Act 2018, in fulfilment of Nigeria obligation under the UNCRPD and also stipulate a five years' modification of public buildings alongside other infrastructures to make them accessible by persons with disabilities PWD (Human Right Watch, 2019).

However, James (2017) studied public awareness of the accessibility features in Meru town, Kenya, and noted that about 59.3% of the participants acknowledged that they are aware of the accessibility features. Furthermore, Hamzat and Dada (2005); Chan, Lee, and Chan (2009); Danso, Ayarkwa and Dansoh (2011); Kardir and Jamaludin (2012); Ubani and Ugwu (2013) have conducted studies on evaluating the level of conformance of public buildings accessibility for PWD.

On this note, this studies investigated the level of awareness of construction stakeholders on accessibility features in public building for PWMD and the level of accessibility conformance of public buildings in three selected states in south east Nigeria, using Americans with Disability Act Accessibility Guideline ADAAG, (2004) as a checklist for standard requirement of an accessible public building. To achieve the aim of this study, the following objectives were formulated:

- i. To determine the level of awareness of construction stakeholders in South-East, Nigeria on the accessibility features/ facility standards for Persons with Mobility Disabilities (PWMD) in public buildings.
- ii. To establish the level of accessibility conformance of public buildings in South-East, Nigeria in line with the United Nations Convention on Right of Persons with Disabilities (UNCRPD) mandate on accessibility for Persons with Mobility Disabilities (PWMD).

**METHODOLOGY**

This study was conducted on three selected states in south east Nigeria which are; Enugu, Anambra and Imo states. The study adopted an exploratory survey research design, which utilized well-structured questionnaire and direct observation record based on the pilot survey of construction stakeholders and a case study of public buildings respectively. The responds from the respondents were collected on a five point Likert scale, while direct observation of the public buildings were reported in an ordered qualitative model.

The population frame for the objective one, is the construction stakeholders, which are: Architects, Builders, Engineers and Quantity Surveyors. The choice of these professionals is due to their role in designing, managing and construction of building projects (Ameh and Odusami, 2014). Stratified random sampling technique was employed in selecting these

Respondents, and this technique was achieved by stratifying the respondents of the three selected States (Enugu, Anambra and Imo) into their various professions. Afterwards, the required number that makes up the sample size in accordance with the stratification were proportionately selected from each professional stratum at random.

The population size as obtained from pilot survey of existing data base of the registered professionals, which makes up the construction stakeholders in this study reveals that's the total population of the construction stakeholders in this study is 1,090 as shown in Table 1. While the sample size is 240 as obtained from the population size, through application of Kish Leslie formula for sample size (Kish, 1965), which is given as;

$$n = \frac{n'}{1 + n'/N}$$

Where *n* = sample size;

*n'* = sample size from infinite population, obtained from the formula (*n'* = S<sup>2</sup>/V<sup>2</sup>)

S<sup>2</sup> = standard error variance of population element which is S<sup>2</sup> = P (1 - P); Maximum at P = 0.05.

V<sup>2</sup> = standard error of sample population equal 0.05 for the confidence level of 95 percent.

*n'* = S<sup>2</sup>/V<sup>2</sup> = (0.5)<sup>2</sup> / (0.05)<sup>2</sup> = 100

N = total population.

**Table 1: Population size and sample size of the construction stakeholders**

Construction Stakeholders	Enugu State	Anambra State	Imo State	Population size	Sample size
Builders	22	25	18	65	39
Architects	112	35	52	199	66
Q.S	33	28	24	85	46
Engineers	288	208	245	741	89
<b>Total</b>	<b>455</b>	<b>296</b>	<b>339</b>	<b>1090</b>	<b>240</b>

Source: Researcher's Pilot Survey (2019).

The population frame for objective two is the buildings in the three selected State University of south east Nigeria (Enugu, Anambra and Imo) that are fundamental to the functionality of higher institutions. The choice of University buildings as the population frame for public buildings is because, the University buildings are of many usage categories. Moreover, University reflects the cultural practices of the nation. Thus, the university buildings have the ability to give a good reflection of what is been practiced by construction stakeholders in the study area. University buildings which are fundamental to the functionality of the higher institutions and are permissible for observation in the three selected States of the study area include; the Senate building, Library buildings, Hostel buildings, Lecture buildings, ICT buildings, giving a population size of five buildings for the objective two. Consequently, census method of sampling was adopted based on how few the population size is; meaning that the entire population was sampled (Akinradewo, Ojo and Oyefusi, 2017).

Data collected from the research tools in this study were computed using Statistical Package for Social Science (SPSS) software. Data for objectives one were analysed to obtain the Mean and Mean rank while data addressing objective two, was ordered to obtain the percentage conformance of the observed public buildings to accessibility requirements of ADAAG for the bases of decision making.

Data addressing objective one, was collected based on the construction stakeholders' level of awareness of functional requirements of 12 identified features of accessibility in public building as stated in ADAAG. 59 item test which represents the functional requirement of the 12 features of accessibility were generated accordingly under the 12 features of accessibility and analysed to obtain the Mean Item Score (MIS) of each of the 59 item test. The MIS generated under the 12 features were summed up accordingly and divided by its total to obtain the mean (Group Mean) of each of the 12 features. The decision on the level of awareness of the construction stakeholders on accessibility feature requirement was achieved as follows: Mean 1-1.44 = extremely low level of awareness; Mean 1.45-2.44 = low level of awareness; Mean 2.45-3.44 = Moderate level of awareness; Mean 3.45-4.44 = high level of awareness; Mean 4.45-5.00 = extremely high level of awareness. This system is as used by Appiah-Agyekum and Suapim (2013) in assessing awareness of HIV/AIDS.

Data addressing objective two was collected under five groups as follows: Entrance (curb ramp and access door); horizontal circulation (passageways); vertical circulation (wheelchair lift and ramp); convenience (restroom); Safety (areas of rescue assistance, signs and symbols, alarm). The report from the observed public buildings were ordered into hierarchy through determining the percentage conformance of the buildings, which form an ordered qualitative data as was used by Abdel-Aty (2003); Bordagaray *et al.* (2014); Dell'olio, MacHado and De Ona (2015). For instance, where the ADAAG requirement for one group such as "the Entrance" is 7, and the entrance of the observed building conforms to only 3 out of the 7 requirements, the percentage of the requirement that were met will be collected to determine the level of conformance of the observed building to accessibility requirements. The decision is that 1% - 20% conformance = extremely low level of conformance; 21% - 40% conformance = low level of conformance; 41% - 60% conformance = moderate level of conformance; 61% - 80% conformance = high level of conformance; 81% - 100% = extremely high level of conformance.

## **RESULTS AND DISCUSSION**

The result obtained from this study is presented and discussed as follows:

### **Questionnaire Administration**

The percentage of the questionnaire returned by construction stakeholders of the three selected states as shown in Table 2 are 55%, 56.92% and 55.42% for Enugu, Anambra and Imo states respectively. However, response rate of 50% has always been viewed adequate for analysis and reporting Mugenda and Mugenda (2003).

**Table 2: Questionnaire distribution in the study area**

States	Stakeholders	No. distributed	No. returned	Percentage returned (%)	No. not returned	Percentage not returned (%)
Enugu	Builders	5	4	80.00	1	20.00
	Architects	25	14	56.00	11	44.00
	Q.s	7	4	57.14	3	42.86
	Engineers	63	33	52.38	30	47.62
Total		100	55	55.00	45	45.00
Anambra	Builders	5	3	60.00	2	40.00
	Architects	8	5	62.50	3	37.50
	Q.s	6	4	66.67	2	33.33
	Engineers	46	25	54.35	21	45.65
Total		65	37	56.92	28	43.07
Imo	Builders	4	3	75.00	1	25.00
	Architects	12	7	58.33	5	41.67
	Q.s	5	3	60.00	2	40.00
	Engineers.	54	28	51.85	26	48.15
Total		75	41	54.67	34	45.33
Grand Total		240	133	55.42	107	44.58

Source: Researcher's field Data (2019).

### Assessing the Level of Awareness of Construction Stakeholders on the Accessibility Features for Persons with Mobility Disabilities (PWMD) in Public Building

The Table 3 reveals the construction stakeholders' level of awareness of accessibility features. It shows the group mean of the 12 features of accessibility which is the bases for decision statement. The Table 3 shows that in Enugu state, the construction stakeholders' level of awareness of the "Curb ramp", "Ramp" and "Wheelchair lift" is extremely high and ranked the first, second and third respectively. This is followed by "Passageways", "Handrail", "Means of egress", "Accessibility symbol (international symbol of disability)", "Accessible doors", "Accessible restroom", "Area of rescue assistance or area of refuge", "Elevator" and "Safety alarm" which ranked from fourth to the twelfth respectively. Noteworthy, the level of awareness of the construction stakeholders of the fourth to the twelfth accessibility features is high, while the level of awareness of the first three ranked features of accessibility is extremely high.

Table 3 further reveals that the level of awareness of the construction stakeholders' in Anambra State on the "Curb ramp" and the "Wheelchair lift" is extremely high among the other features of accessibility. Thus, the two features ranked first and second respectively among other features of accessibility for PWMD in public building. Next to the two features are "Means of egress", "Ramp", "Passageways", "Accessibility symbol", "Restroom", "Elevators", "Accessible doors", "Area of rescue assistance", "Handrail" and the "Safety alarm" which ranked from third position to the twelfth respectively. In Imo State, the Table 3 reveals that the construction stakeholders' level of awareness of the 'Passageway' and the 'Curb ramp' is extremely high. Thus, the two features ranked first and second respectively while the level of awareness of the construction stakeholders on the other features is high. Next to the curb ramp in the rank order is the "ramp" which ranked third, followed by the "wheelchair", the "accessible door", "handrail", "restroom" and "accessibility symbol", "area of rescue assistance", "safety alarm", with the rank of third position to tenth position respectively. The level of awareness of construction stakeholders in Imo State on the features of accessibility which ranked third to tenth is high.

**Table 3: Construction stakeholders' level of awareness of accessibility features for PWMD in public building**

S/n	Accessibility features	Enugu state construction stakeholders N = 55			Anambra construction stakeholders N = 37			Imo state construction stakeholders N = 41			Combined			Remark
		Sum	Mean	Rank	Sum	mean	rank	Sum	mean	rank	Sum	mean	Rank	
1	Curb ramp	249	4.53	1	167	4.50	1	187	4.55	1	201	4.54	1	EA
2	Ramp	245	4.45	3	161	4.36	4	180	4.38	3	195	4.40	4	HA
3	Wheelchair lift	246	4.47	2	165	4.47	2	179	4.36	4	196	4.43	2	HA
4	Elevators	220	4	11	155	4.18	8	162	3.95	11	179	4.04	11	HA
5	Accessible passageways	235	4.28	4	161	4.34	5	189	4.62	1	195	4.41	3	HA
6	Accessible doors	227	4.13	8	154	4.17	9	178	4.34	5	186	4.21	6	HA
7	Accessible restrooms	226	4.1	9	155	4.19	7	173	4.22	8	185	4.17	9	HA
8	Area of rescue assistance	221	4.02	10	154	4.15	10	172	4.2	9	182	4.12	10	HA
9	Accessible means of egress	230	4.19	6	162	4.39	3	176	4.28	6	189	4.28	5	HA
10	Safety alarm	205	3.72	12	147	3.96	12	165	4.02	10	172	3.9	12	HA
11	Accessibility signs and symbol	228	4.14	7	156	4.21	6	173	4.22	8	185	4.19	7	HA
12	Handrail	233	4.23	5	151	4.07	11	174	4.24	7	186	4.18	8	HA
<b>Average</b>		<b>230</b>	<b>4.19</b>		<b>157</b>	<b>4.2</b>		<b>176</b>	<b>4.28</b>		<b>188</b>	<b>4.24</b>		

EA = extremely high level of awareness; HA = high level of awareness.

Result on Table 3 shows that the construction stakeholders are conversant with the features of accessibility in public buildings for PWMD. This result clarifies the notion of Department for Communities and Local Government (DCLG), (2006) which was demonstrated in their call for raising awareness to enlighten construction stakeholders' on the features that are expected of an inclusive public building. This therefore means that the issue of inaccessibility of PWMD is not as a result of lack of awareness of the construction stakeholders' of the accessibility features, as the study has revealed that the construction stakeholders are aware of the features of accessibility and its functional requirement for efficacy. However, this result conflicts the opinion of Lord, Posarac, Nicoli, Peffley, McClain-nhlapo, and Keogh (2010) who suggested creating platforms in other to raise awareness on issues related to accessibility of PWD. The result as shown in Table 3 further reveals that the level of awareness of the construction stakeholders on "Curb ramp" is extremely high, and this remark is consistent across the three selected states of study in south east Nigeria, thus agrees with the report by Mwirigi (2017) that curb ramp is the major accessibility feature of building infrastructure for PWMD. This also explains the reason why most studies on accessibility focuses on the "curb ramp" (Ikechukwu, Folaranmi, Philip, Ayodele, Omachoko, 2015). However, the result on construction stakeholders' awareness of accessibility features which indicates that the construction stakeholders' are custodian with the functional requirements of the accessibility features as outlined in ADAAG means that issues of accessibility in Nigeria public buildings is not on the basis of lack of knowledge of the required features and standards that can make the public buildings disable friendly.

**Evaluating the level of accessibility conformance of public buildings in South-East Nigeria.**

The report obtained from the observed State University buildings which includes; Enugu State University of Science and Technology (ESUT) Agbani campus, Anambra State University (ANSU) Igbariam campus, Imo State University (IMSU) Owerri, were ordered into a quantitative model through simple percentage to show the level at which each observed building conform to accessibility mandate of the UNCRPD using ADAAG as a checklist for conformance. Table 4 is the summary of the observed buildings in the three state universities.

**Table 4: level of accessibility conformance of the observed buildings in ESUT, ANSU and IMSU**

Observed buildings	ESUT N =285						ANSU N = 218						IMSU N = 318						Combined		
	No. of requirements	No. Satisfied	Percentage Satisfied (%)	Rank	Remark		No. of requirements	No. Satisfied	Percentage Satisfied (%)	Rank	Remark		No. of requirements	No. Satisfied	percentage	Satisfied (%)	Rank	Remark	Percentage Satisfied (%)	Rank	Remark
Senate	42.00	5.50	13.10	4	<b>EL</b>		42.00	4.50	10.71	4	<b>EL</b>		42.00	9.00	22.62	2	<b>L</b>	15.48	4	<b>EL</b>	
Library	42.00	8.00	19.05	1	<b>EL</b>		42.00	6.00	14.29	3	<b>EL</b>		42.00	6.00	15.48	3	<b>EL</b>	16.27	3	<b>EL</b>	
Hostel	38.00	6.50	17.11	3	<b>EL</b>		35.00	6.50	18.57	2	<b>EL</b>		42.00	9.50	22.62	1	<b>L</b>	19.43	1	<b>EL</b>	
Lecture hall	42.00	4.00	9.52	5	<b>EL</b>		42.00	6.00	14.29	3	<b>EL</b>		42.00	4.00	9.52	4	<b>EL</b>	11.11	5	<b>EL</b>	
ICT	42.00	7.86	17.86	2	<b>EL</b>		42.00	9.50	22.62	1	<b>L</b>		42.00	6.00	14.29	3	<b>EL</b>	18.26	2	<b>EL</b>	
<b>Total</b>	206	31.86	15.47				203	26.5	16.10				210	34.50	16.90			16.11			

EL = extremely low level of conformance, L = low level of conformance

Table 4 shows that all the observed buildings does not conform to the accessibility standard for PWMD in terms of independent and commensurable access as mandated by the UNCRPD. This result supports the observation by Mwiri (2017) that person with disabilities are the most vulnerable in the public building during emergency evacuation situations.

However, in ESUT, the percentage conformance of the observed building to accessibility indicates an extremely low level of conformance, while in ANSU and IMSU; the ICT buildings and the senate buildings level of conformance are at the low level, while other observed buildings in IMSU and ANSU shows an extreme low level of conformance.

Generally, Table 4 further explains that none of the observed public buildings in south east Nigeria is accessible to PWMD as most of the entrances observed have a floor slab thickness greater than 150mm, yet they are without Curb ramp, and where the curb ramps are seen at the entrance, they fail to satisfy the ADAAG standard for curb ramp. The entrance doors are with unbeveled thresholds making it difficult for the wheelchair users to pass through.

However, the result on the entrance of the observed buildings in the three selected states supports the study by Yarfi, Ashigbi and Nakua (2017) which revealed that despite the presence of curb ramp at a building entrance, the standard of the curb ramp might render the curb ramp ineffective. Their finding on curb ramp gradient in other buildings is consistent with the result obtained on the gradient of this study as all the observed curb ramp gradient is greater than 1:12. The result on accessibility conformance of the public buildings in this study also reveals that most of the curb ramps have widths that are greater than 915mm with a non-slippery surface even though none of the curb ramps has a gradient less than or equal to 1:12. Which makes independent entrance into the public buildings difficult for PWMD. However, this study reveals that modification of the observed entrances is very possible as it will not cause obstructions in accordance to the belief of the United State Access Board (2011) that inadequacy of the Curb ramp's gradient is because the modification of the curb ramps to make it accessible might cause blockage of access route. Thus, the inadequacy of the observed building curb ramp is not as a result of modification problem. The result of the observed buildings also reveals that some passageways (the corridors and entrance porch) of the observed buildings have widths that are less than 1,525mm and changing floor levels which will constrain the free horizontal circulation of PWMD. This finding supports the study by Mwiri (2017) that most public buildings lack accessible routes which stands as barrier for wheelchair users. The observation record on accessibility conformance of the observed buildings further reveals that none of the observed buildings has features for vertical circulation of PWMD; no wheelchair or ramp in the observed buildings with more than one floor, and this supports the findings by Kportufe (2015) who stated that 80% of the Ghana public building which are upstairs do not have vertical circulation facilities like the Ramp and Wheelchair lift. The observed restrooms have no door closers, the doors can't allow the passage of wheelchair users into the restroom, the restrooms are without grab bars, and the water closet is centralized which will eventually not allow the transfer of PWMD from the wheelchair to the water closet. And this result is in agreement with the finding by Danso *et al.* (2011) and Banda-Chalwe, Nitz, and Jonge (2014) that lavatories in Ghana are inaccessible to wheelchair users due to the width of the door and lack of grab bars. Asfaw, Azage and Gebregergs (2016) explained that absence of grab bars, size of lavatories makes the lavatories to be inaccessible in Ethiopia. None of the observed buildings has area of rescue assistance, none has symbol of accessibility and safety alarm which supports that PWMD are unsafe in public buildings which is in line with the opinion

## CONCLUSION

From the results obtained in this study, it was concluded that construction stakeholders are aware of the functional requirements of accessibility features of public buildings for PWMD. But the public buildings in south east Nigeria are inaccessible by PWMD as their level of conformance to accessibility requirement is below the research set average of 41% - 60% which represents a moderate level of conformance to accessibility in accordance to the ADAAG standard.

From the result obtained in the test for significant variation among the three selected states of south east Nigeria on the level of awareness of their construction stakeholders on accessibility



features for PWMD, it was concluded that there is no significant variation among the three selected states of south east Nigeria on their construction stakeholders' awareness of accessibility features. Therefore, it is recommended that international monitoring framework should be developed such that will ensure that the mandates on accessibility are adhered to. Following that, Landlords and construction stakeholders that default the mandate should be prosecuted accordingly as stipulated in Nigeria prohibition Act 2018 (The National Assembly Federal Republic of Nigeria, 2018).

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## **EFFECT OF POPULATION GROWTH ON QUALITY OF RESIDENTIAL ENVIRONMENT IN UYO URBAN, AKWA IBOM STATE OF NIGERIA**

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### **Abstract**

*The effect of population growth on the quality of residential environment of neighbourhoods in Uyo urban, Akwa Ibom State of Nigeria was examined. The research design adopted was survey technique in which 381 copies of questionnaire were administered in 10 sampled neighbourhoods. Data were extracted from 298 questionnaire that were returned fit for analysis. Regression analysis was used to establish the relationship between population growth and quality of residential environment in Uyo urban, Akwa Ibom State of Nigeria. The study revealed that there is a significant negative (inverse) relationship between population growth ( $\Delta POP\_GRT$ ) and the quality of residential environment. In effect, population growth negatively influences the perceived residential environmental quality in Uyo urban. Based on the findings, it is recommended that measures should be put in place by government to control population growth if the effect on residential environmental quality must be reduced.*

**Keywords:** *Population, Growth, Quality, Residential, Environment, Neighbourhood.*

### **1.0 Introduction**

Human population can be referred to as the number of people usually residing within a specified habitat or area while population growth is a change in population over time, meaning a change in the number of individuals in a population per unit time (Matthew, 2016). From a global perspective, population growth is still a serious cause for concern which has become a public health issue, especially among countries in the continent of Africa. Africa contributes a high number of world's population every year. The effect of population growth on economic growth and standard of living is a major concern in most of the developing countries including Nigeria (Headey and Hodge, 2009). Population growth which is usually as a result of urbanization occurs at a rapid rate over the past few years in many developing countries, Nigeria inclusive (Abimbola and Adebayo, 2015). This rapid growth especially through urbanization requires a corresponding rate of growth of residential environment quality.

Environmental quality refers to a set of features and characteristics of the environment; generic or local as they affect human beings and other organisms. Components of environmental quality include the natural environment such as vegetation, the built environment which includes air, water purity or pollution, noise and its potential effects on physical and mental health (European Environment Agency, 2012). In this sense, residential environment is a setting in which systems of human activities take place and where population lives (Bae *et al.*, 2019). Residential environmental quality, according to Kesalkheh and Dadasphoor (2012) is related to concepts such as: quality of life, livability, living quality, living environment, quality of a place, residential perception and satisfaction; and the evaluation of the residential and living environment. A quality residential environment comprises a good quality of life and the protection of economic, social and cultural activities.

The quality of a residential environment focuses on physical amenities, resources, aesthetics, safety, stimulation, peacefulness heterogeneity and homogeneity of the population together with interaction or withdrawal (Kesalkheh and Dadashpoor, 2012). Residential environmental quality is desirable in Africa's fast growing population. Consequently, Africa being the second largest and second most populous continent on earth with an estimated population in 2016 of 1.2 billion people thrives with difficulty to have residential environmental quality. In most countries in the continent, the population growth is in excess of 2% every year (UN, 2019). Nigeria, in 2019, had an estimated population of over 200.96 million, ranking seventh in the world (UN, 2019). Uyo, the capital city of Akwa Ibom State, Nigeria, perhaps because of its central location and administrative status has the fastest growing and highest population in the state (Ofem *et al.*, 2012). The population in the last national census in

1991 of Uyo urban was 188,188. In the last national census 2006 exercise, the population figure of Uyo stood at 307,507. The last known estimated population is approximately 1,200,000 in 2021 (UN, 2021). Stevenson and Wolfers (2013) posited that there were many consequences for the nature of population growth in an urban area such as urban expansion, urban sprawl, high cost of infrastructural development, increased emissions from transport vehicles that can cause air pollution which reduces air quality in the residential environment and affects human and environmental health in Uyo urban and impeding sustainable development (Aliyu and Ahmadu, 2017; Ofem and Adimah, 2022).

Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (UNSD, 2015). The concept of needs goes beyond simply material needs and includes values, relationships, freedom to think, act, and participate, all amounting to sustainable living, morally, and spiritually. It is about improving the well-being of everyone wherever they are and achieving this milestone collectively (Jones *et al.*, 2009). And adopting innovative technologies while keeping the environment safe. Sustainable development also focuses on finding better ways of doing things without affecting the quality of our life (Kauko, 2009).

### **Research Problem**

Population growth is a serious cause for concern in the world especially in developing countries. Globally, the effect of population growth is associated with consequences such as poor accessibility to health care services, pressure on human communities, exacerbating food and water scarcity, reducing resilience in the face of climate change, making it harder for most vulnerable communities to come out of poverty. Increasing human activities resulting from unsustainable population growth affects environmental quality such as vegetation, water, air and land which in turn impact on all components of the residential environment. As an ever growing human population reaches farther into remote areas in search of space to build cities and housing developments. It further threatens the balance between natural resources and people thereby causing serious physical, economic and social problems in urban areas.

The effect of population growth in Uyo urban which could probably be due to its location and status as state capital city on residential environmental quality has not been empirically established. The aim of this study therefore, is to examine the effects of population growth on the quality of residential environment. To achieve this, the hypothesis which states that there is no significant relationship between population growth and the quality of residential environment in Uyo urban was formulated for testing.

### **2.0 The Study Area**

Uyo urban is located between latitudes 4°32' and 5°38' north of the equator and longitudes 7°25' and 8°25' of the Greenwich meridian as shown in Figure 1. Uyo urban is centrally located, centre of administration and covers the most developed part of Akwa Ibom State (Udo, 2016; Akpan-Ebe *et al.*, 2016). These have resulted in massive influx of people into Uyo urban area. Consequently, available infrastructure and social amenities in the residential environment may not be keeping pace with the increase in population.

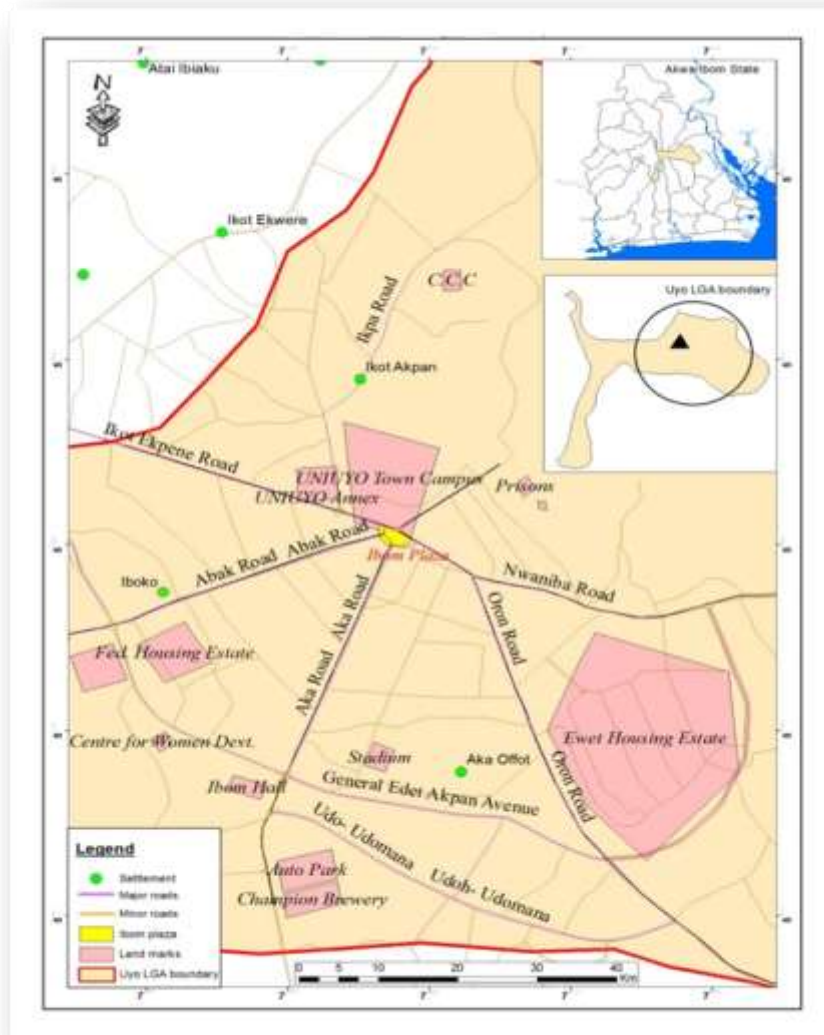


Figure 1: Map of Uyo Urban  
 Source: GIS Laboratory, Department of Geography and Natural Resources Management (2022)

### 3.0 Literature Review

The most populous country in the world is China having a population figure of more than 1.4 billion persons. India ranks second with a population of over 1.355 billion persons. The next eleven countries, each having a population of more than 100 million include the United States, Indonesia, Brazil, Pakistan, Nigeria, Bangladesh, Russia, Mexico, Japan, Ethiopia and the Philippines. Every five years since the 1970s, the population growth trend has fallen continually. The population of the world is expected to continue to increase but at a slower rate. The current annual population growth estimates from the United Nations are in millions (UN, 2019).

The main characteristics of population growth in Africa are the paradoxical low degree of urbanization in the face of rapid population growth. The continent of Africa generally does not consist of highly urbanized region of the world but the available few large urban centres are experiencing phenomenal population growth with cities such as Cairo, Kinshasa, and Lagos growing at the rate of over 10% per annum (UN, 2019). This was supported with a conclusion that the rate of change in the proportion of urban centres in developing countries is not exceptionally rapid by historical standards but instead is the rate of growth of populations in the urban centres (Muhammed *et al.*, 2015). Urban population trends in the third world countries such as India and Nigeria, have increased progressively over the years and by the year 2050, more people would have migrated to urban areas than the rural

areas. Urbanization is a major global trend; presently over half of the world's population live in urban areas (Guest and Brown, 2006). For instance, in India the trend of growth rate of population in the urban area between 1991 - 2001 was 21.5% and between 2001- 2011 was 17.6% resulting in a difference of - 3.9%.

The implication of this is that there is disequilibrium between the population and the environment and this has adversely affected the carrying capacity of the urban areas in the country; hence the increasing poor quality of the living conditions and the low livability index of urban areas (Asoka *et al.*, 2013). Previous research noted that the effects of overcrowding on individuals' residential environment often vary among different subgroups. High - density homes with mothers, children or low - status individuals are more likely to be problematic compared to other subgroups, and they tend to report more health problems than other subgroups (Solaris and Mare, 2012).

Residential environmental quality is one of the basic elements for quality of life and the main support for activities of economy, culture and society (Xiaoyu *et al.*, 2007). One of the main issues in relation to population and its environment is seen in individual satisfaction of the environment since the urban residential environment is seen as hierarchical and multidimensional concepts. Environmental quality is described by essential characteristics such as satisfaction of residents with environmental quality (Kesalkheh and Dadashpoor, 2012). Satisfaction is one of the main indicators considered as far as residential environmental quality is concerned. A high residential environmental quality provides welfare and a feeling of satisfaction to its residents which could be physical or social. They added that the quality of a residential environment is a reflection of planning, development and resources allocation between socio - economic classes and residents' quality of life.

Kesalkheh and Dadashpoor (2012) grouped residential environment into two categories namely: dwelling and neighbourhood. Dwelling according to them, consists of facilities and size, costs and upkeep. Neighbourhood comprised physical - spatial characteristics, functional - structural characteristics and socio-cultural characteristics. In addition, Moon *et al.* (2018) considered some Perceived Residential Environmental Quality (PREQ) scales which include architectural or town planning features comprising architectural and town planning space, organization of accessibility and green areas. The second scale being social relation features comprising people and social relations. The third scale being functional features including welfare services, recreational services, transport services and commercial services. The fourth scale relates to context features comprising pace of life, environmental health, upkeep and care. The fifth scale is neighbourhood attachment.

Constant increase in population is becoming a regular occurrence in cities, being that large urban areas provide enormous benefits to those who live in urban setting, such as better employment opportunities, a wider range of available services. Consequently, high population density is usually associated with various negative sides; such as noise pollution, heavy traffic, and low level of streets that may affect the quality of life of residents. An important factor to consider is whether the issue of residential includes both neighbourhood and housing satisfaction respectively (Hanak *et al.*, 2015). Sanni and Akinyemi (2009) posited that factors that are considered in residential environmental quality include a planned area with necessary infrastructural facilities which include good roads, pipe borne water, electricity make a place conducive for living and are taken into deep consideration. Findings in Ibadan urban centre revealed that educational level and estimated monthly income of housing consumers for instance, were major factors that determined the influence of the demand for residential neighbourhoods of housing consumers while others were employment and official status (Obiowo, 2017).

The quest for living a good life is usually centred on cities, since cities have become the target of quality of life measurement, due to the fact that they exhibit current culture trend ranging from technological development to social progress (Wokekoro, 2015). However, infrastructures and services in the urban areas have not been able to keep pace with rising population which usually brings spatial expansion; with rising urban poverty and deterioration in urban environmental problems (Lee and Son, 2017).

According to Adriaanse (2007) and Hanak *et al.* (2015) measurement and evaluation of satisfaction with residential environment and /or development of urban areas is a problem since there is no general consensus among experts regarding it. A number of different approaches based on a heterogeneous set

of indicators was established, which is in relationship with measurement of sustainability and satisfaction of residential areas. A slowdown in economic growth of a country will limit opportunities for employment and the resultant drift in place of residence, which would result in the quality of residential environment receiving more attention including the methods used to monitor the attributes that play a role in quality and public perception of a residential environment (Lee and Son, 2017)

The NPC (1991) observed that most urban areas in Nigeria have grown beyond their environmental carrying capacities and existing infrastructure. For instance, data from the NPC (1991) revealed that most of the urban areas in Nigeria with small land mass have already exhausted or have extremely limited capacities to accommodate further increase in population with a population figure of more than 140 million and land mass of about 924,000 km<sup>2</sup>. Current estimates indicated that 10 % of the land area accommodated 28 % of the country's total population (Cleland *et al.*, 2019).

Asthana and Asthana (2012) opined that as population agglomerates in urban areas most especially, human activities generate tremendous amount of waste materials, which increases as production and consumption activities increase. The waste generated may find their way into the major components of the environment (air, water and land) bringing about environmental pollution. The environmental conditions in cities have gradually deteriorated due to the rapid growth of cities and the frequent inability of social services and infrastructures to keep up with the rate of growth in population. Inadequate storm drains, dumping of refuse in drainage lines and construction of houses close to and even on channels of natural water have been revealed to be responsible for the increasing cases of flood in the urban centres also significantly influences an individual's life.

Urban sprawl is another effect of population growth on residential quality. It is the spreading out of a city and its suburbs over more and more rural land at the periphery of an urban area. This involves the conversion of an open space rural land into built - up developed land, over time (Butu and Mshelia, 2014). Sprawl is used as an aesthetic judgement about a general urban development pattern. Generally, sprawl is widely known as an ugly development with tendency to discontinuity and haphazard layout. (Haregewoin, 2005). Urbanization in Nigeria is characterized by city slums with serious environmental and social consequences. According to Lanrewaju (2012) millions of Nigerians live in sub - standard and sub - human environment, plagued by slum, squalor and grossly inadequate social amenities. The result is shown in growing overcrowding in homes, increasing pressure on infrastructural facilities and rapid deteriorating environment (Ohwo and Abotutu, 2015).

Population growth puts severe pressures on existing resources, but as Sivam (2014) observed, such growth ushers in needed adjustments that neutralize the effects of depleting technological change. Nigeria's large population has implication for development, as it does not augur well for the purpose of planning. Plans only succeed when the implementation is carried out with reliable data. But in the Nigerian experiences, the unreliable demographic data does not make implementation successful in the country (Biagi *et al.*, 2018).

Rapid population growth in Nigeria is equally associated with unemployment with figures ranging from 17% per annum for the entire population 60 % per the youths because job opportunities are fewer than the number seeking for them, due to stagnating economic performance because a larger proportion of available resources is consumed instead of invested to generate growth (Federal Republic of Nigeria, 2004). Social services, for instance, safe drinking growing number of the population in some other places crave for attention, thereby reducing whatever achievement made in the area of human development. For example, the proportion of the Nigerian population with access to safe drinking water and adequate sanitation in 1999 was 54.1% and 52.8 % respectively (FOS / UNICEF, 2000). The issue of housing has exacerbated with the number of homelessness of people increasing. Urban slums have risen in size. (UNSN, 2002).

A survey of housing quality and neighbourhood environments of Ibadan city, Nigeria was carried out on housing infrastructure, those areas where there was a tendency of future incidences of disease and epidemics were identified by Coker *et al.* (2007). Penalty scoring, was employed to assess the conditions and housing quality as well as the neighbouring environment in each of the zones. House in the high-density area had the worst property and environmental characteristics followed by houses in the medium density housing areas, and only one of the low density areas attained a good scoring grade. The houses are usually overcrowded with up to eight persons per room and to tenant abuse by

internal conversion to increase the occupancy rate (Coker *et al.*, 2007). The contributions of water supply to the quality of life sector are clear. It was reported that when there was a gap between demand and supply of water increase there was corresponding decrease in perceived quality of life. In the same vein, a decrease in the demand supply gap for water improved quality of life. (Wokekoro, 2015).

#### 4.0 Research Methods

The research design adopted is the survey technique, to evaluate population growth and the quality of residential environment in Uyo urban. To determine population growth trend, data on population growth of ten (10) sampled neighbourhoods out of (75) seventy five obtained from the National Population Commission was projected from 1991 to 2020, in which a graph showing the population growth from 1991 to 2020 was drawn from an excel sheet. Analysis was conducted to determine the population growth trend of the neighbourhoods in Uyo urban. The sampling units were households who were issued the questionnaire. Seventy-five (75) neighbourhoods made up the study area. Ten (13%) neighbourhoods were randomly sampled by arranging the neighbourhoods in an alphabetical order. This method was adopted in order to cover a wide area in the study and to avoid bias. The first neighbourhood on the list was selected, after which a skipping range of eight (8) was used to select ten (10) neighbourhoods from the 75 neighbourhoods to be sampled. Data on population growth trends and residential environmental quality were taken and the ten neighbourhoods sampled are presented in Table 1.

**Table 1: Ten Neighbourhoods and their Projected Population, Household and Sample Size**

SN	Neighbourhood	1991 Population	2020 Projected Population	Number of Households	Sample size
1	Afaha Atai	2,482	6,545	414	19
2	Anua Offot	6,521	17,195	2866	133
3	Ifa Ikot Akpabio	616	1,624	271	13
4	Ikot Akpa Etok	1,853	4,886	814	38
5	Ikot Mbon	1,291	3,404	567	26
6	Ikot Okubo	2,213	5,835	973	45
7	MbakIkotAbasi	1,883	4,965	828	38
8	Mbikpong Atai	1,176	3,101	517	24
9	Nung Ukana Ikot Obio	1,567	4,132	687	32
10	Use Ikot Ebio	640	1,687	281	13
	<b>Total</b>	<b>20,242</b>	<b>53,374</b>	<b>8224</b>	<b>381</b>

**Source:** Researcher's compilation (2021)

In addition, a 5-point Likert scale was used to measure the independent(X) and dependent variables(Y) (Potter *et al.*, 2004) identified, defined and measured as presented in Table 1. Statistical data analysis and testing of hypothesis were conducted. Decision - making was based on data analysis and results of findings.

Population growth projected as shown in Table 1 was calculated using the formula:

$$P_o = P_1 (1+r/100)^n \text{ -----Equation (1)}$$

Where  $P_o$ = Population projection (1991-2020),  $n$ =Number of years of projection (29),  $r$  = Rate of population growth (3.4), 1 = Constant



#### 4.1 Identification, Definition and Measurement of Variables

Tables 2 and 3 present both the 11 dependent and 3 independent variables respectively identified for data gathering and analysis. The definitions and units of measurements are also presented.

**Table 2: Dependent Variables (PREQIs)**

SN	Indices	Definition	Unit of Measurements
X <sub>1</sub>	Architectural and urban planning space	Refers to the space between houses in the neighbourhood	Metre square (m <sup>2</sup> )
X <sub>2</sub>	Road Accessibility	Refers to the road network connections linking the neighbourhood to other parts of the city.	Number of road networks
X <sub>3</sub>	Security	Refers to how safe the neighbourhood is from criminal activities.	Number
X <sub>4</sub>	Education	Refers to schools in the neighbourhood.	Number
X <sub>5</sub>	Transport Service	Refers to proximity of residents to the public transport pick up point.	Distance in Metre
X <sub>6</sub>	Waste Management	Refers to the dumpsite volume and frequency of evacuation of waste by waste management agency.	Frequency
X <sub>7</sub>	Commercial Service	Refers to availability of stores to serve the neighbourhood.	Number
X <sub>8</sub>	Recreational Service	Refers to availability of areas for outdoor activities like sport, sit- out etc.	Number
X <sub>9</sub>	Neighbourhood Upkeep	Refers to the cleanliness and maintenance culture in the neighbourhood.	Number
X <sub>10</sub>	Neighbourhood Serenity	Refers to the degree of noise and calmness in the neighbourhood.	Frequency of cases

**Source:** Adapted from Mao *et al.* (2015), Bonaiuto *et al.* (2015)

**Table 3: Independent Variable**

SN	Indices	Definition	Unit of Measurements
Y	Change in population growth	Refers to the summation of all population growth change, divided by the number of years	Mean change in population

**Source:** Adapted from Mao *et al.* (2015)

The regression model is specified below.

$$RES\_QUA = \alpha_0 + \alpha_1 \Delta POP\_GRT_1 + \alpha_2 URB\_PLN_2 + \alpha_3 RD\_ACC_3 + \alpha_4 SEC_4 + \alpha_5 EDU\_FAC_5 + \alpha_6 REC\_SERV_6 + \alpha_7 COMM\_SER_7 + \alpha_8 TRAN\_SERV_8 + \alpha_9 NEB\_SERE_9 + \alpha_{10} WST\_MGT_{10} + \alpha_{11} NEB\_UPK_{11} + \mu_1 \quad \text{-----Equation (2)}$$

Where:  $\alpha_0, \alpha_1, \alpha_2, \dots, \alpha_{11}$  are constants;  $\Delta POP\_GRT$  is population growth,  $URB\_PLN$  is urban planning,  $RD\_ACC$  is road accessibility,  $SEC$  is security,  $EDU\_FAC$  is educational facilities,  $REC\_SERV$  is recreational service,  $COMM\_SER$  is commercial service,  $TRAN\_SERV$  is transport service,  $NEB\_SERE$  is neighbourhood serenity,  $WSTMGT$  is waste management,  $NEB\_UPK$  is neighbourhood upkeep,  $RES\_QUA$  is residential quality,  $NEB\_ATT$  is neighbourhood attachment,  $RES\_SAT$  is residential satisfaction.  $\Delta POP\_GRT$  is change in population growth between 1991 and 2020 and will be computed as follows:  $\Delta POP\_GRT = (\text{Total Population Current Year} - \text{Total Population of Base Year}) / (t)$ .

The same principle applies to residential quality ( $RES\_QUA$ ) in equation 1, is for: population growth effects on residential environmental quality in Uyo urban Mao *et al.* (2004). The independent variable  $X_1$  to  $X_{10}$  was measured using a 5-point Likert scale, while  $X_{11}$  was derived from 1991 population figure.

#### 4.2 Population Growth Effects

To determine the effects of population growth on residential environmental quality, data on population growth was retrieved, and the mean value was obtained to analyse the data using regression analysis with the aid of statistical tool.

#### 5.0 Data Presentation, Result and Discussion

Of the 381 copies of the questionnaire distributed, 298 (78.2%) were completed correctly and returned.

#### 5.1 Population Growth Trend in Uyo Urban

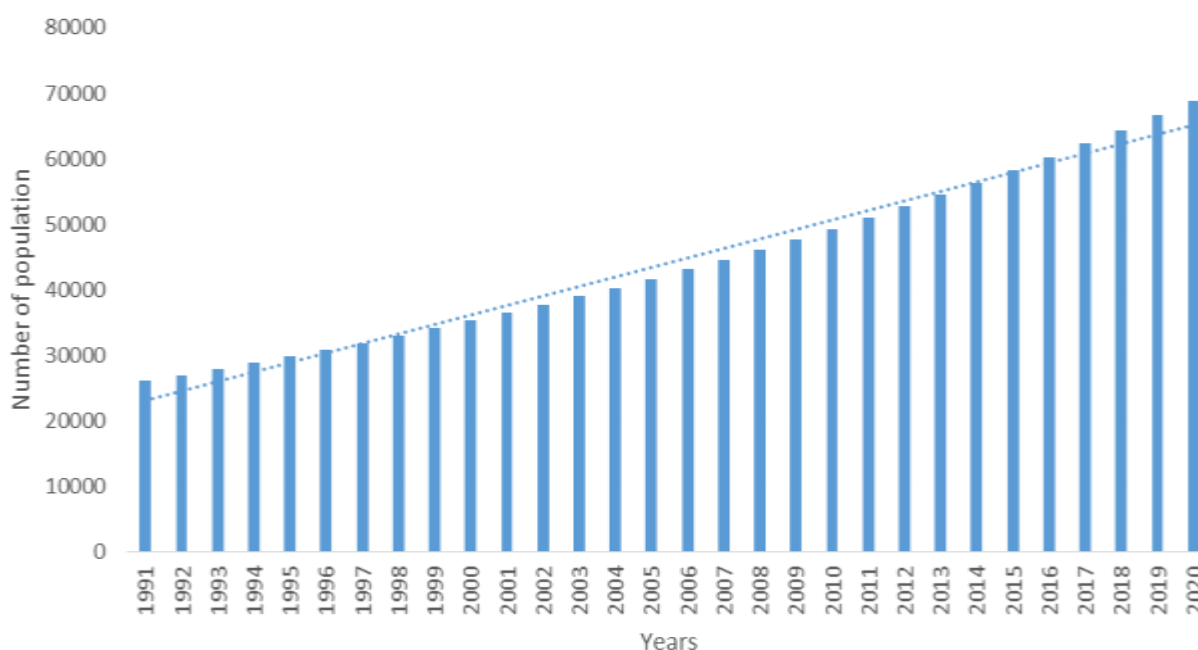
**Table 4: Data Presentation on Population Growth Trend.**

SN	Neighbourhood	1991 Population	2020 Projected population	Differences in Population
1	Afaha Atai	2,482	6,545	4, 063
2	Anua Offot	6,521	17,19	10,674
3	IfaIkotAkpabio	616	1,624	1,008
4	Ikot Akpa Etok	1,853	4,886	3,033
5	Ikot Mbon	1,291	3,404	2,113
6	Ikot Okubo Offot	2,213	5,835	3,622
7	MbaIkotAbasi	1,883	4,965	3,082
8	MbikpongAtai	1,176	3,101	1,179

9	Nung Ukana Ikot Obio	1,567	4,132	1,922
10	Use Ikot Ebio	640	1,687	1,047
Total		20,242	53,374	31,743

Source: Researcher's Projection (2021)

The changes in population growth between the years under study have also been reported. In effect, based on the projection of 2020 the ten neighbourhoods would have grown by more than half of the 1991 total population as shown in Table 4 and illustrated in Figure 2. The implication is that the continuous population growth will put pressure on the existing facilities and residents may not derive satisfaction from them.



**Figure 2:** Population growth trend in Uyo urban

## 5.2 Effects of Population Growth on Residential Environmental Quality in Uyo Urban

Table 5, reveals that Afaha Atai, Mbikpong, Nung Ukana, Ikot Obio and Use Ikot Ebio recorded a mean score of between 3.0 and 3.2 in architectural and urban planning space, implying that population growth has affected adversely the landscape and planning of the residential environment; All neighbourhoods in the study area have a mean score of between 3.1 and 4.4 in road accessibility which shows that population growth affects negatively the use of roads in the area. This may manifest in the form of more pressure on existing roads, traffic congestion and loss of traveling time. In terms of security, all the neighbourhoods except Anua Offot, Ikot Mbon, Mbikpong Atai and Nung Ukana Ikot Obio have mean scores ranging from 3.0 to 3.8 and negatively affected by population growth. This area could be prone to security challenges. Ifa Ikot Akpabio, Ifa Akpa Etok, Ikot Mbon, Ikot Okubo and Mbikpong Atai are all affected by population growth as they recorded mean scores of between 3.0 and 3.6 on education. The implication of this is that educational facilities may not be adequate owing to population growth in the area. Ifa Ikot Akpabio and Ikot Okubo are the only two neighbourhoods affected negatively by population growth in transport service as they recorded mean scores of 3.2 3.3 respectively.

Other effects are on: Waste management with mean scores ranging from 3.0 to 3.5 in Ifa Akpa Etok, Ikot Mbom, Ikot Okubo and Mbak Ikot Abasi. The growth in population increased waste generation which may not be adequately managed. Afaha Atai, Ikot Mbon and Mbak Ikot Abasi recorded 3.1, 3.3 and 3.3 respectively in commercial service owing to population growth. Recreational service recorded mean scores of between 3.0 and 4.2 in all the neighbourhoods studied. This reveals that population growth affected negatively the utilization of available recreation facilities. Finally, population growth affected Afaha Atai and Anua Offot neighbourhood upkeep with mean scores of 3.1 and 3.0 respectively.

**Table 5: Mean Value of Effects of Population Growth and Residential Environmental Quality**

SN	NH	Y	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>	X <sub>9</sub>	X <sub>10</sub>
1	AA	3.0	3.2	3.8	3.8	2.6	2.8	3.0	3.1	4.2	3.2	3.1
2	AO	2.7	2.6	4.3	2.1	2.9	2.6	2.8	2.9	3.0	3.3	3.0
3	IIA	3.0	2.6	3.5	3.3	3.4	3.2	2.5	2.6	4.1	3.2	2.7
4	IAE	2.8	2.8	4.3	3.2	3.6	2.6	3.5	2.0	4.2	3.0	2.5
5	IM	2.3	1.8	3.7	2.4	3.1	2.4	3.3	3.3	3.8	2.8	2.8
6	IO	2.6	2.3	3.1	3.2	3.2	3.3	3.1	2.7	3.3	2.9	2.9
7	MIA	2.5	2.9	3.5	3.1	2.3	2.1	3.0	3.3	3.4	2.9	2.7
8	MA	2.4	3.0	3.7	2.6	3.0	2.2	2.7	2.8	3.1	2.2	2.3
9	NUI	2.6	3.2	3.3	2.7	2.4	2.2	2.9	2.7	3.5	3.0	2.9
10	UIE	2.2	3.0	3.6	3.0	2.7	2.6	2.2	2.8	3.6	3.2	2.7

**Source:** Field data (2021)

**Note:** Mean score of 3.0 and above means adverse effect; below 3.0 means positive effect

**Key:** Y – Population growth, X<sub>1</sub>- Architectural and urban planning space, X<sub>2</sub> - Road accessibility, X<sub>3</sub> – Security, X<sub>4</sub>- Education, X<sub>5</sub> - Transport service, X<sub>6</sub> - Waste management, X<sub>7</sub> - Commercial service , X<sub>8</sub> - Recreational service, X<sub>9</sub> - Neighbourhood upkeep, X<sub>10</sub> - Neighbourhood serenity.

NH- Neighbourhood, AA - Afaha Atai, AO - Anua Offot, IIA - Ifa Ikot Akpabio, IAE - Ifa Akpa Etok, IM - Ikot Mbon, IO - Ikot Okubo, MIA - Mbak Ikot Abasi, MA – Mbikpong Atai, NUI – Nung Ukana Ikot Obio, UIE – Use Ikot Ebio.

**Table 6: Effects of Growth in Population and Quality of the Residential Environment in Uyo Urban**

Dependent variable: RES\_QUA

Variables	Coefficient	Standard Error	t-stat
POP_GRT	-0.003**	0.0022351	-1.67
URB_PLN	-0.469**	0.2700858	-1.74
RD_ACC	-0.242	0.3322652	-0.73
SEC	-0.043	0.2534151	-0.17
EDU_FAC	-0.170	0.3059006	0.56
TRAN_SERV	0.3000	0.1975882	1.52
WST_MGT	-0.200	0.147468	-1.36
COMM_SERV	0.2776	0.2147362	1.29
REC_SERV	-0.060	0.2284051	-0.26
NEB_UPK	-0.230	0.1484825	-1.55
NEB_SERE	-0.166	0.1935972	-0.86
Constant	13.764***	4.532837	3.04
Observations	298		
R <sup>2</sup>	0.0047		

t-statistics is significant at 1%\*\*\*, 5%\*\*

The value of the  $R^2$  is 0.0047 (0.47%) so the independent variables of the regression model explained 0.47% of the variation in the dependent variable (RES\_QUA).

## 5.2 Test of Hypothesis

The hypothesis tested  $H_0$  states that there is no significant relationship between population growth and the quality of residential environment in Uyo urban. Table 6, revealed that population growth has a coefficient of  $-0.003$  with a t-statistics of  $-1.67$ , which is greater than the critical value  $1.64$ , and significant at 5%. This result implies that there is a significant negative (inverse) relationship between population growth ( $\Delta$ POP\_GRT) and the quality of residential environment in Uyo urban. In effect, population growth over the 29 years affects the residential environmental quality in Uyo urban.

## 5.3 Discussion of Findings

From the population growth graph in Figure 2, the population growth trend of Uyo urban had steadily been on the increase. Normally, population growth will have an inverse relationship with environmental facilities and by extension the qualities. The population growth will put pressure on the residential facilities, thus, adversely impacting residential environmental qualities. This result supports Asoka *et al.* (2013) assertion that neighbourhoods that have exhibited steady and remarkable population growth are caused by rapid development due to urbanization leading to low quality of residential environment.

The study revealed that there is a significant negative (inverse) relationship between population growth ( $\Delta$ POP\_GRT) and the quality of residential environment in Uyo urban. In effect, population growth, negatively influences the perceived residential environmental quality in Uyo urban. This result agrees with the findings of Asthana and Asthana (2012) that population growth in urban areas reduces the residential environmental quality especially as it relates to poor waste management that usually causes environmental degradation and pollution. Also, the result of Asoka *et al.* (2013) is in line with the findings that 90 per cent (90%) of the basic infrastructure and services have been negatively affected by population growth and neighbourhoods being overwhelmed by the escalating human population which has strained its basic functioning.

## 6.0 Conclusion

Population growth is a problem in urbanization and has impacted adversely on the existing infrastructural facilities and social amenities in Uyo urban. Consequently, the quality of residential environment in Uyo urban is adversely affected as many of the neighbourhoods in the study area scored 3.0 and above in the indices used to measure the quality of residential environment. The most affected neighbourhoods by population growth being Afaha Atai, Anua Offot, Ifa Ikot Akpabio and Ifa Akpa Etok that recorded high in 6 to 9 out the 10 variables measured.

## 7.0 Recommendations

On the basis of the findings, the following recommendations are made:

- i. There is an urgent need to launch population enlightenment campaign to slow down population growth in Uyo urban.
- ii. More infrastructural facilities and the expansion of existing ones through urban renewal programmes should be instituted by government. This would ensure the restoration and improvement of residential environmental quality.

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## **INFLUENCE OF RECYCLED CONCRETE AGGREGATES MADE FROM LABORATORY CONCRETE CUBES IN THE COMPRESSIVE STRENGTH PROPERTIES OF CONCRETE**

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### **Abstract**

*Over the years, millions concrete cubes were being produced and destroyed, as a result of series of laboratory practical's in Building and Civil Engineering Departments of Tertiary Institutions. The accumulation of the cubes produced and cost of dumping the residue is rising each year due to the ever increasing of admission. Also as a result of high demand of aggregates for construction quantities of natural aggregates is reducing every year. There is need to find a viable solution to this problem. Therefore, a considerable concern was made to utilize these broken concrete cubes as recycled concrete aggregate (RCA) for concrete production. The aim of this paper is to evaluate the properties of concrete produced by using crushed laboratory concrete cubes. Properties of recycled coarse aggregates produce from crushed laboratory cubes were studied in this work which includes; specific gravity, bulk density, absorption, moisture content, aggregate impact value (AIV) and aggregate crushing value (ACV). Also concrete samples were produced with 10%, 20% and 30% RCA as replacement of natural coarse aggregates (NCA). It was found that specific gravity and bulk density of RCA are within stated limit for aggregates to be used for concrete production. Therefore, aggregates produced from crushed laboratory cubes met the requirement for aggregates for concrete production. Also the study establishes that in term of compressive strength 10% is the optimum replacement level for NCA with RCA obtained from crushing laboratory concrete cubes.*

**Key words:** *Compressive strength, Concrete, Concrete cubes, Natural coarse aggregates, Recycle concrete aggregate,*

### **Introduction**

Conventional materials for concrete production are diminishing due to higher demand. Also rapid urban development leads to construction of new structures which course increasing demand of conventional aggregates. These factors among others bring about shortages of natural aggregates and challenges in aggregates mining process. Hence, sourcing alternative to conventional aggregate may reduce the challenges. Xuan, Zhan and Poon, (2017) reported that the amount of construction and demolition waste has been hovering considerably in the past periods. On the other hand it has been found that utilization of recycled concrete aggregates contrived from the waste concrete brought from the site of construction and demolition, has been stimulated for justification of scarcity of natural aggregates in various parts of world (Shi-Cong & Chi-Sun, 2013). Also, the complications associated with the disposal of vast quantity of waste concrete produced from construction and demolition activity could be solved to certain extend by the recycling of waste concrete elements (Xuan *et al.*, 2017). However investigation based upon the utilization of fine fraction of recycled concrete aggregates in concrete indicated that its use had significant adverse effects on properties of concrete (Verian, Whiting, Olek, Jain & Snyder, 2013). Hence, the use of coarse recycled concrete aggregates was more feasible option than fine fraction in making concrete. Inferior nature was observed for recycled concrete aggregates (RCA) in respect to their specific gravity and higher water absorption in relation to natural coarse aggregates (NCA) (Kou & Poon, 2012; Verian *et al.*, 2013; Xuan *et al.*, 2017). This is attributed to the presence of less dense and porous nature of the attached mortar (Tam, Kotrayothar & Xiao, 2015). This work has set to investigate the effect of using RCA obtained from crushing waste concrete cubes of tertiary institutions laboratories as replacement to conventional aggregates NCA in concrete production.

### **Materials and Methods**

#### **Materials**

Blended Limestone Cement manufactured and supplied by Dangote Cement Company was used which satisfied the requirement of BS EN 197-1 (2011). Natural fine aggregates (NFA) which met BS 12620 (2013) requirements was used and presented in Plate I. Natural course aggregate (NCA) used



was crushed granite stone with 20mm maximum size. Obtained from single quarry along Zaria-Sokoto road as shown in Plate II. The recycled concrete aggregates (RCA) were obtained by crushing waste laboratory concrete cubes to 20mm maximum sizes as shown in Plate III. Portable water fit for drinking was used throughout the project.



Plate I: Fine aggregate

Plate II: Coarse aggregates

Plate III: Recycled aggregate

### Methods

Both the materials and concrete samples were tested. The tests carried out for the aggregates include:

**Moisture Content and Absorption Capacity:** The moisture content and absorption capacity of the NCA, RCA and NFA were determined in accordance to the provision BS 812: Part 2 (1975). The results are shown in Table 1.

**Bulk Density:** The test of bulk density of the NCA, RCA and NFA samples were carried out and the result is shown in Table 2.

**Specific Gravity:** The specific gravity of both the NCA, RCA and NFA were determined using the plastic cylinder method. As shown in table 3.

**Aggregate impact value and aggregate crushing value:** Both NCA and RCA were tested for impact and crushing resistance in accordance with BS 812-110 (1990) and BS 812-112 (1990) respectively. test results are shown in Table 4.

**Sieve Analysis:** The particle size distributions for both the coarse and fine aggregates were determined using sieve analysis. The results were shown in table 5 and 6.

**Concrete mixture:** Grade 40 concrete was designed using ACI method of concrete mix. The water/cement (w/c) ratio was fixed at 0.35 throughout the experiment. Percentage replacement was made at 0%, 10%, 20%, and 30% RCA to NCA. The workability was maintained at a slump of (100-160mm). A commercially available super plasticizer (COMPLAST CP430) was used to improve workable concrete mix. Four sets of concrete cubes were produced. The control sample contained 100% NCA. The other three (3) samples NCA was replaced with 10%, 20%, and 30% RCA.

**Specimen casting and curing:** A mechanically operated concrete laboratory mixer of capacity 0.03m<sup>3</sup> was used for the concrete mixing. The obtained fresh concrete was put into molds of 100mm x 100mm x 100mm cubes and manually compacted by use of tamping rod. Demolding was done after 24 hours and the specimens were cured under water at 27°C ± 2°C to the specified period.

**Testing of specimens:** After 7, 14 and 28, days of wet curing the cubes were tested for compressive strength. The compressive strength of the concrete cubes produced were determined using 200KN compressive testing machine following the provision of BS EN 12390-3 (2019). The results for the compressive strength are presented in Figure 1.

## Results and Discussion

### *Physical properties of materials*

**Moisture content and water absorption:** Moisture content and water absorption of NFA, NCA and RCA test results were presented in Table 1.

Table 1 Moisture content and water absorption of aggregates

Materials	Moisture content %	Water absorption %
NFA	0.8	1.6
NCA	0.6	1
RCA	2.4	6.5

Table 1 shows moisture content and water absorption aggregates used in the research. RCA has the highest moisture content (2.4). This is due to the inherently sticks of mortar on its surfaces as stated by (ACPA, 2009). Recycled aggregates have higher water absorption. It can be identified that due to adhered mortar and porous nature of recycled aggregate they absorbs water much more than natural coarse aggregates (Verian *et al.*, 2013; Xiao, Li, Tam &Li, 2014).

**Bulk density of aggregates:** Bulk density of the aggregates used in the research are presented in Table 2.

Table 2 Results of bulk density test

Materials	Bulk density kg/m <sup>3</sup>
NFA	1756
NCA	1699
RCA	1528

Table 2 shows bulk density of Natural fine aggregate (NFA), Natural coarse aggregate (NCA) and Recycled concrete aggregate (RCA) used. The bulk density found for NFA, NCA and RCA were 1756kg/m<sup>3</sup>, 1698.75 kg/m<sup>3</sup> and 1527.5 kg/m<sup>3</sup> respectively. This identifies that RCA is lighter in weight than NCA. The result is in line with Mohammed, Ali and Mohamed (2020) findings. Nonetheless, BS 812: Part 2 (1995) specifies normal weight ranges between 1280 and 1920kg/m<sup>3</sup>. This proved that RCA obtained from crushed laboratory cubes can be used for the production of normal weight concrete.

**Specific gravity:** The specific gravity of the aggregates (NFA, NCA and RCA) used in the study was tested and the results were presented in Table 3.

Table 3 Specific gravity of the aggregates

Materials	Specific gravity
NFA	2.67
NCA	2.56
RCA	2.32

Table 3 gives the specific gravity of Natural fine aggregate, Natural coarse aggregate and Recycled concrete aggregate. It shows that values for specific gravity are 2.67, 2.56 and 2.32 respectively. Recycled aggregates had a lower specific gravity compared to conventional aggregates due to porous nature of recycled aggregates (Ahmad, 2015; Gokarla, 2016). Yet , the specific gravities of all the aggregates used in the study falls within the range of 2.30-2.90 respectively as specified by ACI (2001). Therefore, aggregates found from crush laboratory concrete cubes can be used for the production of normal weight concrete.

*Aggregate impact value (AIV) and Aggregate crushing value (ACV):* Mechanical properties of the Natural coarse aggregate (NCA) and Recycled concrete aggregate (RCA) used in the research were tested and the results are presented in Table 4.

**Table 4 Aggregate crushing value and impact value**

Materials	Crushing value %	Impact value %
NCA	29.05	17.68
RCA	31.15	18.65

Table 4 shows the aggregates crushing value (ACV) and aggregates impact value (AIV) of NCA and RCA. Aggregates crushing values were found to be 29.05% and 31.15%. This indicates that NCA has ability to resist more crushing than RCA. While the percentage of aggregates impact value test were 17.68% and 18.65%. Meaning that NCA has higher resistance to impact than RCA as result of the weak mortar attached to it (Rupali, Rakesh, Bibhuti & Tanish, 2018). Though, the values are within the 45% limit as identified by (Gupta & Gupta, 2012).

*Sieve analysis:* Particle size distribution of the Natural fine aggregate (NFA) is presented in Table 5. Also results of sieves analysis for Natural coarse aggregate (NCA) and Recycled concrete aggregate (RCA) were compared and presented in Tables 6.

**Table 5 Particle Size Distribution of Fine Aggregate**

BS sieve size	Weight retained (g)	Weight passing (g)	Percentage retained (%)	Percentage passing (%)	British Standard EN
5mm	0	2000	0.0	100	90-100
2.36mm	310.7	1689.3	15.53	84.47	60-95
1.18mm	882.5	826.8	44.13	41.34	30-70
600mm	284.8	522	14.24	26.1	15-34
300mm	340	182	17	9.1	5-20
150mm	160	22	8	1.1	0-10
Pan	22	0	1.1	0	0

Table 5 present results for sieve analysis of the fine aggregate. Its indicate that the percentage of fines passing through 600micron sieve size is 26.1% which is within the range of 15 – 34 this shows that the fine aggregate used in this work fall within Zone 1 fine aggregates as approved by British Standard EN 12620 (2002). Therefore, the Fine aggregates are good for the concrete work.

Table 6 particle size distribution of NCA and RCA

Bs sieve size	NCA		RCA	
	Percentage retained %	Percentage passing %	Percentage retained %	Percentage passing %
20mm	0.00	100	0.0	100
10mm	61.0	39.0	56.8	43.2
5mm	26.2	12.8	29.6	13.6
2.36mm	8.0	4.8	6.6	7.0
1.0mm	3.5	1.3	4.1	2.9
0.6mm	0.6	0.7	1.1	1.8
0.3mm	0.3	0.4	0.7	1.1
0.15mm	0.1	0.3	0.5	0.6
Pan	0.3	0	0.6	0

Table 6 shows the percentage passing and percentage retained for the sieve analysis test carried out on the NCA and RCA. It can be understood that the percentage of coarse aggregates passing through 20mm sieve is 100% for all the two samples. However, most of the coarse aggregates were retained on 10mm sieves size with 61% and 56% for NCA and RCA respectively. This conform to the grading requirement for coarse aggregates stated in BS 882: 1992 for 20mm aggregates samples. Hence, based on the similarities in their particle size distribution RCA obtained from crushed laboratory cubes can replace NCA.

*compressive strength of concrete samples:* The compressive strength properties of the four concrete samples used in the research are presented in Figure 1.

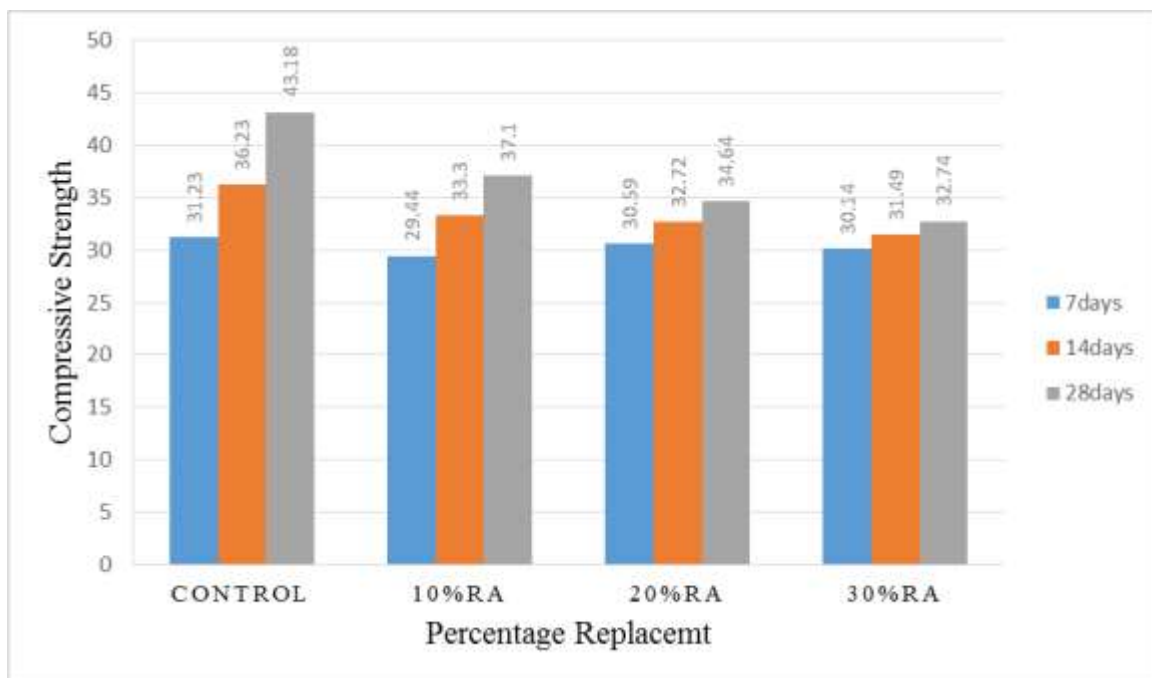


Figure 1: Compressive strength of the Concrete Samples

Figure 1 shows the compressive strength of control sample and the other three test samples. At 28 days the control sample attend the target strength (40 N/mm<sup>2</sup>). However, for the taste samples the result shows significant reduction in compressive strength as percentage replacement of recycled aggregates increases. This is in line with Mohammed *et al* (2020) finding which stated that compressive strength of concrete decreases with the increase in RCA percentage. Also for all the four samples considered there were progressive increase in strength from 7 days' test period to 28 days. It was found that 10% replacements show a better result at 28days of curing with 2.9N/mm<sup>2</sup> less than the target strength. Therefore, based on the compressive strength test 10% replacement of NCA with RCA is the optimum level.

### Conclusion

It was found that the specific gravity and bulk density of RCA produced by crushing laboratory concrete cube can be classified as normal weight aggregates. Also mechanical properties of the RCA are within the acceptable limit for aggregates to be use in concrete production. Based on the compressive strength result of grade 40 concrete it was found that compressive strength of 37.1 N/mm<sup>2</sup> was obtained at 28days for 10% replacement of NCA with RCA.

### Recommendations

Based on the present investigation, RCA produced from crushed laboratory cubes can replace NCA for the production of normal weight concrete. For grade 40 concrete 10% is the optimum replacement level of NCA with RCA.

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## IMPACT OF COVID-19 PANDEMIC ON CONSTRUCTION PROJECT DELIVERY IN AKWA IBOM STATE

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### **Abstract**

*The impact of covid-19 across the globe has been significant, leading to deaths and disruption of the global supply chain. Since the outbreak in 2019, the world has witnessed a downturn in productivity, which has contributed to a decrease in the population of workplaces due to unsafe environments. The construction industry is at the centre of the pandemic and has encountered difficulties in delivering construction projects. This study investigated the impact of the covid-19 pandemic on construction project delivery. The study adopted a survey research design, and the sample size was established using a random sampling technique. The survey data was obtained using a structured questionnaire administered to 213, which consist of 61 Architects, 32 builders, 46 quantity surveyors, and 74 Civil Engineers and were analysed using mean item scores and spearman rank correlation. The finding of the study shows that the relationship between problems caused by covid-19 pandemic and the performance of construction projects executed during covid-19 are strongly correlated. The study concluded that problem caused by covid-19 (restriction of movement, delayed project timeline, transportation/logistics problems, high cost of construction materials and increasing project cost) negatively influences construction project performance in terms of meeting client expectation and needs, compliance with health and safety, client satisfaction, completed safely, risk management among others. Opportunities, however, have emerged in the areas of contemporary procurement planning, the requirement for virtual working, and particular design issues. This research is essential for the creation of new working tactics and extra contingency plans in the event of a pandemic with minimal human interaction.*

**Keywords:** COVID-19, Construction industry, Project delivery, Construction Professionals, Correlation

### **Introduction**

In Nigeria, the construction industry has always been a major contributor to the country's gross domestic product (GDP). For instance, according to the National Bureau of Statistics (2020), construction contributed 6.83% to nominal GDP in Q2 2020, lower than 6.86% in 2019, and 7.94% in Q1 2020. This was shortly before covid-19 established its full presence in Nigeria. The sector is principally involved in the development and maintenance of building and civil engineering works and infrastructure projects comprising roads, bridges, and railways as well as both residential and commercial real estate. It is also known to have the highest workforce after agriculture. To underscore the importance of this sector to the nation's economy, it has been reported that the massive spending of the government at both federal and state levels on infrastructure led to the early exit of Nigeria from recession in 2020 (World Bank, 2019). However, the coronavirus disease 2019 (COVID-19) pandemic dealt the construction industry a major blow, as it has affected its performance in the construction industry.

Furthermore, the coronavirus disease 2019 (COVID-19) pandemic has emerged as a global health crisis, with 3,855,788 infected persons and 256,862 deaths worldwide as of May 9, 2020. In Nigeria, the first case of the pandemic was reported by the Nigerian Centre for Disease Control on February 27, 2020 (Nigeria Centre for Disease Control, 2020). Between the dates when the index case was reported and May 9, 2020, the nation has recorded a total of 4151 confirmed COVID-19 cases from 25,951 samples screened and 745 (18%) cases discharged with 128 deaths indicating a case fatality rate of 3.1%. Thirty-four (34) States and the Federal Capital Territory have recorded coronavirus disease. The most affected state in Nigeria is Lagos (the epicentre of COVID-19) with 1764 cases, followed by 576 cases in Kano state. Demographically, a total of 2828 male subjects have been infected representing 68% and 1323 female subjects representing 32%. The age group 31 - 40 years is mostly affected accounting for 24%. In Akwa Ibom State, NCDC established 4,348 total number cases confirmed and 44 deaths recorded (Nigeria Centre for Disease Control, 2020).

The impact of the epidemic has been phenomenal. According to Ataei *et al* (2020), construction projects have been adversely affected by the pandemic and will continue to have impacts on the Engineering and Construction industries. This was supported by Zamani *et al* (2021) who observed that the restriction of movements and working from home adopted by governments all over the world has negatively impacted the fortunes of workers and governments. In Nigeria, a series of lockdowns were declared by the federal government to stem the tide of infection and deaths. It involved complete restriction of movement across the country.

The unexpected chaos caused by the impact of the covid-19 pandemic on virtually every section of the world economy has thrown Engineering and Construction practitioners' response to the covid-19 impact into a very challenging mode (Ataei *et al.*, 2020). This is coupled with the fact that finding resources/solutions that address the shortcomings in the construction industry particularly in terms of country-specific has been difficult. This is due to the assertion that there is a limited number of studies in the extant literature that examined the impact of global pandemics on construction project delivery. In a study on the effect of covid-19 on building construction projects in Malaysia, Zamani *et al.* (2021) examined underlying problems caused by the covid-19 pandemic and revealed operational and financial issues as the main problems while financial aid and complete information are needed to overcome those problems. The study did not investigate any relationship between the identified problems and construction project performance in Malaysia. This study intends to fill this gap by identifying the significant problems and the nature of the influence of these problems on construction project delivery. Therefore, this study seeks to explore the impact of the covid-19 problems on construction project delivery in the study area.

## **2.0 Literature Review**

### **2.1 Problems Caused by COVID-19 Pandemic in Construction Industry**

COVID-19 has had a significant impact on the global workforce and has affected virtually all industries across the world. This study will centre on the problems caused by COVID-19 in the construction industry, an area that seems to lack research attention in Akwa Ibom State. Since the outbreak of COVID-19, severely construction companies' performance have been affected as the overall business performance in different countries. Zamani *et al* (2021) revealed that COVID-19 problems in the construction industry are associated with operational and financial problems. The operational problems caused by covid have negative effect on the project timeline, and reduced labour and logistics, while financial problems centre on late payment, increased project cost and reduced number of construction projects. Osuizugbo (2020) opined that problems caused by COVID-19 are "transportation problem (for both materials and workers)", "project abandonment", "delay in construction activities", "high cost of construction materials", "reduction in working hours per day", "lack of funding" and "shortage of workforce".

The impact of the COVID-19 pandemic is very detrimental, and a poor impact has been made on the labour market, supply of materials, company liquidity, project delivery, key cost components on construction projects, and so on. Due to the lockdown situation, all sites are being closed across the Globe. People are in-home quarantine for the well-being of their health and safety. Many countries like Italy, China, and others face a sharp decrease in the production sector. Contractors and employers who depend on Chinese-made goods, materials, and equipment are facing problems like shortage of construction materials, and higher costs of such materials and equipment that lead to slower project completion, moreover more projects have been cancelled due to this situation (Rowlinson, 2004). A shortage of workers is always a concern for the construction industry, but the pandemic has intensified it as a large percentage of construction staff has reportedly screened positive for the coronavirus (Karimi *et al.*, 2018). The shortage of skilled construction workers represents one of the main problems of the construction industry (Azeez *et al.*, 2019).

As the spread of COVID-19 is largely related to individual contact, encounters between construction employees have played a major role in the delays in reopening projects. Since the pandemic began, there have been fewer employment opportunities, partially due to the work disruptions that were



caused by following constraints that were put in place to stop the progression of the virus, and a shortage of personal protective equipment (PPE) that was caused by the more pressing need for it by healthcare employees (Pamidimukkala and Kermanshachi, 2021). Due to an interrupted supply chain and employee shortages due to quarantines, many projects have been halted or postponed (Rouhanizadeh *et al.*, 2019). A survey conducted by the Associated General Contractors of America (AGC) found that 28 per cent of their members claimed that because of COVID-19 they had halted or delayed projects in the United States (Pamidimukkala and Kermanshachi, 2021).

COVID-19 ushered in a total lockdown which affected construction activities (movement of construction materials and workers to the site) in Akwa Ibom State, Nigeria, and the world at large. By implication, all construction activities were stopped following Federal Government Order. Zamani *et al.* (2021) opine that COVID-19 has caused construction projects delay. Alenezi (2020) reveals several forms of project delay were experienced such as; concurrent delay, independent delay, critical delay, non-excusable delay, and excusable delay. The majority of these delays are the result of daily working time that has been shortened by the emergence of COVID-19. Osuizugbo (2020) observes that delays in construction activities as a disruption in the construction sector during the COVID-19 pandemic. Delay in construction activities affects first the construction programme and it does not in any way help construction projects. Delays can bring about an increase in project costs.

COVID-19 affected the global supply chain. The global supply chain has been interrupted in various ways across the world (Biswas *et al.*, 2021). Construction materials demand was high but due to the lockdown these materials were not reaching the construction site, and this has a negative influence on hampering the construction work. Husien *et al.* (2021) stated that COVID-19 shock was a global phenomenon rather than a local one which disrupted most supply chains around the world and reduced or paused most international commercial activities related to the supply of construction materials, causing major delays in the projects. The supply of materials, especially imported materials, has been and will be impacted due to the coronavirus pandemic. Thus, a full understanding of existing sources is necessary and potential alternate/new sources should be identified for future procurements in the event of supply shortages (Adhikaria and Poudyala, 2021). Alsharef *et al.* (2021) added that delays in the supply chain in turn affected the overall project delivery.

According to Alsharef *et al.* (2021), delays in inspections and securing permits significantly affected the construction phases. Biwas *et al.* (2021) noted problems caused by COVID-19 are unemployment, labour shortage, transportation problems and financial issues. Construction companies are suffering huge economic losses due to this lockdown, while some are yet to recover even though the lockdown has been lifted and normalcy returned. Construction firms were not to pay their staff and it results in laying off workers. Many lost their jobs in the results led to unemployment. Osuizugbo (2020) stated that many construction projects suffered project abandonment due to locked down and restrictions of movement. Abandonment of construction projects can cripple the development of nations. Another problem encountered by the construction industry is the transportation problem. Biswas *et al.* (2021) showed that all transportation in the country has been disrupted due to the lockdown in all parts of the country. That is why no materials are arriving in the construction sector and no workers can work from their homes. That's why the work has stopped.

Problems regarding workforce/labour shortage; based on the report of the International Labor Organisation, approximately 2.7 billion workers, equivalent to 81% of the workforce around the world, would be affected by COVID-19, and certainly, these percentages include workers in the construction sector. In addition, the workforce has also suffered from great psychological burdens as a result of worrying about their future, and the financial difficulties that they may face, especially since the majority of them have financial obligations and families (Husien *et al.*, 2021). Concerning labour shortage, construction workers are unable to reach their workplaces because the transportation system is completely closed and the disease is caused by a viral infection, so workers are more likely to spread the disease when they come in contact with each other (Biswas *et al.*, 2021). By implication, many construction workers are not willing to come to work.

Problems of reduction in efficiency and productivity rates were witnessed during the pandemic. productivity rates reportedly suffered across the construction industry, much of the loss in

productivity and efficiency was attributed to the new safety measures that were necessary to protect the workforce as the pandemic continued to progress (Alsharef *et al.*, 2021). The reduction in productivity rates also was attributed to shortages in the availability of PPE and the reduction in the number of workers to comply with the social distancing recommendations.

According to Alsharef *et al.* (2021), suspension or slowing of ongoing projects and delay in the start date for new projects were the norm during the pandemic. The pandemic caused widespread economic downturns and uncertainties, and owners, investors, and businesses were increasingly wary about investing in construction projects and operations. Therefore, several projects were cancelled or temporally suspended. Adhikaria and Poudyala (2021) added issues concerning site security. The pandemic could potentially delay the work for months thus the risk management plan should provide site security using one of several approaches such as fencing or barriers, electronic security, and guard services.

Biswas *et al.* (2021) revealed Contractual implication problems, it is based on a clause called 'Force Majeure'. There are many rules mentioned in this clause, and 'Large Scale Epidemic' is one of them. The COVID-19 pandemic falls within this category. Different contractors put their different tools in different places for use in different machinery construction sectors but because of this lockdown, all these equipment have been lying there for a long time. The construction companies have a contract with the contractors to work with all this equipment based on some money and if the 'Force Majeure' Clause is mentioned in the contract then no compensation will be paid to the contractor by the agency due to delay. The result is a lot of financial loss when contractors stop working. Husien *et al.* (2021) further agreed that the key problem caused by covid-19 has to do with legal disputes and claims that have significantly affected the local construction industry around the world. Furthermore, surveys and reports related to the construction industry indicated that there is a controversy over the legal interpretation of the impact of the Coronavirus pandemic on construction projects (Husien *et al.*, 2021). Some specialists believe that it is possible to interpret COVID-19 as being of the category Force Majeure (unforeseeable circumstances in which contractors are unable to fulfil a contract) while others tend to the principle of changing laws to resolve disputes.

Psychological issues and mental health problems are common to those who have experienced traumatic events. Workers often have increased feelings of uncertainty, disappointment, anxiety, anger, exasperation, burnout, and depression (Ekpanyaskul and Padungtod, 2021). They can also experience a sense of failure, insomnia, difficulty in focusing, and/or exhaustion. If such stress is not handled appropriately, it may result in the abuse of alcohol, nicotine, or other narcotics (Karthick *et al.*, 2021). COVID-19 has also had an impact on employment factors such as wages, work schedules, workload, stress levels, relationships with co-employees and employers, and access to paid leave, all of which can have a direct effect on the physical and mental health of workers, their families, and their communities (Jahan Nipa *et al.*, 2020). Hook (2020) also declared that the impact of this pandemic might force some Engineering and Construction companies to streamline debt, consider means of funding or risk bankruptcy. Looking ahead, Engineering and Construction companies will encounter a new dispensation which will include a change in the marketplace, and investment in infrastructure by some of the "national government" to kick-start their recovery. In contrast, others may encounter limitations of resources.

According to Biswas *et al.* (2021), COVID-19 caused financial problems for construction companies. Construction companies are not making any kind of profit due to work stoppage in the companies and on the conflict more losses are being incurred, not only construction companies losing money but also all the suppliers who are providing the required materials to different companies to be used in the construction sector, all those suppliers are also incurring huge losses. Since the closure of the company, the supply chain has been shut down and the factories that produce goods have stopped production, resulting in many losses of them. Osuizugbo (2020) posited the high cost of construction materials during this period of the pandemic. The high cost of construction materials was considered a disruption in the construction sector during the COVID-19 pandemic. Cost is often a key factor in construction projects (Osuizugbo, 2020). The costs of most construction materials have gone up due to the lockdown in the country.

Alsharif *et al.* (2021) further added that price escalations, additional costs, loss of revenue, and payment delays are key problems caused by COVID-19. The increase in the cost of lumber, cement, and concrete products was reported by construction companies. Along with the increase in the cost of materials, an increase in the cost of doing business was also reported. Many construction companies forecast unexpected revenue and financial shocks at various points in the supply chain (Alsharif *et al.*, 2021). Osuizugbo (2020) opined the lack of funding has disrupted the construction industry during the COVID-19 pandemic. Construction projects suffer due to financial difficulties. In addition, a reduction in working hours per day was documented as a disruption in the construction sector during the COVID-19 pandemic and this is due to the outbreak of COVID-19, in some states in Nigeria, including Akwa Ibom State to contain the virus. This initiative also affected the construction industry in terms of working hours.

## **2.2 Construction Project Delivery**

Over the year's construction projects have become more difficult and multifaceted owing to the presence of many critical success factors (Chan *et al.*, 2004). Amade (2014) added that construction projects in Nigeria and the world over are confronted with a lot of complexities and ambiguities due to uncertainties in meeting their respective due dates. Unfortunately, the construction industry in Nigeria witnessed an unprecedented fall in the standards of construction project delivery; Projects were poorly conceived, badly planned and executed unprofessionally. The presence of the COVID-19 pandemic has affected the performance of several success factors including planning, execution, communication, economic, social, political, and technological factors (Denny-smith *et al.*, 2021; Khalfan and Ismail, 2021; Stiles *et al.*, 2021). The most critical among all factors is the health and safety of the front-line construction workers (Rehman *et al.*, 2021). Furthermore, construction project performance remains a prominent issue since the emergence of COVID-19 all over the world. This is so because construction projects involve distinct objectives which must be achieved and numerous which need to be efficiently utilised, regardless of the pandemic.

The performance of projects executed by construction professionals during this COVID-19 era could be evaluated based on performance measurement. This performance measurement can be defined as the process of evaluating performance relative to success in terms, of time, cost and quality which are the basic criteria to project success (Ayodeji *et al.*, 2017). Construction projects during the pandemic still need to be confirmed to time, cost and quality, which are the triangle. Criteria for 'project performance' vary according to construction professionals and construction firms in any project, the assessment dimensions agree to the traditional constraints of time, cost, and quality parameters, also known as the iron triangle (Atkinson, 1996). Chan and Kumaraswamy (2002) asserted that construction projects do not only have to confirm time, budget, and quality but also safety and client satisfaction. Safety and client satisfaction must be considered important in this COVID-19 era, as the health of construction workers must be paramount and at the same projects executed must meet client satisfaction. Safety performance in COVID-19 has to do with the safety of workers and the provision of cloth face or face mask coverings ought to be enforced widely in construction workplaces.

Cheung *et al.* (2007) further revealed benchmarks such as time, cost, quality, client satisfaction, client changes, business performance, health and safety can be employed. Tunji-Olayeni *et al.* (2016) abridged that construction professionals make use of cost, time, quality, customer satisfaction, the profitability of projects, labour productivity, safety, and teamwork for evaluating performance. These parameters are still applicable during the COVID-19 pandemic. Due to the conceptual implication problem of COVID-19 on the construction industry, there is a need to evaluate the dispute that arises during this period. Since contracts must be reviewed and amendments may be made to both local regulations and standard contracts to settle disputes over time extension and financial obligations (Husien *et al.*, 2021). There is a need to evaluate this aggravation. Abiodun *et al.* (2017) further added criteria such as minimising construction aggravation, stakeholder satisfaction, directing and control for evaluating project performance of construction firms in Nigeria.

However, the major performance guide of construction projects performed by construction professionals from a standpoint of financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities,

claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting. Cheung *et al.* (2007) further added project performance categories such as people, cost, time, quality, safety and health, environment, client satisfaction and communication. Timely completion of a construction project is frequently seen as a major criterion of project success by clients, contractors and consultants alike (Michell *et al.*, 2007). Successful construction project performance during a pandemic is achieved, when construction professionals meet requirements, individually and collectively. Tunji-Olayeni *et al.* (2016) key performance indicators consist of seven project performance indicators: construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product, client satisfaction with service and three business performance indicators namely: safety, profitability, and productivity.

Navon (2005) posited that the project is completed on time, completed to budget, completed to quality requirements, meets clients' expectations and needs, happy stakeholders, exceed expectations, meets profits/fee goals, satisfies all requirements of stakeholders and is completed safely, have no legal claims, minimises aggravation and have no conflict. Odeh and Bettaineh (2002) posited that a project is termed successful if it passes four success test criteria of the time criterion (completed on time); the cost of money criterion (completed within budget); the effectiveness criterion (completed following the original set performance and quality standards); and client's satisfaction criterion (accepted by the intended users or clients whether the client is internal or from outside the organisation). Minimising construction aggravation is yet another criterion that is considered to determine project success during this pandemic. The life span of most construction projects during this pandemic is unpredictable as there are many abandoned projects littering everywhere because of the negative impact of COVID-19 on the construction industry.

### 3. Research Methodology

This study adopted a survey research design. Furthermore, the survey research design under a quantitative research approach added clarity to the method of data collection. Check and Schutt (2012) explained survey research as the collection of data/information from a sample of construction professionals through their responses to questions. The Population of this study consists of construction professionals in Akwa Ibom State, Nigeria. Akwa Ibom State was selected because of the massive infrastructural development in the State. The population of these construction professionals were obtained from a database available at various professional's bodies' head office in the state. This study adopted a simple random/probability sampling technique. The sample size for the study was established using the Taro Yamane formula which comprises 203 respondents, including 61 architects, 32 builders, 46 quantity surveyors, and 74 civil engineers. A total of 213 questionnaires were administered to the targeted sample size of the study. The study retrieved 157 questionnaire and only 131 were analyzed because they were accurately answered. This produces a response rate of 64.53%. This level of response is appropriate to produce a valid statistical sample knowledgeable to support the findings and conclusion of the study. The method of data collection for this research was sourced primarily using a questionnaire. Data collected from the research tool in the study were computed and analyzed utilising percentages and the Statistical Package for Social Science (SPSS) Software, 2013. The data were also analyzed using Mean Item Score and spearman ranked correlation was used to establish the relationship.

### 4. DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

The background of the respondents that supplied information used for the study was analyzed for an understanding of the perception of construction professionals on the impact of the covid-19 pandemic on construction project delivery. Four demographic factors related to the gender, education, professional affiliations and experience of the respondents to determine the suitability of the data emanating from this population. From the results on Table 4.1., 80.9% represent males while 19.1% represent females. The distribution of gender reveals or affirms that construction is male dominant sector. In education background, 90.8 represents a first degree while 9.2% had a postgraduate qualification. Of the professional affiliation of the respondents, 38.2% were Architects, 29% were Builders, 10.7% were Engineers, 20.6% were Quantity Surveyors and 1.5% were Health and Safety professionals. The results also reveal that 55.7% of the respondents have been in practice between 1-

5yrs, 32.8% have practiced for 6-10yrs, 5.3% between 11-15yrss, 1.5% between 16-20yrs, 1.5% between 21-25yrs and 3.1% have been practising for over 25yrs. The results give a good dependable characteristic of respondents used in the study.

**Table 4.1: Respondents’ Characteristics**

<b>Variables</b>	<b>Categories</b>	<b>Proportion</b>
Gender	Male	80.9%
	Female	19.1%
Education	First-degrees	90.8%
	Postgraduate degrees	9.2%
Professional affiliation	NIA	38.2%
	NIOB	29.0%
	NSE	10.7%
	NIQS	20.6%
	ISPON	1.5%
Experience	1-5 years	55.7%
	6-10 years	32.8%
	11-15 years	5.3%
	16-20 years	1.5%
	21-25 years	1.5%
	Above 25 years	3.1%

**Source: Author’s Field Survey (2023).**

Participation of construction professionals differs by the type and scope of the projects where covid-19 influences construction operations. In this section, project attributes evaluated are related to the sector (building or civil), uses (educational, residential, road amongst others), procurement strategies, client and roles in the project. From the finding, 9.9% of the respondents participated in civil work, 64.1% participated in general building work and 26% have been participating in both civil and general building works during the covid-19 pandemic. The response on project location, 61.1% executed projects in Uyo, 19.1% executed construction projects in Eket senatorial district and 19.8% executed construction projects in Ikot Ekpene senatorial district. The respondents were requested to indicate the type of project they undertook if the projects are educational, residential, or road works, among others. The finding shows, 24.4% of the respondents participated in the construction of educational buildings, 46.6% were involved in residential buildings, 6.9% undertook road works, 6.1% were involved in the construction of isolation centres/hospitals, 13.0% were involved in commercial buildings while 3.1% of the respondents involved in drainage works. The results also show procurement strategies involved by construction professionals during the covid-19 pandemic. The results show that 30.5% of the respondents were involved in direct labour, 22.1% were involved in design-bid-build (traditional method), 22.9% were involved in design-build, 8.4% were involved in private finance initiatives while 16% of the respondents were involved in a construction management type of procurement strategies. The results show that 42.7% were involved in developing public projects while 57.3% took part in developing projects for private entities. The project characteristics shown in table 4.2, were good and dependable to be used for the study.

Table 4.2: Project Characteristics

Variables	Categories	Proportion
Nature of projects	Civil works	9.9%
	Buildings	64.1%
	Civil and buildings	26.0%
Location of Projects during the Covid-19	Uyo Senatorial Districts	61%
	Eket Senatorial Districts	19.1%
	Ikot Ekpene Senatorial Districts	19.8%
Project Type	Education	24.4%
	Residential	46.6%
	Road works	6.9%
	Health/Hospital	6.1%
	Commercial	13.0%
	Drainage works	3.1%
	Procurement strategies	Direct labour
	Design-bid-build	22.1%
	Design-build	22.9%
	Private Finance Initiatives	8.4%
	Construction management	16%
Client	Public	42.7%
	Private	57.3%

Source: Author’s Field Survey (2023).

**4.1.1 Problems Caused by Covid-19 Pandemic in Akwa Ibom State Construction Industry**

The study examined the problems caused by covid-19 in the construction industry. Problems caused by the covid-19 pandemic in the construction industry were identified from the review of related literature. Twenty-six (26) variables were extracted from the literature. The results of the field survey are analysed and ranked using the mean item score. The results presented in Table 4.3 shows the opinion of construction professionals concerning the problems caused by covid-19.

Table 4.3: Problems Caused by Covid-19 Pandemic in Akwa Ibom State Construction Industry

Problems Caused by Covid-19	1	2	3	4	5	SUM	Mean Item Scores (MIS)	Ranking	Remarks
Restriction of movement	2	2	29	24	74	131	4.267	1 <sup>st</sup>	Significant
Delay project timeline	8	5	25	17	76	131	4.129	2 <sup>nd</sup>	Significant
Transportation/logistics problem	3	9	36	33	50	131	3.900	3 <sup>rd</sup>	Significant
High cost of construction materials	3	9	33	43	43	131	3.870	4th	Significant
Increasing project cost	4	6	48	28	45	131	3.793	5th	Significant
Suspension or slowing of an ongoing project	1	10	40	46	34	131	3.778	6th	Significant
reduced construction productivity	5	11	36	39	40	131	3.748	7th	Significant
Abandonment of some projects	3	12	43	34	39	131	3.717	8th	Significant
Reduced number of projects	3	14	41	35	38	131	3.694	9th	Significant
Reduction of productivity	1	14	43	40	33	131	3.687	10th	Significant
Disruption of the supply chain	3	10	57	25	36	131	3.618	11th	Significant
COVID- 19 is also worsening the state of mental health pressure in the construction industry	5	15	47	28	36	131	3.572	12th	Significant
Reduce labour	9	16	36	37	33	131	3.526	13th	Significant
Materials deterioration	6	14	45	37	29	131	3.526	13th	Significant
Lack of funding	4	21	39	38	29	131	3.511	15th	Significant
Government’s deficit and debt increase	6	9	50	44	22	131	3.511	15th	Significant
Shortage of skilled construction workers	5	16	43	42	25	131	3.503	17th	Significant

low demand for both private and public projects	3	17	48	39	24	131	3.488	18th	Significant
Loss of profit	6	19	44	34	28	131	3.450	19th	Significant
Unemployment	9	24	34	30	34	131	3.427	20th	Significant
Contractual implication problems	7	22	47	37	37	131	3.282	21st	Significant
Late payment	7	27	43	31	23	131	3.274	22nd	Significant
Shortage of materials	11	18	45	41	16	131	3.251	23rd	Significant
Disputes	12	24	40	35	20	131	3.206	24th	Significant
Psychological/mental health issues (low morale)	12	29	36	35	19	131	3.152	25th	Significant
Shortage of personal protective equipment (PPE)	15	19	54	33	10	131	3.030	26th	Significant

**Source:** Author's Field Survey (2023).

The result in table 4.3 Shows that problems caused by covid-19 such as restriction of movement were ranked 1st with a mean item score of 4.267, delay of project timeline ranked 2nd with a mean item score of 4.129, transportation/logistics problem ranked 3rd with a mean item score of 3.900, high cost of construction materials ranked 4th with a mean item score of 3.870, and increasing project cost ranked 5th with a mean item score of 3.793. While suspension or slowing of an ongoing project (3.778); reduced construction productivity (3.748); abandonment of some projects (3.717); reduced number of projects (3.694) and reduction of productivity (3.687) were ranked 6th – 10th respectively. Table 4.3 also shows the bottom five variables of problems caused by covid-19 in the construction industry. Contractual implication problems, late payment, shortage of materials, disputes, psychological/mental issues, and shortage of personnel protective equipment were ranked 21st – 26th respectively. However, the table shows that construction professionals agreed that covid-19 affected the construction industry significantly, with all variables measured having a mean item score above 3.00. This implies that all the identified problems caused by covid-19 in construction were accepted by the construction professionals in the study area.

#### 4.1.2 Performance of Construction Projects During the Covid-19 Pandemic

The second aspect of the study is to evaluate the performance of construction projects during the covid-19 pandemic in the construction industry. Construction project performance during the covid-19 pandemic in the Akwa Ibom State construction industry was evaluated. Seventeen (17) variables were extracted from the literature. The results of the field survey were analysed and ranked using the mean item score. The results presented in Table 4.4 shows the perceptions of construction professionals concerning the performance of construction projects during the covid-19 pandemic.

**Table 4.4: Performance of Construction Projects During the Covid-19 Pandemic**

Performance of Construction Projects	1	2	3	4	5	SUM	Mean Item Score	Ranking	Remarks
Meet client expectations and needs	7	11	36	34	43	131	3.725	1st	Significant
Compliance with health and safety	11	21	31	21	47	131	3.549	2 <sup>nd</sup>	Significant
Client satisfaction	4	15	46	42	24	131	3.511	3rd	Significant
Completed safely	9	17	42	33	30	131	3.442	4th	Significant
Risk management	4	13	50	52	12	131	3.419	5th	Significant
Completed to quality	7	20	43	41	20	131	3.358	6th	Significant
Productivity	2	19	54	45	11	131	3.335	7th	Significant
Profitability (Meet profit/fee goals)	9	21	33	54	14	131	3.328	8th	Significant
Environment sustainable	5	20	49	41	16	131	3.328	9th	Significant
Stakeholders/project team satisfaction	4	24	47	37	19	131	3.328	10th	Significant
Business performance	1	26	53	32	19	131	3.320	11th	Significant
Minimizing construction aggravation	4	20	58	35	14	131	3.267	12th	Significant
Finance stability	12	24	51	37	7	131	3.022	13th	Significant
Completed to cost	14	38	31	32	16	131	2.984	14th	Insignificant
Completed to time	20	31	36	22	22	131	2.961	15th	Insignificant
Having no dispute claims	8	38	48	30	7	131	2.923	16th	Insignificant
No conflict	16	33	46	26	10	131	2.855	17th	Insignificant

**Source:** Author's Field Survey (2023).

The result in Table 4.4 reveals performance indicators of construction projects during the pandemic, with meeting client expectations and needs ranked 1st with a mean item score of 3.725, compliance to health and safety ranked 2nd with a mean item score of 3.549, client satisfaction ranked 3rd with a mean score of 3.511, completed safely ranked 4<sup>th</sup> with a mean score of 3.442, and risk management ranked 5th with mean of 3.419. While completed to quality (3.358) ranked 6th; productivity (3.335) ranked 7th; profitability (3.328); environmentally sustainable (3.328) and stakeholders/project team satisfaction (3.328) both ranked 8<sup>th</sup> – 10th respectively.

Table 4.4 also shows the least five variables of project performance during the covid-19 pandemic. Finance stability, completed within the estimated cost, completed within schedule time, having disputes claims and no conflict were ranked 13th – 17th respectively. The results show three bands of mean item scores, namely: above 3.00 (that is, 3.00 to 3.75) and 2.855 to 2.984. However, the table shows that construction professionals agreed with the performance of construction projects during covid-19 with thirteen out of seventeen variables having mean item scores above 3.00. Table 4.4 also shows that construction projects did not perform within the estimated cost and time. This implies that construction projects delivered during covid-19 pandemic were not delivered within the estimated cost and schedule time. This means construction projects suffered cost and time overruns.

#### **4.1.3 Impact of Covid-19 Problems on Construction Project Delivery**

This objective explores the impact of covid-19 problems on the performance of construction projects during the pandemic. The study seeks to reveal whether problems caused by covid-19 have an impact on construction project performance during the covid-19 pandemic. The hypothesis states that there is no significant influence of covid-19 pandemic on the performance of construction projects during the covid-19 pandemic in Akwa Ibom State. To establish this relationship, the study used Spearman Ranked Correlation. The statistical significance of both tests relied on the values of the critical probability (p-values), where values < 0.05 showed a rejection of the hypothesis for a named variable, while values > 0.05 showed an acceptance of the hypothesis.

The study correlated the top five ranked variables of problems caused by covid-19 and construction project performance in Table 4.3 and Table 4.4. The correlation matrix presented in Table 4.5 below reveals the relationship between problems caused by covid-19 (restriction of movement, delayed project timeline, transportation/logistics problems, high cost of construction materials and increasing project cost) and the performance of construction projects during covid-19 pandemic (meet client expectation and needs, compliance to health and safety, client satisfaction, completed safely, and risk management). Table 4.5 shows that problems caused by covid-19 (restriction of movement) do not impact project performance in two areas (client satisfaction and completion safely). The null hypothesis ( $H_{03}$ ) for client satisfaction and completion safely was accepted because critical p-values are greater than 0.05. The problem caused by covid-19 (restriction of movement) however has a significant relationship with project performance indicators (meeting client expectations and needs, compliance to health and safety and risk management) and the null hypothesis was rejected (p-value < 0.05). The strength of the correlation is very weak (R,0.083 – 0.259).



**Table 4.5: Spearman Correlation between Problems Caused by Covid-19 and Performance of Construction Projects During the Covid-19 Pandemic**

S/N	Variables correlated	R	P-value	Decision
1.	Restriction of Movement			
a.	Meet client expectations and needs	0.106	0.226	Reject Ho <sub>3</sub>
b.	Compliance with health and safety	0.259**	0.003	Reject Ho <sub>3</sub>
c.	Client satisfaction	0.083	0.349	Accept Ho <sub>3</sub>
d.	Completed safely	0.102	0.245	Accept Ho <sub>3</sub>
e.	Risk management	0.211*	0.016	Reject Ho <sub>3</sub>
2.	Delay Project Timeline			
a.	Meet client expectations and needs	0.011	0.897	Accept Ho <sub>3</sub>
b.	Compliance with health and safety	0.159	0.069	Accept Ho <sub>3</sub>
c.	Client satisfaction	0.090	0.308	Accept Ho <sub>3</sub>
d.	Completed safely	0.014	0.870	Accept Ho <sub>3</sub>
e.	Risk management	0.211*	0.016	Reject Ho <sub>3</sub>
3.	Transportation/Logistics Problem			
a.	Meet client expectations and needs	0.127	0.148	Accept Ho <sub>3</sub>
b.	Compliance with health and safety	0.100	0.254	Accept Ho <sub>3</sub>
c.	Client satisfaction	0.175*	0.046	Reject Ho <sub>3</sub>
d.	Completed safely	-0.021	0.816	Accept Ho <sub>3</sub>
e.	Risk management	0.253**	0.004	Reject Ho <sub>3</sub>
4.	High Cost of Construction Materials			
a.	Meet client expectations and needs	-0.281**	0.001	Reject Ho <sub>3</sub>
b.	Compliance with health and safety	-0.103	0.244	Accept Ho <sub>3</sub>
c.	Client satisfaction	-0.087	0.321	Accept Ho <sub>3</sub>
d.	Completed safely	0.083	0.354	Accept Ho <sub>3</sub>
e.	Risk management	0.131	0.135	Accept Ho <sub>3</sub>
5.	Increasing Project Cost			
a.	Meet client expectations and needs	-0.238**	0.006	Reject Ho <sub>3</sub>
b.	Compliance with health and safety	-0.166	0.057	Accept Ho <sub>3</sub>
c.	Client satisfaction	-0.049	0.580	Accept Ho <sub>3</sub>
d.	Completed safely	-0.032	0.716	Accept Ho <sub>3</sub>
e.	Risk management	0.122	0.163	Accept Ho <sub>3</sub>

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Source: Author's Field Survey (2023).**

The problem caused by covid-19 (delayed project timeline) does not influence project performance with a very weak correlation coefficient (R, 0.014 – 0.011). The p-values for four out of five components of project performance assessed in this group were accepted (meet client expectations and needs, compliance to health and safety, and completed safely) and the null hypothesis was accepted (p-value > 0.05). These results further show that a delayed project timeline influences risk management (R, 0.211, p (0.016 < 0.05)). The decision reached indicates that problems caused by covid-19 cannot influence the meeting of client expectations and needs, compliance to health and safety, client satisfaction and completion safely.

Table 4.5 also shows the problems caused by covid-19 (transportation/logistics problems) do not impact project performance. The null hypothesis for four out of five components was accepted. However, the direction of the correlation is positive, and the inference suggests the project performance would decrease with an increasing problem caused by covid-19. Problems caused by covid-19 (high cost of construction materials) do not influence project performance with a very weak correlation coefficient (r, .131 – 0.103) the p-value for four out of five components of project performance were accepted (compliance to health and safety, client satisfaction, completed safely and risk management) and the null hypothesis was accepted (p-value > 0.05). These results show that the

high cost of construction materials influences meeting client expectations and needs ( $r, -0.281, p(0.001)$ ). Furthermore, increasing project cost of problems caused by covid-19 does not influence compliance with health and safety, client satisfaction, completed safely, and risk management. The null hypothesis of these dimensions was accepted ( $r, -0.032 - 0.238, p(0.057 - 0.716)$ ) with a very weak degree correlation. However, increasing project cost of problems caused by covid-19 influences meeting client expectations and needs. The null hypothesis for meeting client expectation and needs were rejected ( $r, -0.238, p(0.006 < 0.05)$ ) with a moderate correlation.

#### 4.2 Discussion of Findings

Problems caused by the covid-19 pandemic in the construction industry have a negative impact on the construction industry. The problem caused by covid-19 can be evaluated on the restriction of movement, delay of the project timeline, transportation/logistics problems, high cost of construction materials and increasing project. These components of the problem caused by covid-19 are the top five significant problems caused by the covid-19 pandemic in the construction industry. Overall, construction professionals suffered severely from these problems ranked top five. Furthermore, the finding of the study emphasized that restriction of movement is the highest problem caused by covid-19 in construction. This finding is in line with the opinion of Zamani *et al.* (2020) who observed that the restriction of movements and working from home adopted by governments all over the world has negatively impacted the fortunes of workers and governments. This restriction of movement had a negative impact on the construction industry in Nigeria, as a series of lockdowns were declared by the federal government to stem the tide of infection and deaths. This declaration involved complete restriction of movement across the country.

The performance of projects executed by construction professionals delivers on several meeting client expectations, compliance to health and safety, and client satisfaction objectives. However, the performance of this project can be measured primarily from the perspective of meeting client expectations, compliance with health and safety, completed safely, and risk management context. These components of project performance are prioritised in the top five significant performance levels and criteria over the traditional iron triangle (cost, time and quality) 6th, 14th and 15th in performance level during the pandemic. This implies that construction projects delivered during covid-19 pandemic were not delivered within the estimated cost and schedule time. This means construction projects suffered cost and time overruns. Overall, construction professionals adjudged their projects successful in terms of meeting client expectations, compliance with health and safety, completed safely, and risk management adopted in the projects. The finding of the study reveals that construction projects during the pandemic are delivered to meet client expectations and needs. This is similar to Navon (2005) explanation that the performance of a construction project should meet clients' expectations and needs, exceed expectations and construction projects are completed safely.

The relationship between the problem caused by covid-19 pandemic and construction project performance executed by construction professionals, the results of the inferential non-parametric tests affirmed both dimensions are strongly correlated. The relationship suggests problems caused by covid-19 influences construction project performance in terms of meeting client expectations and needs, compliance with health and safety, client satisfaction, completed safely, risk management, completed to quality, productivity, profitability, environmentally sustainable and stakeholders/project team satisfaction among several other dimensions of project performance.

Findings in critical literature reinforce this conclusion, for instance, Arcadis (2020) asserted that the effect of the pandemic is presumed to be significant in the construction industry and construction professionals are combating the effect of the covid-19 pandemic on all kinds of projects. Husien *et al.* (2021) asserted that the impact of covid-19 human health has been felt, however not only human health but all sector of the economy. The construction industry suffered the consequences of the impact of the construction industry, these impacts have resulted in suspension/slowing of the construction process, workforce concerns, logistics problems and an increase in project costs. These impacts are the result of the restriction of movement. Restriction of movement, delayed project timeline and increasing project cost influences project performance. The finding of the study is not in line with Husien *et al.* (2021) who revealed a key problem caused by covid-19 has to do with legal disputes and claims that have significantly affected the local construction industry around the world.

## Conclusion

The study aimed at the appraisal of the impact of the covid-19 pandemic and its impact on construction project delivery in Akwa Ibom state. The construction industry is at the centre of the pandemic and has encountered difficulties in delivering construction projects. Problems caused by covid-19 pandemic and the performance of construction projects executed during covid-19 are strongly correlated. This means that problem caused by covid-19 (restriction of movement, delay project timeline, transportation/logistics problems, high cost of construction materials and increasing project cost) influences construction project performance in terms of meeting client expectation and needs, compliance with health and safety, client satisfaction, completed safely, risk management among others. This finding implies that, if construction professionals do not prioritise this problem caused by covid-19, then the projects executed may suffer poor performance, time and cost overrun, and worsen the consequence of project abandonment as noted in the literature. The study advances some useful theoretical insights which show that covid-19 is predicated on the impact on construction projects.

The study showed that problems caused by COVID-19 influences project performance. In addition, the study is one of the few studies done on the relationship between the problems caused by COVID-19 and construction project performance during the pandemic in the construction industry in Nigeria. Furthermore, this study provides more information due to the dearth of literature on the effects of COVID-19 on the construction industry. The study advances the theoretical positions in critical literature by providing empirical evidence for mitigating the inherent evidence gap on the relationship between problems caused by covid-19 pandemic and project performance. Opportunities, however, have emerged in the areas of contemporary procurement planning, the requirement for virtual working, and particular design issues. This research is essential for the creation of new working tactics and extra contingency plans in the event of a pandemic with minimal human interaction.

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## RESIDENTIAL AREA DISSONANCE AND COPING STRATEGIES IN IKOT EKPENE URBAN, AKWA IBOM STATE, NIGERIA.

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### Abstract

The paper examined residential area dissonance in Ikot Ekpene Urban, Nigeria. Data were obtained through the administration of questionnaire. A total of 500 households were systematically sampled for questionnaire administration. Frequency counts were used in analysing the determinants of residential area dissonance, and the relative dissonance index (RDI) was also employed to determine levels of residential area dissonance. Spearman's ranked correlation and factor analysis were used to assess the relationships between socio-economic variables and residential area dissonance. It was noted that the major determinants of residential area dissonance were the inadequacy of basic facilities and utilities, insecurity and long distances between home and workplaces. The spearman's ranked correlation indicated a positive relationship between income level, household sizes and age with residential area dissonance, subjecting the socio-economic characteristics of respondents to factor analysis, it was found that income and age could explain 34.115% and 31.807% of respondents' residential area dissonance respectively. On dissonance coping strategy, the majority of respondents (48%) intended to move out of their current neighbourhood to others that were better serviced. The RDI of Ikot Ekpene urban was found to be 2.72 on a scale of 5, which shows that residents are marginally dissatisfied with their residential area, on this premise; it was suggested that facilities that are capable of improving the livability of the area should be provided and security institutions should be equipped and strengthened. community-based security groups could also be set up to complement the efforts of the state actors.

**Keywords;** Dissonance; housing, residential area, housing satisfaction, housing environment

### I. Introduction

Housing has been conceptualized in various ways by scholars. In its basic meaning, housing is more than mere shelter. It encompasses the totality of the residential environment that man uses for shelter. It is a structure that is highly needed for man's physical, mental health and social well-being (Ajom *et al.*, 2022; Eteng *et al.*, 2022). Housing is the totality of the residential neighbourhood and environment or micro-district including the physical structure, all necessary services, facilities, utilities and apparatus for the total health and social well-being of the individual and family in the neighbourhood. The residential area in which a structure is situated is of utmost importance even more than the structure itself because it carries the bundle of goods which will be enjoyed by the inhabitants of the housing units therein. Regrettably, it is near impossible for a resident to be satisfied maximally with a given residential area due to pre-conceived housing aspiration.

Residential area dissonance refers to the gap between the residential area currently being occupied by an individual and that which the individual would have loved to live in ideally. In general, urban planning seeks to create a sustainable and liveable environment through the ordering and re-ordering of land uses and the provision of basic infrastructure to enhance the well-being of people. This is why studies on drivers of residential area dissonance are apt to the profession as residential areas are seen as a micro-unit of planning where other things evolve. Studies on residential area dissonance/ satisfaction help in assessing the success of a public-sector, private-sector, or joint housing project, help policymakers to understand the factors of intra-urban housing mobility and to determine the type of public and/or private efforts (financial and human) that are to be invested in the improvement of a residential environment, and such investments are to be prioritized based on the resident's perceptions of inadequacies in the existing amenities in their area (Afon, 2006). This paper

aims to examine the relative residential area dissonance level of respondents in Ikot Ekpene Urban. To guide the research the following are the research questions;

1. What are the major determinants of residential area dissonance in Ikot Ekpene Urban?
2. What is the relative Dissonance index of respondents in Ikot Ekpene Urban?
3. What is the relation between socio economic characteristics of respondents and their relative dissonance level?
4. What are the residential area dissonance coping strategies in the study area?

## II. Literature Review

Residential area dissonance is defined as the incongruence in terms of land use patterns between the neighbourhood type in which an individual is currently residing and the individual's preference structure regarding such characteristics of the residential environment. This definition links residential area dissonance directly to one dimension of residential satisfaction, which can be seen as a product of the congruence between the actual residential environment and the subjects' opinions about what this environment should look like (Schwanen and Moktarian, 2004).

At least three types of factors explain the existence of residential area dissonance; those relating to residential preferences; those that are associated with the residential choice process; and those that have to do with dynamics in the life course and attitudes of individuals. Residential area dissonance may also result from the fact that residential choice is a household decision, and housing preference structures may vary across individuals within the same household. Disagreement about the importance of features of the residential area among household members may lead to residential type mismatch in the level of the individual or even the household (Schwanen and Moktarian, 2004). Further, the extent of dissonance may be associated with the size and heterogeneity of the choice set of housing alternatives available in the residential choice process. The trade-off between housing attributes becomes more complicated as the constraints on choice are larger.

Households are often bonded to certain locations by the various ties of family members, jobs, and attachments to housing units and neighbourhoods. The strength of these attachments may be measured as the degree of satisfaction or dissonance expressed. Dissonance arises as the housing fit is altered by family cycle changes. For example, a new birth may necessitate an additional bedroom, or conversely, the house may seem larger after the last child is of age and decides to leave home.

Residential area dissonance often leads to the thought of moving out of the neighbourhood, but it is not a sufficient condition for mobility (Deane, 1990). Residents often attempt to make their situation and aspiration pictures as congruent as possible by changing either their aspirations or their environment. Adjustments in aspirations may involve a change of use or change of attitude towards the residence, such that the dissonance level is reduced even when there is no change in the environmental parameters. Any dissonance coping strategy that involves changes in the environmental parameters (including change of location) is often termed active adjustment. Adaptation may be through mobility or structural conversion. Aspiration changes are psychic and quite difficult to capture while changes in the environment are empirically evident adjustments and rather easily measured as housing changes or alterations.

Numerous researchers have shown that housing preferences vary not only with household structure and income but also with lifestyles and personality factors. Because residential preferences play a central part in residential area dissonance, it is logical to infer that factors affecting residential location preferences are also associated with the existence of residential area dissonance. Empirical findings on factors affecting residential preferences are summarized as follows: The determinants of residential area preferences within Ibadan metropolitan city according to Sanni and Akinyemi (2009) are factors that deal with the quality of the environment and those that are socio-cultural in nature. Among factors that deal with the quality of the environment, such reasons as a well-planned area with necessary infrastructural facilities such as good roads, water supply etc that make a place conducive for living, were highly regarded. The study also revealed that each category of residential areas in Ibadan had a distinct and peculiar arrangement of determinants of residential district preferences and that broad generalization of such determinants should not be done for the whole city. Udoh (2020) in his work on housing and environmental quality in rural Akwa Ibom State, found out that the majority (78%) of households were dissatisfied with water source and quality, and frequent flooding made 76%

of respondents to be dissatisfied with their residential area, poor waste disposal and management, drainage system and mice/ pest infestation were also main causes of residential area dissonance.

Etim (2015) examined determinants of residential area preference in Ikot Ekpene urban. The study showed that access to land determined largely the future choice of residents. In order of dominance, the serenity of the environment accounted for the second largest percentage (24.5%) only bettered by access to land (25.25%) Closeness to the workplace (21.5%), Availability of basic facilities (12%), security (10%) and family ties (6.75%) were seen as minor determinants of residential area preference in Ikot Ekpene urban. It was inferred that residents believed that with a good road network and mass transit schemes in place, there will be no need to live near workplaces since they can access such places easily, also government should ensure the provision and maintenance of basic facilities and utilities in the town.

It is believed that the socio-economic status of a household plays a major role in the quality of their housing satisfaction or dissonance. A socio-economic characteristic is a term used to stratify a population according to the interplay of social and economic factors. It may also be defined as a measure of an individual's place within a social group based on various factors, including income and education (Hwang et al, 1999). According to Okpoechi (2018), the socio-economic factors that significantly affect housing satisfaction among the middle-income group in Owerri are income, nature of employment, and socialization habits. Other factors like family size, family structure and level of education were found not to be significant determinants of housing satisfaction among this group. Previous researchers have found linkages between housing (dis)satisfaction and socio-economic factors like age (Varady and Preiser, 1998), family structure (Theodori, 2001), education, income, employment status, length of residency, and physical characteristics of the house (Yeh, 1972). Additionally, fulfilled housing preferences have also been shown to predict the quality of life (O'Connell *et al.*, 2006). This presumes that the subjectivity of housing satisfaction notwithstanding, it is still a very important predictor of the overall quality of life of housing residents.

## Conceptual framework

### a) The Actual-Aspiration Approach

Actual-aspiration gap approach, the conceptual framework developed by Marans and Rodgers (1975), postulated that people have a perception of the main attributes of their physical environment. These attributes are then evaluated against their aspirations (i.e., the environmental amenities people hope they will be able to enjoy). In this sense, residents are seen as having a cognitive construct of reference conditions for each particular salient feature of the residential environment. Given an environment, then, the quality and quantity of the environmental feature implied by the reference point are dependent on individual self-assessed needs and aspirations (Michelson, 1976). The assessed needs and aspirations are also dependent on individual objective social and economic attributes. If the existing situations of the residential environment are not in congruence with (a reasonable portion of) the reference conditions, cognitive state of dissonance will be set in.. There is often a gap between aspirations and what the environment offers. If and when this happens, residents often try to reconcile the incongruence by adopting several coping strategies. This includes lowering housing aspirations, increasing spending to modify the housing unit and moving to another residential area that they believe could meet their aspirations (Afon, 2006).

## III. Materials and Methods

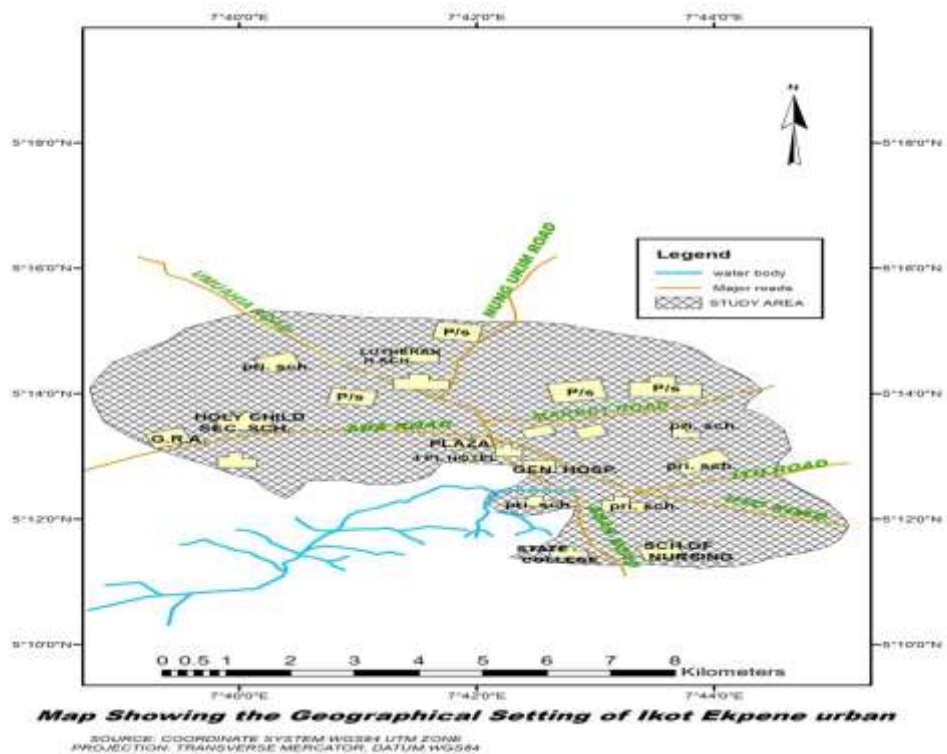
### Study Area

Ikot Ekpene urban extends from Latitudes 5°08' to 5°12' North of the Equator and longitudes 7°38' to 7°45' East of the Greenwich meridian .Ikot Ekpene urban is known as the "Raffia City". The area is an historic town in the Niger Delta region of Nigeria. It is the second most populated urban centre in Akwa Ibom State after Uyo the State capital. It is also the political and cultural capital of the Annang ethnic group. Ikot Ekpene urban is made up of eight (8) settlements, these are Ikot Abia Idem, Ikot Obong Edong, Abiakpo Ikot Essien, Ikot Ekpene, Uruk Uso, Ifuhu, GRA and Ibiakpan Akan Anwan (NPC, 1991). The population figures of Ikot Ekpene urban is 131, 292, projected based on 1991 census data using 3.4% growth rate. The area has retained some of its traditional values such



as male heading families, and relatively large households though it has also acquired a series of urbanism such as having a younger population; most of who are economically active, attain tertiary education status and have moderate income levels. Ikot Ekpene urban is located in an oil palm belt. Consequently, the people have palm oil and kernel extraction as their major occupation. Other economic activities in the area include farming, trading, artisan, carpentry, mechanic and vulcanizing work. A handful of the populations are civil servants.

Road pattern has played an important role in forming the settlement pattern of the area as the tendency to build houses close to the road has led to a linear settlement pattern. Traditional buildings of simple structure constructed with local materials have gradually been displaced by sandcrete blocks and corrugated metal sheets upon sawn timber and cement plastered wall. Most houses are put into mixed use and set out in a haphazard manner. The use of inferior, poor and sub –standard building materials coupled with the fact that these materials are poorly put together with low level technology greatly lowers the performance of this facility. The health consequences occasioned by the inadequate housing conditions on the urban population has gained notoriety (Akpabio, 2010).



### Research Methodology

Ikot Ekpene urban is made up of eight (8) settlements. These are IkotAbia Idem, Ikot Obong Edong, Abiakpo Ikot Essien, IkotEkpene Town, GRA, Uruk Uso, Ifuhu and Ibiakpan Akan Anwan (NPC, 1991). With reference to the National population policy (1998), to acquire the number of households in a settlement, the projected population figure is often divided by the estimated average household size of six.

The Taro Yamane formula was used in deducing the sample size. The formula is as follows;  $n = \frac{N}{1 + N(e)^2}$  ..... Equation 1

Where: n= sample Population, N= finite population, e = the level of significance, 1=constant

However, application of the formula resulted in 400 but the sample size was increased to 500 for a wider coverage. To arrive at the sample size for each settlement, the number of households in each settlement will be divided by the sum of the households in the study area, and then multiplied by the total number of sample size of 500. The systematic random sampling was used in selecting the households which questionnaire were administered in each village. The variables that lead to residential area dissonance were analyzed using frequencies, The respondents' level of dissonance in relation to their residential area condition was evaluated in terms of Relative dissonance Index (RDI) on a five –point scale. Very dissatisfied (5), dissatisfied (4), indifferent (3), satisfied (2) and very Satisfied (1). The RDI was calculated using the formula;

$$RDI = \frac{5N_1 + 4N_2 + 3N_3 + 2N_4 + 1N_5}{N_1 + N_2 + N_3 + N_4 + N_5} \quad \text{Equation 2}$$

**Where:** N<sub>1</sub> - Number of respondents who indicated “very dissatisfied”, N<sub>2</sub> - Number of respondents who indicated “dissatisfied”, N<sub>3</sub> - Number of respondents who indicated “indifferent”, N<sub>4</sub> - Number of respondents who indicated “satisfied” and N<sub>5</sub> - Number of respondents who indicated “Very satisfied”

The relationship between socio-economic characteristics and residential dissonance index of respondents was investigated using the spearman’s ranked correlation. Factor analysis was later used to reduce the data to two variables.

#### IV. Findings and Discussions

**Table 1: Determinants of Residential Area Dissonance in Ikot Ekpene Urban**

S/n	Factor	Frequency	Percentage
1.	Inadequacy of basic facilities/utilities	160	32%
2.	Insecurity within the area	128	25.6%
3.	Distance to workplace/school	116	23.2%
4.	Housing condition	96	19.2%
		500	100.00%

#### Field Survey, 2023

Table 1 shows the major determinant of residential area dissonance among respondents is the inadequacy of basic facilities and utilities in the area. 32% of respondents decried the erratic nature of the power supply, poor drainage network and poor methods of waste disposal. This is in tandem with the assertion of Ajom *et al* (2022) that in the determination of locations for residential housing development, the place of urban infrastructure cannot be over-emphasized in that the availability of infrastructure such as water, electricity, telecommunication systems, waste disposal system and roads all promote land use development and increase property values in an urban area. This is because property demand in districts that have the needed infrastructure is always higher than in areas where there is a shortage in infrastructure.

The insecurity in Ikot Ekpene urban is gradually becoming alarming, 25.6% of respondents experienced residential area dissonance because they were not certain of the security of their lives and properties. Key drivers of crime include poverty, migration, unemployment, endemic drug abuse, small arms and light weapons trafficking and incessant political violence (Usip and Ayadu, 2022). It should however be noted that the rise in insecurity in urban centres is a global phenomenon hence the need to adopt best practices to curtail it. 23.5% of respondents were not satisfied with the distance to their workplace/school while 19% of respondents stated the condition of their housing as the cause of their residential area dissonance. This goes to show that housing is more than a mere shelter, as 81% of factors causing residential dissonance were external to the dwelling unit itself.

**Table 2: Dissonance Levels of Respondents**

	Frequency	Percent	Valid Percent	Cumulative Percent
Very satisfied	123	24.6	24.6	24.6
Satisfied	145	29.0	29.0	53.6
Indifferent	71	14.2	14.2	67.8
Valid Dissatisfied	69	13.8	13.8	81.6
Very dissatisfied	92	18.4	18.4	100.0
Total	500	100.0	100.0	

Source: Statistical Computations, 2023

Relative dissonance index:

$$RDI = \frac{5N_1 + 4N_2 + 3N_3 + 2N_4 + 1N_5}{N_1 + N_2 + N_3 + N_4 + N_5}$$

$$N_1 + N_2 + N_3 + N_4 + N_5$$

$N_1 = 92, N_2 = 69, N_3 = 71, N_4 = 145$  and  $N = 500$

$$= \frac{5(92) + 4(69) + 3(71) + 2(145) + 1(123)}{500} = \frac{1362}{500}$$

$$= 2.72$$

The relative dissonance index of respondents with regards to their residential area in Ikot Ekpene urban is 2.72 on a scale of 5. This means that currently respondents are marginally dissatisfied with their residential area.

**Table 3: Correlation between Socio economic characteristics and Residential Area Dissonance**

	RDI	Income	Household Size	Marital Status	Age	Sex
Spearman's Rho Correlation coefficient	1.000	.618**	-.228**	.103*	.515**	.251**
Sig (1-Tailed)		.000	.000	.010	.000	.000
N	500	500	500	500	500	500

SPSS Analysis, 2023

From the spearman's ranked correlation analysis done with the help of SPSS, the correlation coefficient between residential area dissonance and socio-economic characteristics like income, household size, marital status, age and sex was 0.618, -.228, 0.103, 0.515 and 0.251 respectively. The socio-economic variables were subjected to factor analysis. The result showed that age and income were undermining variables influencing the residential area dissonance of respondents. Income and age explained 34.114% and 31.807% respectively of variation in respondents' residential dissonance levels. (See Appendix)

The analysis shows that higher income levels are related positively with higher dissonance levels (0.618) this further validates the assertion of Goodall (1972) that as income rises housing behaves as a superior good, for the household spends proportionately more of its increased income on purchasing larger and/ or better residential areas. Higher household sizes correlated negatively with residential area dissonance (-.228), this could be attributed to the likelihood of those with large family size owning

their residential units and not just renting, single individuals(.103) were found to be more dissatisfied with their residential area than the married and widowed. The elderly were more dissatisfied than the younger once, while males were more dissatisfied than females.

**Table 4: Residential Area Dissonance coping Strategies in Ikot Ekpene Urban**

Coping Strategies	Frequency	Percent
Increase spending on housing improvement	80	16%
Moving to another residential area	240	48%
Adapting by reducing housing aspiration	180	36%
	500	100%

**Source:** Field Survey, 2023

Table 4 shows that 16% of respondents will like to spend more in order to improve their housing condition, 36% of respondents agreed that they will reduce their housing aspirations so as to adapt comfortably to the current housing condition, majority of respondents 48% asserted that they are likely to move to another housing unit where their aspirations can be met. This infers that there is a high tendency for intra-urban mobility in Ikot Ekpene Urban.

## V. Conclusion

This paper examined residential area dissonance in Ikot Ekpene Urban, Akwa Ibom State, Nigeria. The determinants of residential area dissonance were identified as inadequate facilities/utilities, high insecurity rate and long distances to commute to workplaces/schools. These factors help to lower the livability level of the area hence it was found that the residential dissonance index of respondents was 2.7 measured on a scale of 5. This portrays that residents were marginally dissatisfied with their residential area currently, if nothing is done to address this, intra-urban housing mobility rates will be on the rise as stated by the majority of respondents who regarded such measures as a dissonance coping strategy. The relationship between socio-economic variables and housing dissonance was also investigated, however, income and age were found to be highly correlated positively with residential area dissonance.

In order to improve the livability Ikot Ekpene urban, security of lives and properties must be given utmost attention, this may entail the deployment of urban surveillance systems, technology and GIS in security planning and the use of community-based security groups. The town planning agencies can exert a direct influence on crime reduction by delineating territories, reducing or increasing accessibility by the creation or elimination of boundaries and circulation networks, and facilitating surveillance by the citizenry and the police. The government should ensure that there is adequate provision of basic facilities and amenities; such should also be maintained in order to keep them in a usable state.

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**Factor Analysis Extract**

**Communalities**

	Initial	Extraction
Income	1.000	.764
Age	1.000	.764
HouseholdSize	1.000	.542
sex	1.000	.657
Marital Status	1.000	.569

Extraction Method: Principal Component Analysis.

**Total Variance Explained**

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %		% of Variance	Cumulative %
1	2.030	40.596	40.596	2.030	40.596	40.596	1.706	<b>34.115</b>	34.115
2	1.266	25.325	65.921	1.266	25.325	65.921	1.590	<b>31.807</b>	65.921
3	.766	15.313	81.235						
4	.544	10.890	92.125						
5	.394	7.875	100.000						

Extraction Method: Principal Component Analysis.

**Component Matrix<sup>a</sup>**

	Component	
	1	2
Income	.508	-.711
Age	.823	-.294
HouseholdSize	.590	.441
Sex	.797	.148
maritalStatus	.333	.677

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

**Rotated Component Matrix<sup>a</sup>**

	Component	
	1	2
income	.849	-.208
Age	.816	.313
householdSize	.160	.719
sex	.508	.631
maritalStatus	-.189	.730

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

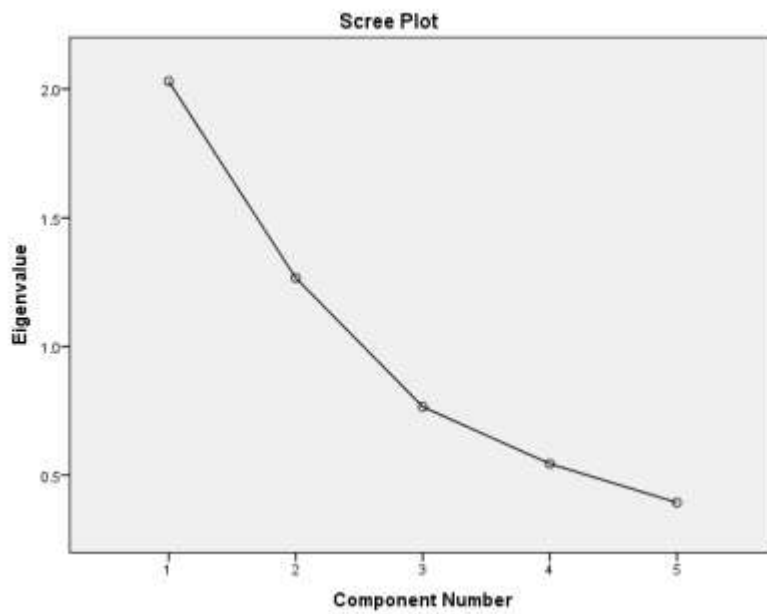
a. Rotation converged in 3 iterations.

**Component Transformation Matrix**

Component	1	2
1	.759	.651
2	-.651	.759

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.





## AN ASSESSMENT OF LANDUSE CHANGE IN NSIT IBOM LOCAL GOVERNMENT AREA, AKWA IBOM STATE, NIGERIA.

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### Abstract

*This study was aimed at assessing of landuse change in Nsit Ibom LGA, Akwa Ibom State, Nigeria. The land use of the study area was characterized into four classes; forest, Bush fallow, farmland and built-up area through the use of supervised classification modules on remotely sensed imageries. The trend of land use change in Nsit Ibom LGA was analyzed for the period of thirty four years (1986 -2020) and it was found that thick forest experienced a decrease at the rate of 41.46ha per year, farmlands expanded by 9.80ha per year and the built-up areas experienced an increase of 27.93%. Key determinants of land use change in the area were reduced into three groups using factor analysis and were named as follows; physical development /Household Size Factor which includes technology, academic attainment, household size infrastructural facilities and availability of market accounted for 45.308 % of the total variances. The second determinant factor was the Fallow Land/ Environmental Factor which includes Rainfall, environmental problems and fallow land and accounted for 11.006% of the total variance. The third factor was the Physical conditions factor, which includes temperature and physical structure and it accounted for 9.746% of the total variance. Based on the findings it was recommended that bye laws on environmental protection should be enacted by the local Government Authorities also there should be public enlightenment programs to educate the residents of the negative effects of deforestation. These when put in place will ensure the sustainable utilization of land and forest resources in the study area.*

**Keyword:** Land Use, Population, Development and Urbanization.

### Introduction

Land use change refers to the set of biophysical modifications of land surface and water bodies caused by the interaction of human and natural processes such as building construction and unexpected disaster (floods), which take control of the lands of the inhabitants (Edewede, 2018). Land use depicts how the biophysical features of land are modified, as well as the rationale behind such modifications (Etim, 2021). Man's interaction with land and his depletion of the natural world as a result of livelihood activities occur on a daily basis. This tie between man and land may be traced back to the Holy Book, which plainly states that man cannot exist apart from his bond with the land. Land use changes are material manifestations of environmental and human processes, as well as their interaction mediated by land availability. Land use change, in addition to affecting the physical dimension or spatial extent of land, influences many other secondary processes that eventually lead to the degradation of the earth's ecosystems (Isibor, Liol and Arthur, 2020). Loss of vegetative cover frequently has a negative impact on the environment, including biodiversity loss, climate change, changes in radiation forcing, pollution of other natural ecosystems with a reduction in their quality, changes in hydrological regimes, and a variety of other environmental effects. This paper sets out to assess the Land use change in Nsit Ibom local Government Area of Akwa Ibom State, Nigeria within the year 1986 and 2020.

### Statement of Problem

Since the middle of the 19th century, changing land use patterns are being observed not only in urban areas but also in rural areas. There are still inadequate studies on the relationship between land use change and its effects on rural livelihoods. The factors that drive these changes seem to vary from place to place and from time to time. In Nsit Ibom Local Government Area, the land use pattern appeared to have changed over the years. Concomitant with these changes are the changes in livelihood patterns. The study of the impacts of land use change has attracted many researchers over the past decades who through their studies attempted to understand land use change, its causes and effects. Nsit Ibom Local Government Area is amongst the heavily populated local government in Akwa Ibom State with a total population of 63,543 people (National population commission, 2009.)

This is a result of the development that has come in the education sector, transportation sector, and the over-spilling sprawl from Uyo the capital of the state. Today, agents of urbanization have modified this area to suit the various desires of the people; proper planning is needed to guide the physical development of the area in a sustainable manner and enhance the livelihood pattern of the people living therein. It is against this background that this study is undertaken to examine the changing land use patterns in Nsit Ibom Local Government Area.

### **Literature Review and Empirical Findings**

Changes in land use and land cover have environmental and socioeconomic consequences that regularly feedback and modify biophysical and socio-cultural elements, ushering in new rounds of change (Helen, 2000). Land use changes result from not only man-made modifications and conversion processes, but also from other eco-systemic interactions.

According to Lambin *et al.* (2008), this alteration and conversion of land use to different patterns has long been a reality. Significant changes have occurred over the course of many decades, mostly as a result of human manipulation of the land's cover. Deforestation, biodiversity loss, global warming, an increase in natural disasters, etc. are all effects of global land cover and land use. Atser *et al.* (2014) asserted that, the annual use of land resources has a high propensity to affect vegetation, soil properties, terrain, and other environmental components, and the alteration frequently takes the form of changes to land cover.

Fred (2019) investigated how land use changes in Nigeria's Akwa Ibom State's Abak LGA affected agriculture. According to the study's findings, the thick forested areas declined by 2312.82 hectares between 1986 and 2016 at a rate of 77 hectares per year, and the amount of disturbed forest decreased by 433.07 hectares at a rate of 14.43 hectares per year. As built-up areas grew by 3338.56 hectares at a rate of 111.29 hectares per year, farmlands fell by 40,992 hectares at a rate of 1366 hectares per year. It was noticed that the region's agricultural practices were under severe threat from unchecked land use change.

Etim (2021) evaluated urban growth and land use change in Ikot Ekpene LGA of Akwa Ibom State, Nigeria. Using supervised classification modules on remotely sensed imageries, the land use of the research region was divided into four classes: dense forest, cultivated farmland, built-up area, and water bodies. The trend of land use change was examined over a forty-year period (1980–2020), and it was discovered that dense forest decreased at a rate of 15.996% annually, cultivated farmland decreased at a rate of 3.272% annually, while built-up areas increased at a rate of 20.008% annually and water bodies decreased at a rate of 0.724% annually. Residents highlighted three indicators of urban development—the availability of services and infrastructure, housing development, and population growth—as the main drivers of land use change in the region, garnering nearly 75% of responses.

The effects of the growing human population on land resources have led to a variety of land uses, including production, shelter provision, recreation, material extraction and processing, and production, shelter provision, and production (Roy and Arijit 2010). Population growth affects both rural and urban areas equally, and it is a significant factor that has had a negative impact on peoples' ability to support themselves. This is because areas of land that were previously used for agriculture have been put to other uses, which has reduced agricultural production and reduced peoples' access to livelihoods. Yet, it was found in a research by Etim (2021) that while population growth is a possibility, it is not a prerequisite for changing land use patterns. It was observed that the socio-economic characteristics of the population were better drivers of land use changes than population numbers. This result confirmed the assertion of Young *et al* (1991) who noted that population growth is not the main driving force of land use change as its importance is relative to the other forces generating land use change such as technology and social advances that improve the conditions of life.

Ofem et al. (2019) looked at the factors causing land use change in the capital city of Uyo, which they represented as urban sprawl. Responses were tabulated and evaluated using frequency counts and percentages after respondents were asked to identify the causes of the change in land usage in Uyo. The study found that of the 390 respondents, 43.3% identified population growth as the primary cause of land use change, 22.0% identified economic growth as the primary driver, 9.0% blamed physical limitations or impassible landforms for uncoordinated land use change, 13.7% mentioned a desire for home ownership, and 12.0% blamed a lack of coordination and affordable housing for land use change.

The impact of altering land use patterns begins with land degradation, which leads to a decline in soil quality and, in turn, a reduction in agricultural operations. Additionally, patterns of land use influence the rate and intensity of soil erosion. Land degradation, on the other hand, refers to a temporary or permanent loss in the capacity for production and has a negative impact on the productive, physiological, cultural, and ecological functions of land resources (Gessese, 2017).

### **Concept of Sustainable Development**

In order to balance the complementary goals of delivering environmental, economic, and social opportunities for the benefit of both the present and future generations, as well as maintaining and improving the quality of land (soil, water, and air) resource, the concept of sustainable development seeks new ways of managing urban development in an intentional, comprehensive manner. When it comes to land use management, the terms "sustainable development" and "smart growth" are frequently used interchangeably (Akanmu et al., 2018). Smart growth was developed as a response to what many planners perceived as unfavorable aspects of ongoing increase through urban sprawl. It has a set of principles that drive spatial development into more compact, interconnected, and mixed-use patterns, resulting in more dynamic communities, healthier land, and a more sustainable settlement pattern. It is one of the urban growth management techniques that employs planning and design concepts to mitigate the effects of disorderly growth (Fodor, 2022).

Through mixed land uses, compact building design, diversity of transport options, walkable communities, and a reliance on participatory planning to foster a strong sense of place, sustainable development attempts to coordinate development within the city center with an attempt to bring about the sustainable development of the adjacent suburbs (Nelson and Wachter, 2002). In this sense, participatory planning includes everyone, including the people's choice of activities (agriculture inclusive). Reversing the current growth trends that frequently waste valuable resources, deteriorate the built and natural environments, and increase resident inequality is known as sustainable development. It is intended to encourage development while safeguarding the environment, as well as lowering the daily distance that people must travel by automobile to promote low fossil fuel combustion (Akanmu et al. 2018).

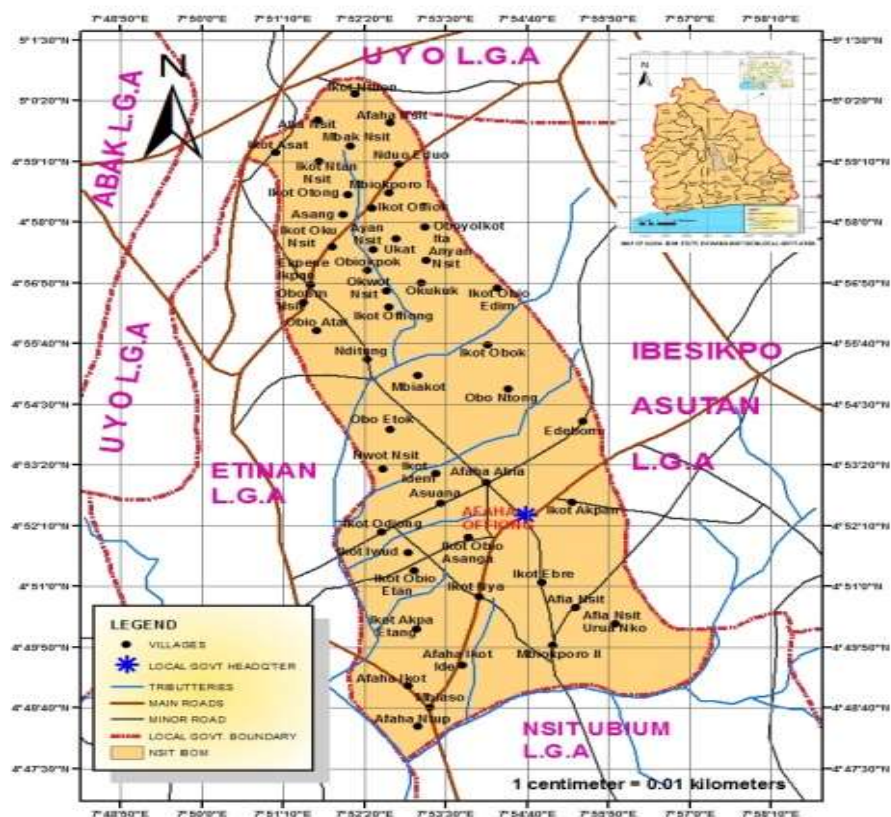
In order to make existing settlements appealing and livable enough to divert expansion away from rural areas, mixed land use, especially the protection of lands for leisure, conservation of natural resources, and open space, is the basis for the sustainable development idea. As a result, it can be seen that the smart growth idea aims to accommodate all land uses rather than to impede development (including agriculture and forested lands).

### **Study Area**

Nsit Ibom Local Government Area is a continuation or an extension of Nsit Clan which is acknowledged as the largest Ibibio Clan, but further splinters of western and eastern Nsit. The now Nsit Ibom is what was known as Western Nsit. Nsit Ibom is one of the Local Government Areas in Akwa Ibom State and it is located within the central axis of the State. It is located between Latitudes 4° 47'N and 5° 25'N and longitudes 7° 50' E and 7° 57'E (Etuk, 2021). Nsit Ibom is situated about 30km from Uyo the State Capital and has a land mass of about 140.6 square Km<sup>2</sup>. It shares boundaries with Ibesikpo Asutan, Etinan, Uyo and Nsit Ubium Local Government Areas.

According to the 1991 population figures from the National population commission (NPC) (1991). Nsit Ibom local government area has a total population of sixty three thousand five hundred and forty

three (63,543 persons) which comprises of both male and female.this figure when projected to the year 2022 is one hundred and fifty two thousand, seven hundred and sixty three (152,763) persons, using the geometric method with a growth rate of 2.87%. The Local Government Area has a total number of forty-seven (47) villages which are divided into 3 districts (Ndiya, Itreto and Ibia Akpan/Oboetim district). The people of Nsit Ibom engage much in trading and farming. Major farm produce in the area are yams, cocoyam, sweet yam, water yam, plantain, banana, and palm fruits. The products traded include palm oil, palm kernel palm wine, mats and cassava and illicit gin.



**Research Methodology**

This study adopts data from satellite imagery, questionnaire and direct observation of the study area. The satellite imagery for this study consists of Landsat Tm 1986 and Landsat 2020. These are acquired from the United State Geological Surveys (USGS). The study involves two major types of data, spatial and socio-economic data. The spatial data consists of imageries captured at different scales while the socio-economic data comprises information on the livelihood conditions of the people as well as factors driving the change in land use patterns. The variables and their definitions in this work depict the meaning needed for the study. 14 variables that influence the dynamics of land use were listed and respondents were asked to rate their level of influence on a Likert scale. Factor analysis was later used to reduce the number of related variables to a more manageable number. The population of Nsit Ibom was sixty-three thousand, five hundred and forty-three persons (63,543) by (NPC 1991), and a Projected population of one hundred and forty-six thousand, three hundred and twenty-two (146, 322) persons by 2022 using the geometric method. Using the Taro Yamane model, the sample size for the study area was determined as 399.

**Projected Population, Number of Heads of Household, Sample Size and Skipping Range**

S/N	Villages	Males (1991)	Females (1991)	Total (1991)	Projected 2022	Head of Household	Sample Size	Skipping Range
1	Ikot Ntuen	477	479	956	2201	367	6	61
2	AfahaNsit	146	145	291	670	112	2	56
3	AfiaNsit	505	518	1023	2356	393	6	65
4	Ikot Asat	395	405	800	1842	307	5	61
5	MbakNsit	178	146	324	746	124	2	62
6	NduoEduo	163	232	395	910	152	2	76
7	Ikot Otong	292	284	576	1327	221	4	55
8	Mbiokporo I	1,695	1728	3423	7884	1314	21	62
9	Ikot Oku Nsit	754	802	1556	3584	597	10	59
10	Ikot NtannNsit	702	603	1305	3006	501	8	62
11	EkpeneIkpan	722	717	1439	3314	552	9	61
12	Ikot Ukat	278	327	605	1393	232	4	58
13	Ikot Offiok	258	252	533	1227	205	3	68
14	Oboyo Ikot Ita	1496	1560	3056	7039	1173	19	61
15	ObotimNsit	1427	1478	2905	6691	1115	18	61
16	Obiokpok	797	806	1603	3662	615	10	61
17	Asang	307	342	649	1495	249	4	62
18	Okukuk	570	491	1061	2444	407	7	58
19	ObioAtai	964	977	1941	4470	745	12	62
20	Mbiakot	187	256	443	1020	170	3	56
21	Ikot ObioEdim	80	105	185	426	71	1	71
22	Ikot Obok	602	592	1194	2750	458	7	65
23	Obo Etok	615	715	1330	3063	511	8	63
24	Obo Ntong	733	789	1522	3505	584	10	58
25	Ikot Idem	457	537	994	2289	382	6	63
26	AnyamNsit	494	580	1074	2474	412	7	58
27	OkwotNsit	419	416	835	1923	321	5	64
28	Ikot Offiong	163	148	311	716	119	2	59
29	Nditung	132	147	279	643	107	2	53
30	NkwotAbia	337	343	680	1566	261	4	65
31	AfahaAbia	489	504	993	2287	381	6	76
32	Ikot ObioAsanga	414	452	866	1995	332	5	66
33	Ikot Idiong	113	106	219	504	84	1	84
34	Ikot Iwud	419	468	887	2042	340	6	56
35	Ikot Akpan 1	301	332	633	1458	243	4	60
36	Ikot Obio Etan	610	556	1166	2686	448	7	64
37	Edebom 1	2172	2429	4601	10597	1766	29	60
38	AfahaOffiong	2991	3252	6243	14379	2397	39	61
39	Ikot Ebre	423	424	847	1951	325	5	65
40	AfahaNsitUruaNko	1958	2048	4006	9227	1538	25	61
41	Mbiokporo II	1225	1444	2669	6147	1025	17	60
42	Ikot Nya	989	1042	2031	4678	780	13	60
43	Ikot Akpan Etang	263	268	531	1223	204	3	68
44	Afaha Ikot Ide	456	402	858	1976	329	5	65
45	Mbiaso	257	282	539	1214	202	3	67
46	Afaha Ikot	1077	1112	2189	5042	840	14	60
47	AfahaNtup	475	502	977	2250	375	6	59
				<b>63543</b>	<b>146322</b>	<b>24386</b>	<b>399</b>	

**Source: National Population Commission, 1991 and Field Survey (2023).**

## Findings of the Study

### a) Trend of Land use Change

The land use of the study area was characterized into four classes; forest, bush fallow, farmland and built up areas.

#### Classes of Land Uses in the Study Area.

Land Uses Classes	1986 (ha)	2020 (ha)	Magnitude of Change(ha)	Percentage Of Change (%)	Rate of change (ha/yr)	Nature of Change
Forest	2512.33	1102.72	1409.61	50.74	41.46	Reduction
Bush fallow	6992.43	7325.47	333.04	11.99	9.80	Expansion
Farmland	2961.64	3047.07	85.43	03.19	2.51	Expansion
Built Up	1428.84	2378.48	949.62	34.19	27.93	Expansion
Total	13895.2	13853.7	1368.09	100	81.7	

#### i. Forest Land Use Class

The forest category is made up of the relics of the high forest and the fragmented secondary forests scattered all over the study area. In 1986, the base year, forest covered a total land area of 2512.33 hectares, while that for 2020 was 1102.72 hectares. This indicates a declining trend within the 34 years under study. This however represents about 50% of the total change in land use in the area. The base year of 1986 coincides with the creation of the Akwa Ibom State in 1987. After this year, several LGAs were created including Nsit Ibom LGA thus bringing the government and perhaps development closer to this area. This is one of the explanations for the observed massive shrinking of forests in the area. Further findings from interviews and personal observation revealed that the change is due to increase in population resulting in greater need for land for agriculture, settlement, commerce, etc. as was observed around Afaha Offiong the Headquarters of the LGA. Another major change driver here has been infrastructure extension. For example, the road from Afaha Offiong through Ikot Edibom to Itreto in Nsit Ubium. This road was an earth road, largely unmotorable in 1986, but after construction in the early 2000s has attracted so much development leading to land use conversion. All over the area, such projects litter. Within the period of study, forest witnessed a reduction at the rate of 41.46 hectares per year. This is in line with the global trend of reduction in forest resources.

#### ii. Bush Fallow Land Use Class

In this study, findings indicate that bush fallow areas have experienced increases in many areas of occurrence. Thus in 1986, bush fallow covered 6992.43ha, while that in 2020 was 7325.47ha. In this regard, the magnitude of change was 333.04ha. This represents about 12% of the total change in the entire study area. With this figure, bush fallow experienced an expansion at the rate of 9.80ha per year. This expansion is understandable since forests in the area have actually shrunk. This means that part of the reduction in forests explained earlier is due to bush fallow which is an agricultural land use. Field findings indicate that the length of fallow in the area has actually reduced from about 10 to 15-year cycle in 1986 to about 3 to 5-year fallow cycle presently. Population pressure on land, large household sizes and natural processes of soil husbandry are largely the driving forces of change in this regard.

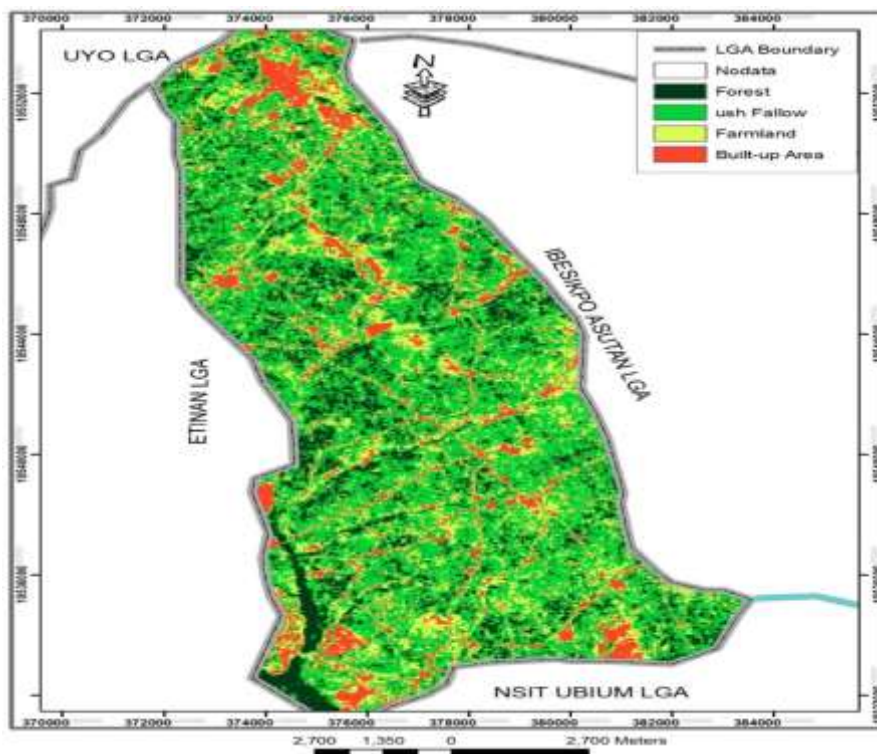
#### iii. Farmland Land Use Class

Within the period of study, there has been marginal expansion of 85.43ha in the area used as farmland. This is the most stable of all the land use classes. This is largely so since they are largely practice individual land tenure system. Since land is not in abundant supply in the area, there is an extent to which rural farmers in the area can practice agricultural extensification. As a way out, they increase the frequency of cultivation on a particular plot used. By so doing, this land use type witnessed 1 to 2 years of cultivation to continuous cropping. Compound farmland belongs to this category. Due to high frequency of use of this area, farm output per hectare of land has reduced

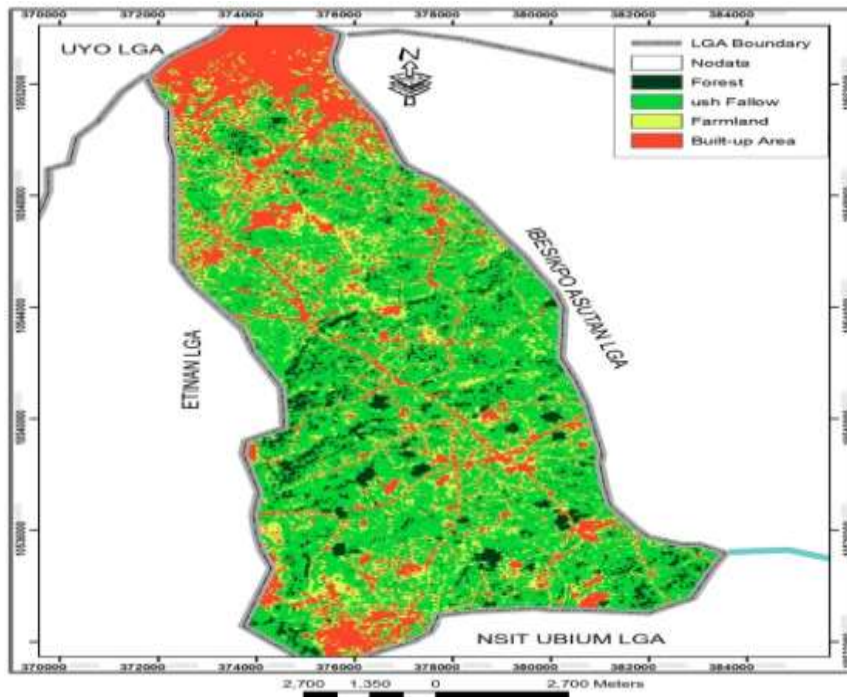
tremendously. With this, the area has no capacity to produce food enough for the population. This explains the reason the bulk of what is consumed like garri, yam, etc. is brought in from outside the LGA. Therefore, the rate of change is 2.51ha per year.

#### iv. Built-up Area

This land use pattern has shown an expansion of 949.62ha over the study period of 34 years. This implies that the built-up areas have been expanding at the rate of 27.93ha per year. Built-up land use represents about 34% of the total changes in the area. This is however not in doubt as developments are evident around Afaha Offiong and adjoining areas. Areas that were previously compound farmland, farmland, bush fallow and even forests have been converted to this land use. As said earlier, this is made possible by road construction, markets establishments, government offices, etc. With the way this land use is expanding, there is every indication that in another 34 years, this area will be mostly built-up. This development impetus is largely due to a reduction in the travel distance between settlements in this study area and major towns like Eket, Uyo, Ikot Edibon, Nung Udoe, Ikot Abasi. Many people residing here prefer to settle here while moving daily to neighbouring towns for business and work. Therefore, the wave of development which is felt across this study area has actually stimulated and induced expansion in the built environment, while at the same time speeding up the rate of reduction in agricultural land use.



Land Use map of Nsit Ibom (1986)  
Source: LandSat Imagery classification.



Land Use map of Nsit Ibom (2020).  
Source: Land Sat Imagery classification.

#### b) Determinants of Land Use Change in Nsit Ibom LGA

Factor analysis was employed here to assess the factors Land use change in the study area, this helped in collapsing a larger group of factors into smaller and representative ones. Consequently, fourteen (14) variables of land use change were reduced into three significant variables as discussed below.

- i) The first factor loaded significantly on 6 variables. Using the highest loadings for its naming **physical development/ household size factor** has been given as the name of the first factor. It accounted for 45.308 % of the total variance and indicates significantly positive in 13 communities with a highest factor loadings in Ikot Offiong (2.404092), followed by Ikot Akpa Etan (2.287571), Afaha Ikot Ide (1.551427), Obotime Nsit (1.386918), Asang (1.260397), Ikot Ntann Nsit (1.077993), Oboyo Ikot Ita( 1.063114), Mbiokporo 1(0.928221), Mbiakot (0.829975), Ikot Otong (0.714441), Afia Nsit (0.754529), Afaha Ikot (0.69713), and Afaha Nsit (0.578153). The lowest loading is in Ikot Obio Edim(-1.0316)and Ikot Obio Etan(-1.1282).
- ii) Factor 2 loaded significantly on 3 variables, X1- Rainfall - . 747, X13- environmental problems - . 799, X14-fallow land - . 884. This second factor is named **fallow land/ environmental factor** and it accounted for 11.006% of the total variance, and loaded positively in 11 communities with the highest loadings in Ikot Idiong (2.327811), Afia Nsit Urua Nko (1.844132), Mbak Nsit (1.72115), Afia Nsit(1.684389), Ikot Ntann Nsit (1.489753), Afaha Nsit (1.132592), Okukuk (0.882682), Ikot Offiong (1.075728), Ikot Asat (0.761055), Ikot Obok (0.682461), Asang (0.591894). The lowest loadings were in Oboetuk(-0.1664), Ikot Ebre (-0.02476), Afaha Ikot(-0.03875) and Afaha Offiong(-0.4007).



- a) Factor 3 loaded positively on 3 variables. X2- temperature - .672, X5- arts and culture - .641, X8- physical structure - .808. It accounted for 9.746% of the total variance. Since it loaded on weather conditions that affect land uses it is named **physical conditions factor**. Physical condition factor loaded in 15 communities. The highest loadings are in Ikot Obio Edim (1.922459), Ikot Asat (1.296621), Ikat Ukat (1.292334), Ikot Idiong (1.113665) and Nditung (1.025493), Others above 0.5 include Mbiakot (0.682933), Asang (0.657717), Mbiaso (0.618849), Obio Atai (0.935521), , Ikot Ntann Nsit (0.900743), Ikot Ofiok (0.797028), NkwotAbia (0.567507), Oboyo Ikot Ita (0.77601), Ikot Iwud (0.987186), Ikot Nteun (0.747343). The lowest loadings are: Ikot Idem (-0.02915), Okukuk (-0.0915), Ikot Obio Asanga (-0.8602), Ekpene Ikpan (-1.00601).

## Discussion of Findings.

### i. Trend of Land Use Change

Four major classes of land use have been characterized for the study area, these are: - Forest, bush fallow, farmland and built-up classes of land use pattern. From 1986 finding shows that forest cover in the study area was 2512.33(ha) and has experience a reduction as showed by its areal extent 1102.72(ha) in 2020 at a fast rate of 41.46ha/year. This reduction in the areal extent of the forest became a gain to other classes of land use. Bush fallow as at 1986 was 6.992.43 and in 2020 expansion shows 7325.47(ha), this shows an expansion at the rate of 9.80(ha/year) summing up 11.99%. Fallow land was 2961.64ha in 1986 but in 2020 it areal extent was 3047.08ha. This is an expansion at the rate of 2.51ha/year making up 03.19% of the change in the land use. Built up area was 1428.84ha in 1986 however in 2020 its areal extent was 2378.48ha, showing an expansion at the rate of 27.93ha/year summing up at 34.19% of changes. This means that housing development, road construction and siting of facilities like schools, hospitals and markets have been on an increase. The expansion of this land use is at the expense of the other ones especially cultivated farmlands and thick forest.

Roy and Arijit 2010 highlighted more on this that increase in human population has affected the land resources which gives rise to land uses that differ in purpose and types, be it production, shelter provision, recreation, extraction and processing of materials All these are conversion of land use from one class to another and these have been triggered by increase in population which has resulted in a greater need for a better living (Meyers, 1980). Even as these conversion are ongoing and on a daily basis things are still lacking, surplus food production to cater for the teeming population, findings reveals that insufficient land for massive production and proper capacity building in the agricultural sector has made the fallow period to be reduced, leading to intensification of land use without time for these agricultural lands to replenish. This leads to severe food shortage, diminishing crop yield and high cost of living. The declining forest land use is worrisome because forestry belongs to an important sector of the economy known as the primary production which is concern with the production of food for the growing population, fibre for clothing and timber for housing.

### ii. Factors responsible for changes in land use pattern

Findings has shown that though there are many factors that are responsible for changes in land use pattern, in the study area, though not all might have been considered in the cause of this study. Fourteen variables were listed out and consider to be tested on their perceived effect on land use change. Three groups of variables were shown to be significant in the changes in land use pattern; physical development and household size; rainfall, environmental problems and fallow land; and temperature, arts and culture and physical structure. Collapsing all the factors analyzed earlier, it is safe to discuss these drivers under the sub themes of climate change, demographic characteristics, urbanization, culture and Agricultural practices. Due to the loadings of temperature, rainfall and environment problems like pollution and flooding, it could be seen that climate change is evident in the area, hence there is urgent need for control of pollution levels and deforestation. Demographics characteristics epitomized by the loading of family size had significant effect on land use change, there is urgent need for population control and decentralization of facilities to discourage rural-urban migration. On the loadings of urbanization agents( physical development and physical structures), there is need for proper development plans to be drawn up and used in development control, to ensure that buildings are not built on flood plains and that forest resources are conserved. Best agricultural

practices should be embraced by farmers and incentives should be given by the local government to farmers, this could come as a form of subsidized farm inputs, or provision of better storage facilities and rehabilitation of local markets and the road leading thereto.

### Conclusion

Nsit Ibom has recorded significant changes in the pattern of land use as a result of the various activities exerted by man for their means of livelihood. The main land use categories in the area include forest, bush fallow, farmland and built-up. Over the years, a change detection analysis using GIS shows variations in land use for the past 34 years. For instance, the forest which made up of relics of the high forest and the fragmented secondary forests covered a total land area of 2512.33 hectares in 1986 while it reduces to 102.72 hectares in 2020. Bush fallow on the other hand experienced increases in many areas of occurrence, increasing from 6992.43 hectares in 1986 to 7325.47 hectares in 2020 with an increase of 333.04 hectares. Farmland experiences a marginal expansion of 85.43ha in the area within the period of 34 years under study, likewise built-up area which also recorded an expansion of 949.62ha over the study period of 34 years. This implies that the built-up areas have been expanding at the rate of 27.93ha per year and thus represents about 34% of the total changes in the area.

There are several determinants of changes in land use pattern in Nsit Ibom, these include: Rainfall, Temperature, Land availability, Custom and Beliefs, Arts and culture, Technology, Academic attainment, Physical structure, Household size, Level of income, Infrastructural facilities, Availability of markets, Environmental problems and Fallow land. There have been significant changes in the effect of each of determining factors, these factors were collapsed into three classes using factor analysis, hence the determinants were named as follows; first, the physical development /Household Size Factor which include technology, academic attainment, household size infrastructural facilities and availability of market accounted for 45.308 % of the total variances. The second determinant factor was named as Fallow Land/ Environmental Factor which include Rainfall, environmental problems and fallow land and accounted for 11.006% of the total variance. The third factor was named the Physical Conditions Factor includes temperature and physical structure and it accounted for 9.746% of the total variance.

Based on findings from this study, the following recommendations are made:

1. Enactment of bye laws by the local administration and partnering with Area planning Authorities to ensure the proper management and sustainable use of land resources.
2. Discouraging unnecessary deforestation as this tilts the balance of the ecosystem.

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## Appendix

### Drivers of land use change (14 Variables )

S/N	Variables	Definitions	Score 1- 5
X1	Rain fall	The amount of rainfall in an area, at a given period.	score
X2	Temperature	This refers to the amount of hotness or cold of a place at a given time	Score
X3	Land availability	The total plots of land available for usage	Score
X4	Custom and Beliefs	This refer to the types of religion in a community	Score
X5	Arts and culture	This has to do with the expression of ideas and skills that enhances livelihood and makes them different from others	Score
X6	Technology	This refers to the facilities use in the practice of agriculture in a community.	Score
X7	Academic attainment	This has to do with the level of educational attained.	Score
X8	Physical structure	This has to do with the qualities and styles of the structures constructed for shelter in a community.	Score
X9	Household size	The size of a family or household.	Score
X10	Level of income	The amount of income earned by head of household.	Score
X11	Infrastructural facilities	Facilities available in a community that brings about development and makes life easier.	Score
X12	Availability markets	A place for the exchange of goods and services.	Score
X13	Environmental problems	Environmental problems that affects the land	Score
X14	Fallow land	Land set aside for a certain period of time to regain the lost nutrient.	Score

Score= 1 - Strongly Agreed, 2 – Agreed, 3 – Not Certain, 4 – Disagreed, 5 – Strongly Disagreed

**Scores for Drivers of land use change .**

Village Names C	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14
IkotAkpan I	2.2	2.0	2.7	3.0	3.2	2.7	3.5	4.7	3.2	4.5	3.5	3.0	2.2	1.5
Nditung	5.0	3.0	3.0	3.5	3.5	4.0	3.5	5.0	5.0	4.0	3.0	2.0	2.0	3.0
IkotOffiong	4.5	1.5	4.0	4.5	2.5	3.0	4.5	2.0	5.0	5.0	4.5	5.0	4.5	4.0
Mbiakot	1.0	2.3	4.3	3.6	3.0	2.6	3.6	5.0	3.6	3.3	5.0	3.3	2.3	1.0
Asang	3.7	4.0	3.7	4.2	4.0	3.5	4.5	4.2	4.0	4.5	4.7	4.5	4.2	3.7
Ikot Idem	3.1	3.0	3.6	2.8	2.0	1.8	3.1	4.5	1.6	3.3	3.8	2.1	2.6	3.0
Edebom I	2.8	2.3	2.6	2.7	2.0	2.2	2.9	3.7	2.9	2.0	2.5	3.0	2.4	2.7
Afahalkot	2.5	2.8	3.8	3.7	3.8	3.9	3.1	3.9	3.8	4.2	3.7	3.8	3.0	3.0
AfahaNtup	3.8	3.3	3.6	3.1	2.6	2.3	3.8	4.5	2.8	3.1	3.1	3.3	2.3	2.6
AfahaAbia	2.5	2.6	2.8	2.6	2.6	1.0	3.0	3.8	3.3	3.3	3.0	3.0	3.0	3.8
Mbiaso	2.3	2.3	4.0	3.6	3.0	2.3	3.3	4.3	3.0	2.6	2.0	3.3	4.0	1.0
Afahalkot Ide	2.4	2.4	2.4	3.0	3.2	4.6	4.4	4.0	3.4	3.0	4.2	3.4	1.2	1.6
IkotEbre	3.0	2.8	4.2	4.2	3.6	3.0	3.8	4.2	3.8	3.6	3.4	3.8	2.4	4.0
IkotObioEtan	2.5	4.5	3.0	2.5	2.2	3.0	3.7	3.8	3.7	4.0	4.0	3.7	3.8	3.0
AfiaNsitUruaNko	4.4	4.1	4.6	3.7	3.1	2.3	3.1	4.1	4.1	3.9	4.3	3.7	4.1	4.5
ObioAtai	2.8	3.4	3.3	2.7	3.6	2.7	2.9	3.9	3.1	2.2	2.2	2.4	2.8	2.5
Mbiokporo	2.9	2.7	3.6	3.4	2.7	2.8	3.5	3.7	3.9	3.9	4.0	3.7	2.7	3.8
Ikot Nya	2.8	2.9	3.7	3.4	2.7	2.7	3.1	3.7	3.5	3.9	3.4	3.2	2.9	3.3
IkotIdiong	5.0	5.0	5.0	5.0	3.0	5.0	3.0	4.0	3.0	5.0	4.0	4.0	4.0	5.0
IkotObioEdim	3.0	4.0	4.0	3.0	3.0	3.0	4.0	5.0	2.0	3.0	2.0	4.0	3.0	2.0
IkotNtannNsit	4.5	4.5	5.0	4.6	3.8	3.8	4.3	4.1	4.6	4.3	4.5	4.8	4.3	4.5
Ikot Oku Nsit	3.5	3.5	3.2	3.3	3.6	2.7	3.3	3.3	3.0	3.2	2.7	2.2	3.7	3.0
IkotObok	4.0	3.4	3.4	4.1	2.5	2.7	3.1	3.7	4.2	3.4	3.2	3.2	3.1	3.5
AnyanNsit	2.8	2.4	4.2	3.2	2.0	3.4	2.2	3.5	3.0	3.1	2.4	2.8	2.1	2.1
IkotUkat	1.7	3.2	3.7	3.0	3.5	3.5	3.7	4.0	2.7	1.5	2.5	3.0	3.2	2.5
AfahaOffiong	3.1	3.1	3.5	3.1	2.8	2.8	3.4	4.2	2.9	3.0	2.8	3.3	2.5	2.5
IkotObioAsanga	3.2	3.2	3.0	2.2	3.0	2.2	3.7	3.0	3.0	3.5	3.2	2.7	4.0	3.2
Okukuk	4.4	3.1	4.0	3.7	3.4	3.0	3.4	3.4	3.2	3.5	3.4	2.8	3.4	4.0
IkotOffiok	2.7	2.7	3.7	3.3	2.7	2.7	3.0	4.7	2.0	2.3	2.3	3.3	3.0	3.7
NkwotAbia	2.7	4.2	4.0	3.0	2.7	2.7	4.5	4.7	4.2	4.7	3.0	3.5	3.0	4.0
Obo Ntong	3.7	2.8	3.0	3.6	3.0	3.0	4.5	4.2	2.5	3.3	3.1	3.6	2.5	3.8
OkwotNsit	3.2	3.2	4.2	3.8	3.4	3.0	3.8	3.8	3.4	2.8	2.8	3.4	3.2	4.2
Ekpenelkpan	3.0	2.1	3.1	3.1	2.4	3.3	3.2	3.3	4.0	2.6	3.3	3.8	2.5	2.5
IkotAkpanEtan	3.0	1.6	3.6	3.6	3.0	5.0	4.6	4.3	5.0	4.0	3.3	4.0	2.0	2.3
Obiokpok	3.2	2.7	2.7	3.7	2.7	1.7	4.0	3.2	3.2	2.0	2.7	3.7	2.7	2.7
OboyoIkotIta	3.0	3.6	4.2	4.0	4.0	3.5	4.3	3.6	3.4	3.5	3.9	4.7	2.6	2.9
IkotIwud	3.0	3.0	4.0	3.5	3.3	4.0	3.3	4.1	4.0	3.1	2.1	2.5	2.8	2.6
ObotimNsit	2.7	2.1	4.2	3.5	3.2	3.2	4.5	2.1	3.2	3.8	3.8	3.8	2.8	2.1
Oboetuk	2.6	2.4	2.8	2.4	2.2	2.0	3.0	3.2	2.8	3.6	4.0	2.8	2.5	3.0
IkotNtuen	3.8	3.3	4.0	3.0	3.5	3.3	3.8	4.3	4.1	2.3	3.8	3.8	4.0	3.1
AfahaNsit	5.0	3.0	4.5	3.5	3.0	4.5	4.0	4.5	4.0	4.0	4.0	4.0	5.0	4.0
AfiaNsit	5.3	3.3	4.6	4.6	3.6	3.0	4.0	4.1	4.3	4.3	4.5	4.1	4.5	4.5
IkotAsat	4.5	3.7	4.5	4.0	4.0	3.2	3.7	4.7	3.2	4.2	4.0	5.0	3.7	3.2
MbakNsit	3.5	2.0	4.0	3.5	2.0	2.0	3.0	3.5	3.0	5.0	3.0	4.0	4.0	5.0
NduoEduo	0.7	0.8	1.5	1.3	1.3	1.0	1.3	1.7	1.2	0.7	0.7	1.0	0.7	0.8
IkotOtong	3.5	3.3	3.8	3.0	3.3	2.5	4.5	3.0	4.3	3.8	3.8	3.0	3.3	3.0
Mbiokporo 1	4.3	3.7	2.0	3.7	3.2	3.9	4.1	3.8	4.2	3.7	3.9	4.4	4.4	3.7

**Factor scores for the determinants of changing land use pattern in Nsit Ibom LGA.**

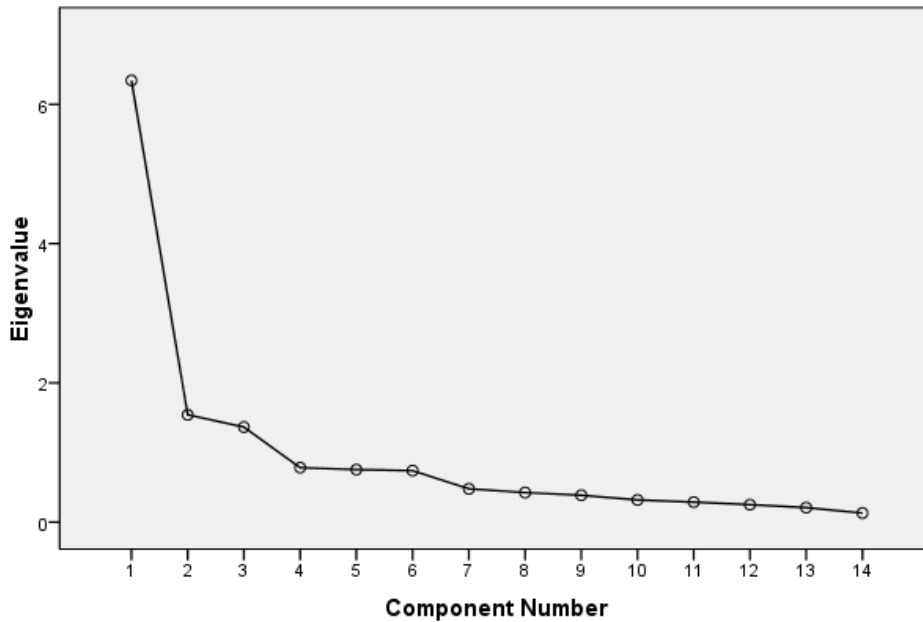
S/N	villages	Physical development/ household size factor.	Fallow land/environmental size factor	Physical conditions factor
1	Ikot Akpan I	0.467289	-1.49854	0.122318
2	Nditung	0.403924	-0.57634	1.025493
3	Ikot Offiong	2.404092	1.075728	-3.05454
4	Mbiakot	0.829975	-1.66974	0.682933
5	Asang	1.260397	0.591894	0.657717
6	Ikot Idem	-1.65233	0.321849	-0.02915
7	Edebom I	-1.04532	-0.52296	-0.80611
8	Afaha Ikot	0.69713	-0.3875	0.394407
9	Afaha Ntup	-0.61542	-0.15521	0.48825
10	Afaha Abia	-0.93178	0.320615	-1.12664
11	Mbiaso	-0.63984	-0.66829	0.618849
12	Afaha Ikot Ide	1.551427	-2.44398	0.330592
13	Ikot Ebre	0.487483	-0.02476	0.491332
14	Ikot Obio Etan	-0.1282	0.336259	-0.33892
15	Afia Nsit Urua Nko	-0.4434	1.844132	0.100324
16	Obio Atai	-1.23194	-0.50131	0.935521
17	Mbiokporo	0.449114	0.116097	-0.77986
18	Ikot Nya	-0.20504	0.190644	-0.45961
19	Ikot Idiong	-0.28567	2.327811	1.113665
20	Ikot Obio Edim	-1.0316	-0.35386	1.922459
21	Ikot Ntann Nsit	1.077993	1.489753	0.900743
22	Ikot Oku Nsit	-0.86178	0.319006	0.222467
23	Ikot Obok	-0.2322	0.682461	-0.45052
24	Anyan Nsit	-0.90426	-0.38479	-0.31912
25	Ikot Ukat	-0.67205	-0.97152	1.292334
26	Afaha Offiong	-0.5719	-0.4007	0.453657
27	Ikot Obio Asanga	-0.6261	0.377462	-0.8602
28	Okukuk	-0.37966	0.882682	-0.05829
29	Ikot Offiok	-1.52593	0.154481	0.797028
30	Nkwot Abia	0.059539	0.358784	0.567507
31	Obo Ntong	0.058061	-0.16367	0.209321
32	Okwot Nsit	-0.30384	0.424706	0.491709
33	Ekpene Ikpan	0.463329	-0.77028	-1.00601
34	Ikot Akpan Etan	2.287571	-1.81784	0.056389
35	Obiokpok	-0.16126	-0.36549	-0.78781
36	Oboyo Ikot Ita	1.063114	-0.38483	0.77601
37	Ikot Iwud	-0.22289	-0.59304	0.987186
38	Obotim Nsit	1.386918	-0.74853	-1.25058
39	Oboetuk	-0.46988	-0.1664	-1.56113
40	Ikot Ntuen	0.154323	0.091246	0.747343
41	Afaha Nsit	0.578153	1.132592	0.419874
42	Afia Nsit	0.754529	1.684389	0.083541
43	Ikot Asat	0.393641	0.761055	1.296621
44	Mbak Nsit	-0.54144	1.72115	-1.82143
45	Nduo Eduo	-2.78693	-2.09406	-2.53164
46	Ikot Otong	0.714441	0.01353	-0.65089
47	Mbiokporo 1	0.928221	0.445312	-0.29313

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.343	45.308	45.308	6.343	45.308	45.308	3.660	26.146	26.146
2	1.541	11.006	56.314	1.541	11.006	56.314	3.555	25.393	51.539
3	1.364	9.746	66.060	1.364	9.746	66.060	2.033	14.521	66.060
4	.782	5.586	71.646						
5	.754	5.385	77.031						
6	.738	5.275	82.306						
7	.477	3.410	85.716						
8	.424	3.027	88.742						
9	.385	2.753	91.495						
10	.317	2.267	93.763						
11	.287	2.047	95.810						
12	.250	1.784	97.594						
13	.207	1.481	99.075						
14	.129	.925	100.000						

Extraction Method: Principal Component Analysis.

Scree Plot



## **MODELLING THE EFFECT OF COUNTERPRODUCTIVE WORK BEHAVIOURS OF CONSTRUCTION CRAFTSMEN ON ORGANISATIONAL PERFORMANCE REDUCTION IN NIGERIA.**

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### **ABSTRACT**

*This study has attempted to model the causes and effect of counterproductive work behaviours of construction craftsmen on the reduction of organisational performance, with a view to enhancing project delivery through better organizational reputation, increased productivity, better costs, time and quality performance of construction organisations in Nigeria. Data for the study were collected from 256 construction organisations representatives selected using stratified purposive sampling techniques from Abuja, Lagos and Port Harcourt. The relationships and hypothesis proposed in the conceptual framework were tested using structural equation modeling (SEM). The finding of the study shows that the identified factors have positive relationship with exhibition of counterproductive work behaviours by construction craftsmen. Another finding from the study is that a positive relationship exists between exhibition of counterproductive work behaviours of construction craftsmen and the reduction of construction organisations' performance in terms of time, cost, quality and productivity, while an indirect positive relationship also exists between the identified influencing factors and the construction organisations' performance. It is therefore recommended that managers of construction organizations should adopt strategies and processes to reduce, manage or prevent deviant behaviours by craftsmen at construction workplaces. It is also recommended that construction organisations should not undermine the management and control of causes of counterproductive workplace behaviour by craftsmen, so as to remain sustainable, competitive and survive in the construction industry.*

**Keywords:** *Construction craftsmen, construction organisations, counter productivity organizational performance, work behaviours.*

### **INTRODUCTION**

Nigeria is one of the countries seriously plagued with poor quality and quantity of infrastructure Obiadi, Irouke, Ezezue and Nzewi (2017). Ofori (2018) noted the pressing need to substantially increase the capacity, capabilities and performance of the construction industries in the developing countries. Capacity improvement involves the efforts to improve the skill and competence of workers especially the craftsmen who play a very crucial role to the survival and growth of the construction industry.

Dalyop, Bogda, Okwoli, and Dassah (2017) opined that craftsmen are those workers who make things skilfully (skilled workers), and are mostly engaged in the practical realization of construction projects. They include brick layers (Masons), iron benders, carpenters, plumbers, electricians among others. They work either in client, contracting or consultancy organizations, and these organizations constitute the triumvirates of construction project management in the construction industry.

Zannah, Latiffi, Raji, Waziri, and Mohammed (2017) opined that the low level of skilled workers' performance has been seen as a major contributory factor to the inefficient productivity in construction projects delivery in many developing countries. The study attributed the low productivity and poor performance of skilled workers' productivity to economic, social, physical and psychological related factors.

An aspect of the social factors according to Tiarapuspa, Indyastuti and Sari (2018) is the counterproductive behaviour of the organization and its members. The counterproductive work behaviour (CWB) is also referred to as workplace deviant behaviour (WDB) (Liu, Wang, Zhao, Xia and Guo, 2020).

Tiarapuspa, Indyastuti and Sari (2018) identified the various kinds of counterproductive work behaviours to include delays, theft, sabotage, and evil in both verbal and physical forms (aggression, violence and others) as well as alcohol use, substance abuse, and absenteeism (Zahid, 2019). It was



opined that the key characteristic of counterproductive behaviour is that, the action must have a purpose and not usually by accident. That is, a person must have malicious intent and can take the form of deliberately damaging company's property, counterproductive behaviour, workplace deviance, and aggression at work, antisocial behaviour, retaliation and violence among others.

Szostek (2017) and Szostek (2018) corroborated that counterproductive behaviour are referred to as bad, negative, pathological, dysfunctional, retaliate or unethical. Noting that the common major common characteristic of such behaviours is that they infringe on rules and norms of an organization or make it impossible to reach organisational goals. Zoster (2018) also observed that, counterproductive behaviours comprised a collection of some activities characterized by voluntariness (contrary to accidental or forced activities) that are or may be detrimental to an organization or various groups of its stakeholders. It also noted that the behaviours can be of various significance, starting from petty misconduct (such as gossiping, theft of corporate pens) and ending with serious offences (such as verbal/physical aggression aimed at a colleague, sexual harassment or swindling). The study also opined that counterproductive behaviours result from internal (personality) and external/contextual conditions (such as organisational culture, environment, social permission) relating to a worker, stating that the negative consequences of the behaviours may affect a worker or organisation itself and, thus, also affect economies and societies. Zahid (2019) also substantiated that counterproductive work behaviours (CWB) are commonly known phenomena in organizational life because of their deleterious effects in the form of potential harm to organisational reputation, increased turnover, ramification costs and property loss. Liu, Wang and Xia (2016) stated that construction workers' workplace deviant behaviour (WDB) has significant impact on project success, and this impact is higher in construction project because of its one-off nature and uncontrollability. Liu *et al.* (2020) also observed that unlike the general management setting, a construction project is characterised by its labour-intensive and project-oriented nature, leading to a much more complex environment, which introduces difficulty in controlling WDB.

Although, Prabhu and Ambika (2013) had observed that many researches have been carried out on worker productivity enhancement, yet a deeper understanding is still needed on workers counterproductive behaviour in construction industry. In corroboration Liu *et al.* (2020) observed that, despite the fact that WDB among construction workers can pose serious dangers to the success of construction projects, academic research on it remains limited. The study further submitted that the lack of a theoretical explanation of its occurrence has also hindered its preventive management.

Braje, Aleksic and Jelavic (2020) also submitted that, although, various personality, situational and organizational factors have been analysed as instigators of workplace deviant behaviour, literature calls for a more comprehensive approach that analyses interaction and mutual effects of different sources of deviant behaviour.

Construction craftsmen who are mostly involved in carrying out the manual labour have been associated with poor image and referred to as people with less intelligence, in order to survive, artisans resort to strategies such as doubling their productivity, cheating and other behaviours which can be counterproductive (Jekwu, Audu and Oguegbe, 2016), but considering the assertion by Bilau *et al.* (2015) that skilled craftsman can help to raise productivity, reduce accident, lessen supervision, increase organization stability and flexibility when properly managed, this study aims at modelling the causes and effect of counterproductive workplace behaviours of construction craftsmen on the reduction of organisational performance, with a view to enhancing project delivery through better organisational reputation, increased productivity, better costs, time and quality performance of construction organisations in Nigeria.

## **LITERATURE REVIEW**

This section covered the empirical review of the influence of some factors on the counterproductive behaviour as well as the relationship between counterproductive behaviour and performance of construction organisations.

### **Empirical studies on Factors affecting counterproductive work behaviour**

Liu, Wang, and Xia (2016) examined how psychological ownership affects construction workers' WDB in the context of construction industry, especially the effect degree of each dimension. Questionnaires were sent out to construction workers with more than five years of working experience. Data shows that, although varies in level of effect, four dimensions of psychological ownership, that is, territoriality, accountability, sense of belongingness and self-identity, are negatively related to WDB, while self-efficacy has no influence. The study established that construction workers' workplace deviant behaviours (WDB) have significant impact on project success even though existing researches on its occurrence mechanism are mainly focused on personal and organizational factors.

Waseem (2016) examined the extent of organizational and interpersonal deviance at a private sector firm in Pakistan, in which a sample of 50 employees were asked to rate deviant workplace behaviours and some influencing variables. Instruments used were questionnaire and interview of senior managers. The study identified some deviant behaviours which included stress, violence, sexual harassment, employee hostility and organizational injustice. The influencing variables included leader mistreatment, employee hostility, organizational sabotage, intention to quit, and political and production deviance. The study found that a significant relationship exists between workplace deviance and most of these variables and recommended the examination of steps to lower workplace deviance among employees, provide them with safer and better work environments, and increase job satisfaction.

Tahir, Baloch and Shujaat (2018) investigated the factors influencing counterproductive work behaviour in Pakistani organisations. The paper focused on the prevalence of interpersonal workplace aggression (IWA), organisational citizenship behaviours (OCBs) and counterproductive work behaviours (CWBs) among employees in Pakistani organisations. Interpersonal workplace aggression, organisational citizenship behaviours and counterproductive work behaviours were measured through adopted instruments, after establishing the validity of measures. Data was collected by administering close-ended questionnaires to a sample of 123 respondents from private sector organisations in Pakistan, selected through convenience sampling. Descriptive statistics, correlation and multiple regressions statistical tools were used. The results indicated significant positive relationship between IWA and counterproductive work behaviours, whereas, significant negative relationship was found between organisational citizenship behaviours and counterproductive work behaviours.

Wang, Chen and Li (2018) explored the key factors affecting deviant workplace behaviours based on various dimensions such as organizational deviance, interpersonal deviance, leader-member exchange, and corporate culture. The multiple-criteria decision-making analysis method was applied and dimensions developed based on scale factors devised in previous literature. The opinions of experts from industry, the government, and academia were examined. The affecting factors were then weighed and ordered according to their importance. According to the research results, among the key factors affecting deviant workplace behaviour, the organizational deviance variable of production deviance has the most significant impact on organizational development. The second most significant factor was anti-organizational behaviour, a variable of interpersonal deviance, followed by members' behaviour and attribution, a leader-member exchange variable. The study advised organisations to formulate rules that prohibit organizational deviance, while building a supportive organizational culture and enhancing positivity in the workplace to reduce deviant behaviour.

### **Various identified factors affecting counter productive workplace behaviour**

Martinko and Gundlach (2002) identified situational variables which cause CWB to include; inflexible policies, competitive environment, leadership style, hard rules and regulation, hard economic conditions, poor reward system, adverse working condition, task difficulty, home and family life, organizational culture, lack of ability and prior outcomes. The study also identified individual difference variables which have relationship with the various forms of counterproductive behaviour. They include; gender, emotional stability, negative affectivity, integrity, attribution style, core self-evaluation, locus of control, self-esteem, self-efficacy, and situation/environment.

Karthikeyan and Thomas (2017) identified lack of self-regulation and self-control, lack of monitoring by the leader, lack of perceived ownership and age of workers.

Zahid (2019) found that individual variation in perpetrating the CWB largely depends on factors classified into personality traits, organizational politics, political skill, influence tactics, and power. Others are; negative work experiences or events, workload, role ambiguity, role conflict, interpersonal conflict, organizational constraints and workplace incivility.

Akinsola and Alarape (2019) found that organisational politics, organizational justice and leader-member relationship jointly predicted dimensions of CWB significantly among local government workers in Ibadan. Braje, Aleksic and Jelavic (2020) identified demographic factors influencing workplace deviance behaviour to include; age, gender, education and tenure. Personality trait include; extraversion, agreeableness, conscientiousness, neuroticism and openness. Other individual-related factors are mental health, differences in attitudes, perceptions, motives, values, unethical attitudes, deviation in moral philosophy, and low level of general trust of the individual. Organisational culture features are; clan, adhocracy, market and hierarchy.

### **Empirical studies on Counterproductive work behaviour and organisational performance**

Rahman, Karan and Ferdausy (2013) examined the relationships between the typology of deviant workplace behaviour (such as, production deviance, property deviance, political deviance, and personal aggression) and job performance. Deviant workplace behaviour was measured by the Multidimensional Scale while job performance was assessed by Tsui *et al.*'s Job Performance Scale. Data for this study were collected from 201 employed MBA students studying at four private universities in Chittagong, a port city of Bangladesh, who were asked to rate their supervisors' deviant workplace behaviour and job performance with the help of self-administered questionnaires. The study used convenience sampling technique to collect data which were analysed using descriptive statistics, bivariate correlation, and regression analysis. Results indicated a negative correlation between the typology of deviant workplace behaviour and job performance. The study stated that the implication of the study was that, the existence of deviant workplace behaviour is a prior indication of poor job performance, therefore preventive measures is necessary.

Adeyeye (2014) investigated the effect of workplace deviance on employee performance with a focus on Unilever Manufacturing, Nigeria Plc. Lagos, Nigeria. The objective of the study was to determine whether organizational deviance and interpersonal deviance jointly affect employee performance and also to ascertain the association between workplace deviance behaviour variable and employee performance. The study employed survey research, while primary data for the study were sourced with questionnaire as research instrument. The respondents were two hundred and twenty employees of Unilever Manufacturing, Nigeria Plc. The study postulated six hypotheses which were tested using multiple regression and Pearson's Correlation. The finding revealed that organisational deviance and interpersonal deviance jointly and individually predict employee performance, with strong association between workplace deviance behaviour variables adopted and business performance.

Akikibofori and Akikibofori (2014) established the prevalence of production, property and personal deviance at the workplace and the impact they have on organisational performance. Stratified random sampling was employed to sample 60 respondents with 8 being the immediate bosses (management) and the rest were the secretaries. Robinson and Bennets' typology of workplace deviance was used and speculated that the factors contributing to workplace deviance range from interpersonal factors, organizational justice and work place environment. Findings revealed that indeed workplace deviance through its various forms was obvious in work places. It established the two most common deviance behaviour are production and property deviance through leaving early or coming to work, misuse of company property, use of stationery on personal matters and verbal abuse were common judging from the response. The research concluded that workplace deviance is not a phenomenon to be underestimated as it impacts negatively on both the organization total output and the individual employee's moral and motivation. The study recommended that management should be involved and set the tone in supporting ethics programmes to improve organizational culture and conduct of workers in the workplace. Though the study was not carried out in the construction industry.

Roopa, Nanjundeswaraswamy, and Swamy (2016) investigated the counterproductive work behaviour of nurses in 13 hospitals in Bengaluru. The components of counterproductive work behaviour were evaluated using a questionnaire in a sample size of 143 nurses. The existence of CWBs such as abuse against others, withdrawal behaviours, lateness among others in an organization, can harm organizations or people in organization including employees and clients, customers or patients. The study found that abusing others is the predominant behaviour shown by employees. It was concluded that counterproductive work behaviours have a major negative effect on organisations and their employees. The research also reveals that the age, experience, gender, salary does not show in any significance. The study was not also carried out among workers in the construction industry.

Liu *et al.* (2020) noted that the success of construction projects is largely influenced by the significant costs incurred by workplace deviant behaviour (WDB). Hence it is better to understand how WDB occurs among workers for its preventive management. The paper invoked social exchange theory, to clarify how WDB among construction workers can be predicted by leader–member exchange (LMX) and leader–member *guanxi* (LMG). Data were gathered from 153 workers and 17 supervisors in 17 construction projects. The results show that LMX and LMG are negatively related to WDB. LMG moderates the relationship between LMX and WDB: The negative relationship between LMX and WDB is stronger when LMG has higher quality. It was recommended that Managers of construction projects should benefit from the novel explanation offered here of the occurrence of WDB among workers and apply the suggestions on controlling it in advance made in the study.

#### **Various counter productive workplace behaviour identified**

Martinko and Gundlach (2002) identified retaliatory counterproductive behaviours of workers to include; aggression, violence, sabotage, terrorism, stealing, fraud, vandalism and harassment. The self-destructive counterproductive behaviours of workers are; drug use, alcohol use, absenteeism, depression, passivity, dissatisfaction and lower performance.

A typology of deviant workplace behaviour was also identified in Rana and Punia (2014) which included; production deviance( leaving early, taking excessive breaks, intentional working low and wasting resources); Property deviance (sabotaging equipment, accepting kickbacks, lying about hours worked and stealing from company); Political deviance (show favouritism, gossiping co-workers, blaming co-workers and competing adversely) and; Personal aggression (sexual harassment, verbal abuse, stealing from co-workers and endangering co-workers).

Metofe (2017) identified five categories of counterproductive work behaviour, which includes, verbal behaviours (e.g., rudeness, ostracism, spreading rumours, and sarcasm), physical behaviours (e.g., bullying and overt violence), sabotage (e.g., damage to a company's property, products, or reputation), work-directed behaviours (e.g., lateness, excessive absence, theft, and working slowly), and workplace homicide.

Szostek (2018) identified abuse, production deviance, theft, sabotage, withdrawal, property deviance, political deviance and personal aggression. Zahid(2019) identified , theft, tardiness, absenteeism, aggression/bullying, and sabotage withdrawal, abuse, drugs, alcohol use, crimes like fraud, embezzlement, back-stabbing, and resource misappropriation. Others include Misusing personal position for own benefit, Concealment of information, hiding ones errors, presenting colleagues idea as one's own, divulging confidential information, searching co-workers documents for information, tempering with organisation documents, blaming colleagues for ones mistakes, exaggerated ones work to get credit, manipulated/misguiding co-workers. Using my position or resources to unduly oblige colleagues.

#### **Performance indicators in construction**

Key Performance Indicators are tools used by organizations to define, measure, monitor, and track its performance over time toward the attainment of project success and the stated organisational goals. Kuroshi and Baba (2014) identified 9 indicators as effective key performance indicators used by the Nigerian construction companies. The identified indicators in order of effectiveness are; quality control, cost, on time completion, client satisfaction, earned value reporting, resource management,

unit/day and, safety. The study found that the four indicators chosen as the common set of indicators for Nigerian construction firm were; quality control, on time completion, cost and unit/day or productivity. Sibiya, Aigbavboa and Thwala (2015) found that the most significant construction projects KPIs in South Africa are: construction time, profitability, project management, material ordering, handling and management, risk management, quality assurance, client satisfaction (product), safety, time predictability (project, design, construction), productivity, client satisfaction (service). Ofori-Kuragu, Baiden and Badu (2016) also developed a set of nine (9) KPIs which can be used by Ghanaian contractors to measure and benchmark their performance and by client groups to compare contractor performance. The criteria include; client satisfaction, cost, time, quality, health and safety, business performance, productivity, people and environment.

### **Theoretical framework**

This study is based on the following theories; theory of planned behaviour, personality theory, and attribution theory of counterproductive work behaviours.

#### **Theory of Planned Behaviour**

According to Zhang (2018) the theory of planned behaviour (TPB) is a full-fledged social-psychology theory derived from theory of multi-attribute attitude (TMA) and theory of reasoned action (TRA) and has been widely used in the fields of management and others. The theory is designed to predict and explain human behaviour in specific contexts. It explains the behavioural decision-making processes of human beings with the aim of understanding and predicting the behaviour of individuals, advocating that the successful completion of human behaviours are mainly controlled by individual will, in order words the theory of planned behaviour is based on the individual's intention to perform a given behaviour. This is vital to this study in that the counterproductive behaviour of a worker depend on the individual's will and intent.

#### **Personality Theory**

The most accepted taxonomy for describing personality is centered on the Big Five Personality Traits or five-factor theory, a personality model that has been most widely researched and adopted in management. The model groups personality traits under five major factors, in order to represent personality on a wide level of abstraction. It therefore suggests that differences between individuals can be classified within these five dimensions: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (De Bortoli, da Costa, Goulart and Campara, 2019). The five-factor theory consequently describes personality as a system that is formed based on biology and social-cultural inputs, and consists of basic tendencies (the five trait dimensions) and characteristic adaptations (for example, habits, attitudes, roles). Personality manifests through the interaction between genetically based traits and the environment, which results in characteristic adaptations, and the interaction between characteristic adaptations and the environment in any given moment, which in turn gives birth to specific behaviours and experiences. This makes the theory very relevant to this study

#### **Attribution theory of Counterproductive Work Behaviours**

Martinko, Gundlach and Douglas (2002) opined that attribution theory provides the most comprehensive, parsimonious, and integrated explanation of why some individuals, as opposed to others, when presented with the same stimuli, choose to engage in counterproductive behaviour. The theory helps to explain why, when confronted with negative situation, some individuals choose to direct their behaviour externally through retaliatory forms of counterproductive behaviour (like aggression, fraud, harassment and others) or direct their efforts internally to produce self-destructive forms of counterproductive behaviour, such as alcohol and drug abuse. This is very relevant because both the retaliatory attitudes and the self-destructive attitudes contribute to reduce the performance the individual and the organisation.

**Conceptual frame work of the study**

The conceptual frame work of this study is used to illustrate the expectation of the research and includes the relationship among variables which indicates variables of causes and effects.

Counterproductive workplace behaviours are some of the common employee behaviours that instigates significant organisational cost, create an unhealthy working environment, and lead to various social and psychological job and non-job-related consequences (Braje, Aleksic and Jelavic, 2020). The theoretical review has shown that some factors influence the exhibition of counterproductive workplace behaviours, which eventually leads to the reduction of organisational performance. This relationship is represented in the theoretical framework presented in Figure 1.

Four groups of counterproductive workplace behaviours were identified namely; verbal deviance, physical deviance, material deviance and, work-related deviance behaviours. The factors affecting the behaviours were also grouped into four namely; worker features, political influence, organizational situation and individual difference factors, while the firm performance measure comprised cost, time, quality and productivity. The approach in this study represents a more comprehensive approach that analyses the interaction and mutual effects of different sources of deviant behaviour which can enhance project delivery through better organizational reputation, increased productivity, better costs, time and quality performance of construction organisations in Nigeria.

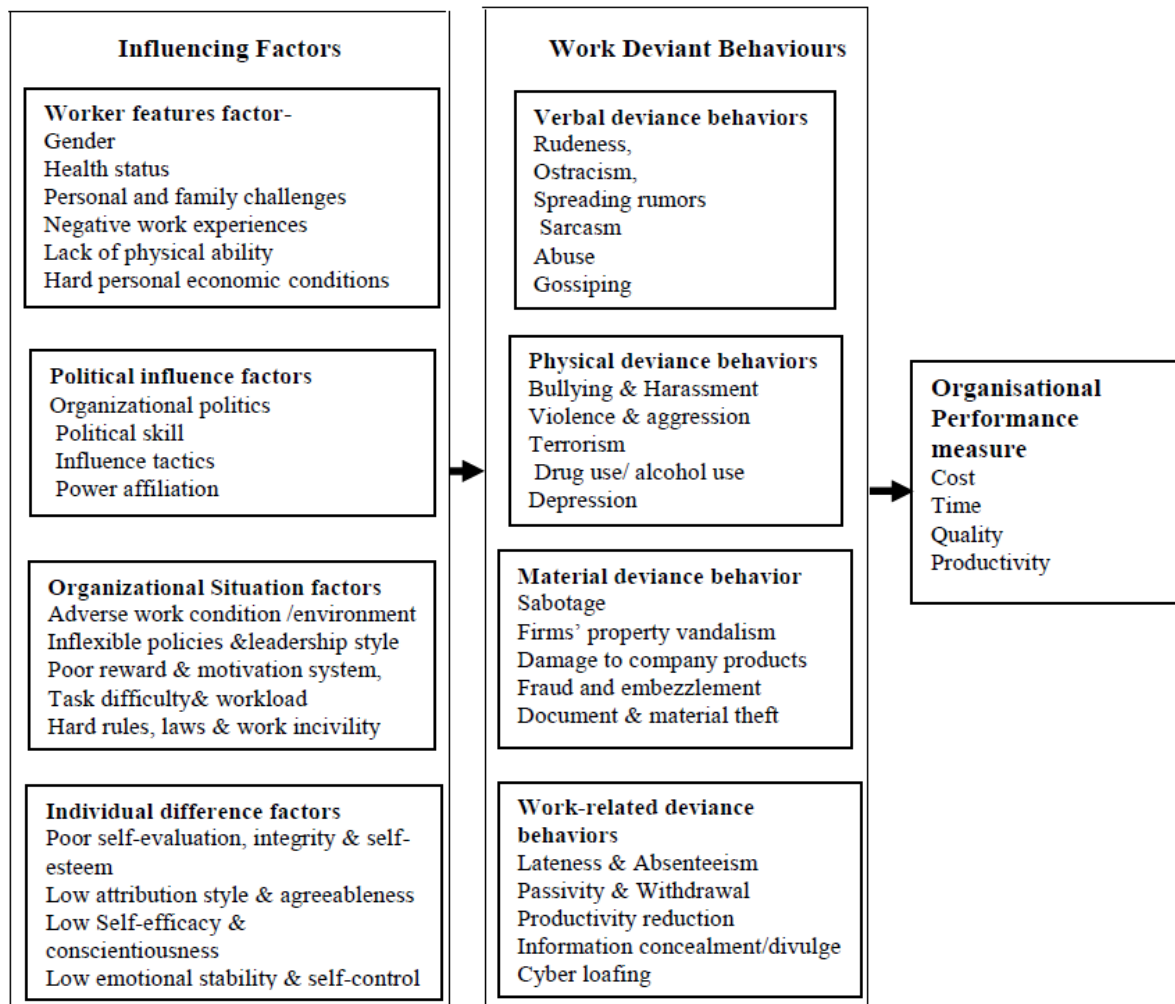


Figure 1: Conceptual framework of the study

### Hypotheses of the study

The study postulated two hypotheses grounded on the theories and relationships established in literature. The first hypothesis states that the selected internal and external factors do not have effect on the counterproductive behaviours of construction craftsmen in Nigeria. The second hypothesis states that the counterproductive behaviours of construction craftsmen do not reduce the performance of construction organisations in the study area.

### METHODOLOGY

The study adopted quantitative survey approach which enables quantification, description and evaluation of the factors affecting the counterproductive behaviours of construction craftsmen, as well as to measure the effect of the counterproductive behaviours of construction craftsmen on the performance of construction firms in Nigeria. A pilot survey was conducted to identify 170 small firms, 120 medium and 30 large sized firms operating in the construction industry in three purposively selected towns (Abuja, Lagos and Port Harcourt) in Nigeria and adopted as the study population. Abuja is the nation's capital, Lagos is known as the commercial capital of Nigeria, while Port Harcourt is the centre of oil exploration and operation. These considerations make Abuja, Lagos and Port Harcourt well populated, necessitating high volume of construction activities and most of the construction firms operating in Nigeria are located in these cities. The construction works in Abuja, Lagos and Port Harcourt are quite representative of construction works in other states in the country. A sample size of representatives of 144 small, 90 medium and 22 large size construction firms were selected using stratified purposive sampling techniques as respondents for this study. The study utilised structured questionnaire as the research instrument administered and filled by the firms' representatives, preferably managers who supervise artisans. Questions on the counterproductive behaviours of construction craftsmen, factors instigating them, as well as the effect of the counterproductive behaviours of construction craftsmen on performance reduction of construction firms in Nigeria, were formulated from extensive literature review. All questions were rated by using Likert scale ranging from 1(low) to 5 (very high) points. Data obtained through questionnaire, were analysed using SPSS25 and AMOS24 to obtain the output analysis of descriptive and inferential statistics. Structural Equation Model was adopted to test the hypothesis and examine the relationship between the variables.

### RESULTS, ANALYSES AND DISCUSSIONS

The result and discussion are presented in this section.

#### Characteristics of Respondents used for the Study

In order to appreciate the features of the managers whose perceptions were investigated, the sex, age, qualification, experience, status of the managers, location of operation and size of construction organisations were evaluated and the result presented in Table 1.

**Table 1: Descriptive results of Project managers Features**

Features	Sub features	Frequency	
		N	%
Sex	Male	206	80.47
	Female	50	19.53
	<b>Total</b>	<b>256</b>	<b>100</b>
Age	1-17yrs	0	0
	18-60yrs	194	75.78
	>60yrs	62	24.22
	<b>Total</b>	<b>256</b>	<b>100</b>
Qualification	OND	8	03.13
	HND	28	10.94
	B.Sc.	132	51.56
	M.Sc.	68	26.56
	Ph.D.	20	07.81

	<b>Total</b>	<b>256</b>	<b>100</b>
Experience	1-5yrs	18	07.04
	6-10yrs	46	17.97
	11-15yrs	52	20.31
	16-20yrs	86	33.59
	>20yrs	54	21.09
	<b>Total</b>	<b>256</b>	<b>100</b>
Status of Managers	Top Level Managers	34	13.28
	Middle level Managers	154	60.16
	Low level Managers	68	26.56
	<b>Total</b>	<b>256</b>	<b>100</b>
Location of Operation	Abuja	86	33.59
	Lagos	92	35.94
	Port Harcourt	78	30.47
	<b>Total</b>	<b>256</b>	<b>100</b>
Size of Construction firm of Managers	Large size firms (above 250 employees)	22	08.59
	Middle size firms (50-249 employees)	90	35.16
	Small size firms (1-49 employees)	144	56.25
	<b>Total</b>	<b>256</b>	<b>100</b>

The result in Table 1 shows that majority of the managers were male who are adults fairly spread across the three selected cities in Nigeria. Majority of the respondents equally have the basic qualification and experience expected of managers. The managers are predominantly middle and low level managers who relate more with the craftsmen, and they operate more in small and middle construction firms where the employment of manual labour is predominant. Hence, the results generally imply that the selected respondents have the required features to provide reliable information for this study.

**Exploratory Factor Analysis (EFA)**

For the purpose of determining if the identified factors fitted the constructs as designated theoretically in the literature, exploratory factor analysis (EFA) was conducted.

Table 2: Result of Rotated Component Matrix

	CODE	Rescaled Component								
		1	2	3	4	5	6	7	8	9
Rudeness	VDB1	.978								
Ostracism	VDB2	.957								
Spreading rumors	VDB3	.944								
Gossiping	VDB4	.971								
Abuse	VDB5	.962								
Sarcasms	VDB6	.976								
Sabotage	MDB1		.916							
Firms' property Vandalism	MDB2		.964							
Fraud and embezzlement	MDB3		.917							
Document & material theft	MDB4		.947							
Damage to company's product	MDB5		.918							
Poor self-evaluation, integrity & self-esteem	IDF1			.854						
Low attribution style and agreeableness	IDF2			.917						
Low Self-efficacy & conscientiousness,	IDF3			.947						
Low emotional stability & self-control	IDF4			.949						
Negative affectivity	IDF5			.881						
Lateness & absenteeism	WDB1				.892					
Passivity & withdrawal	WDB2				.901					
Productivity reduction	WDB3				.956					
Concealment /divulging of information	WDB4				.951					
Cyber loafing	WDB5				.849					
Gender	WFF1					.821				
Health status	WFF2					.847				



Personal and family challenges	WFF3	.807								
Negative work experiences	WFF4	.769								
Lack of physical ability	WFF5	.885								
Quality performance	OPI1	.928								
Time performance	OPI2	.899								
Cost performance	OPI3	.912								
Productivity	OPI4	.914								
Organizational politics	PIF1	.926								
Political skill	PIF2	.938								
Influence tactics	PIF3	.942								
Power affiliation	PIF4	.937								
Bullying & Harassment	PDB1	.870								
Violence & aggression	PDB2	.781								
Terrorism	PDB3	.792								
Drug use/ alcohol use	PDB4	.778								
Depression	PDB5	.865								
Adverse working condition /environment.	OSF1	.893								
Inflexible policies & leadership style	OSF2	.928								
Poor reward & motivation system,	OSF3	.917								
Task difficulty & workload	OSF4	.912								
<b>Eigen value</b>		3.540	2.630	2.528	2.475	1.828	1.844	3.013	3.403	2.266
<b>Percentage Variance</b>		12.720	9.452	9.085	8.894	6.569	6.626	10.827	12.227	8.142
<b>Cumulative variance</b>		12.720	22.172	31.257	40.151	46.720	53.346	64.174	76.401	84.543

The result presented in Table 2 shows that all items had significant loadings on their respective factors with Eigenvalues above 1(one) and all the constructs exhibited relatively high factor loadings ranging between .778 and .978. The values of cumulative variance explained ranged from 12.720 to 84.543. The KMO (Kaiser–Meyer–Olkin) measure in Table 3 was 0.841 which is above the recommended threshold value of 0.50, indicating that there are sufficient items for each factor, while the reliability measure of Cronbach’s alpha was 0.882, which is considered acceptable. The P-value of 0.000, is significant (less than .05), indicating that the correlation matrix is significantly different from an identity matrix, in which correlations between variables are all zero. The result provided evidence to support the theoretical conceptualization of the nine latent variables or constructs.

**Table 3: Result of KMO, Bartlett's and reliability tests**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.841	
Approx. Chi-Square	14254.772	
Bartlett's Test of Sphericity	Df	903
	Sig.	0.000
Cronbach’s alpha	0.882	
No of items	43	

### Evaluation of the goodness of fit of Models

In order ascertain if the data set satisfied the theory and provide a good fit to the model the results from the structural equation models were obtained and compared with the baseline criteria as adopted from Byrne (2010) and Gaskin (2012) for model goodness of fit. The result is presented in Table 4.

**Table 4: Model goodness of fit result**

Model	Factors	Criteria	$\chi^2$	Df	$\chi^2/Df$	CFI	NFI	TLI	RMSEA	PCLOSE
			< 3.0	$\geq 0.95$	$\geq 0.90$	$\geq 0.95$	$\leq 0.05$	>.05		
1	9 factors (43 indicators)		1700.886	852	1.996	0.942	0.891	0.939	0.063	0.000
2	9 factors (41 indicators)		1382.643	771	1.793	0.955	0.904	0.952	0.056	0.024
3	9 factors (39 indicators)		1184.749	694	1.707	0.961	0.911	0.958	0.053	0.194
4	9 factors (38 indicators)		996.295	657	1.516	0.971	0.921	0.969	0.045	0.930

Where  $\chi^2$  = Chi Square; DF = Degree of Freedom; CFI = comparative fit index; NFI= Normed fit index; RMSEA = root mean squared error of approximation; TLI = Tucker-Lewis Index. PCLOSE= Closeness of fit

Table 3 shows that the first model which is the hypothesized model consists of nine factors with 43 indicators, chi square for the model was 1700.886 with 853 degrees of freedom at a probability level of  $p < 0.05$ . Comparative Fit Index (CFI, 0.942) which is above the threshold of acceptance of  $> 0.95$  is a measure of the relative amount of variance and covariance in sample data that is jointly explained by the hypothesized model, while that of the Normed fit index (NFI) is 0.891 which fell short of 0.90 threshold. The Tucker-Lewis Index (TLI) yields a value of .939 which is within an acceptable range of 0-1.00. The Root mean square error of approximation (RMSEA) which measures how well the model would fit the population covariance matrix if unknown optimally chosen parameter values are available (Byrne, 2010), has a value of  $0.063 > 0.05$ , while the closeness of fit (PCLOSE) is  $0.000 < 0.05$  criteria. These fell short of the criteria implying that the model did not fit the data.

The second model was obtained by dropping MDB5 of material deviant behaviour and IDF5 of Individual difference factors. The model consists of 9 factors with 40 indicators with a model fit of ( $\chi^2 = 1382.643$ , Df= 771, CFI= 0.955, NFI= 0.904, TLI= 0.952, RMSEA= 0.056, PCLOSE=0.023). The third model was obtained by dropping WDB5 of work-related deviance behaviours and IDF4 of Individual difference factors. It consists of 9 factors with 39 indicators and provides a goodness of fit of ( $\chi^2 = 1184.749$ , Df= 694, CFI= 0.961, NFI= 0.911, TLI= 0.958, RMSEA= 0.053, PCLOSE=0.194), with all the models having  $\chi^2/Df < 3.0$ . It can thus be seen that the second and third models though show a substantial improvement in the model fit, yet fail to satisfy the RMSEA and PCLOSE criteria in Table 3, hence the models did not fit the data.

Model 4 is the acceptable model obtained by dropping WDB4 of work-related deviance behaviours, consisting of 9 factors with 38 indicators having goodness of fit of ( $\chi^2 = 996.295$ , Df= 657, CFI= 0.971, NFI= 0.921, TLI= 0.969, RMSEA= 0.045, PCLOSE=0.930) with the models having  $\chi^2/Df = 1.516 < 3.0$ . These values satisfied all the criteria, hence the fourth model represents the final best-fitting and most parsimonious model representing the data. The path diagram of the final model is shown in Figure 1.

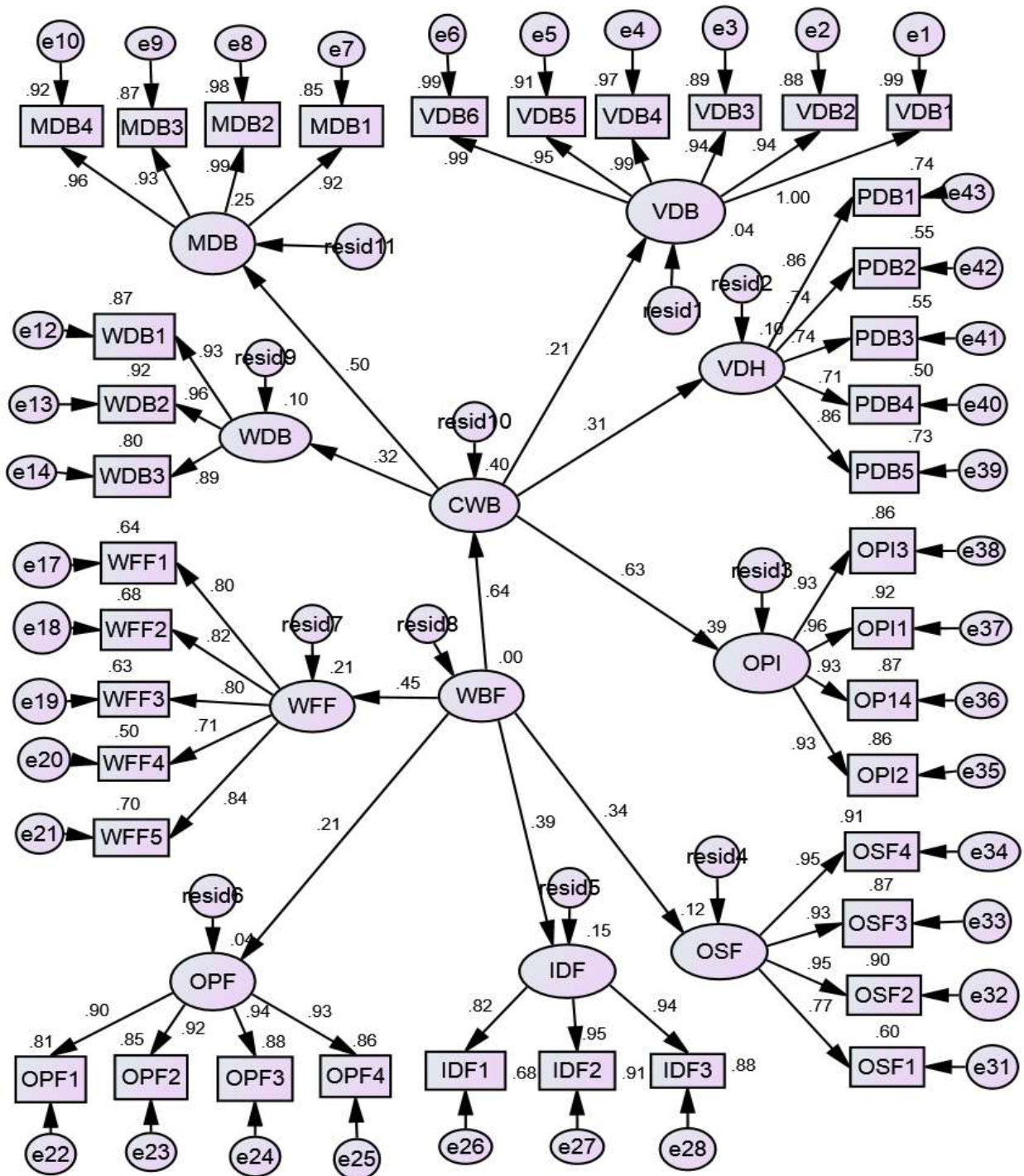


Figure 1: Path Diagram of Model 4 – Final model

**Regression Estimates of factor loadings for the final model 4**

The results presented in appendices 1 and 2 show the regression loadings of the factors in the final model. The result shows that all the estimated values in Appendix 1 were found to have critical ratio value >1.96 (between 2.102 and 84.579), while the p-values are all less than 0.05, indicating that they are significantly difference from zero. MDB loads on CWB with standardized regression value of 0.816, WDB with 0.512, VDH with 0.623, while VCD loads lowest with 0.357. This implies that as

CWB increases by 1 standard deviation, MDB increases by 0.816, WDB by 0.512, VDH by 0.623, while VCD increases by 0.357. The probability of getting a critical ratio as large as the values in Appendix 1 is less than 0.001. For example, the regression weight for CWB in the prediction of VCD is significantly different from zero at 0.001 level (two-tailed). Therefore, the regression weight estimate is 2.367 standard errors above zero. The result also indicate that OPI loads on CWB with standardized regression value of 0.628, while CWB loads on WBF with standardized regression value of 0.635.

**Proposed relationship and hypothesis testing**

The results in Table 4 is used to ascertain if the proposed structural equation model analysis indicated supports the postulated hypotheses. The decision criteria is that if p-value is less than 0.05, the hypothesis fails to be accepted and if otherwise the hypothesis is accepted.

Table 4: Result of Proposed Structural equation model and hypothesis testing

Hypothesis	Relationship	Total Effect	Direct Effect	Indirect Effect	Decision
Hypothesis 1	CWF → CWB	0.635	0.635	-	Reject
	p-Value	0.000	0.000	-	
Hypothesis 2	CWB → OPI	0.628	0.628	-	Reject
	p-Value	0.000	0.000	-	
	CWF → OPI	-	-	0.399	

Table 4 shows that the standardized coefficient of the relationship between counterproductive behaviour factors and counterproductive work behaviour is 0.635 with a p-value of 0.000 < 0.05 significant level. This implies rejecting hypothesis 1, which indicates that the selected factors have direct positive effect on the exhibition of counterproductive work behaviours. Hence, Worker features, political influence, organizational situation and individual difference factors will directly enhance the exhibition of counterproductive work behaviours if the various aspects of the factors are not adequately taken care. This finding is consistent with some previous studies by Tahir, Baloch and Shujaat (2018) which found a significant positive relationship between the prevalence of some interpersonal workplace factors and counterproductive work behaviours in Pakistan, and Wang, Chen and Li (2018) which identified the organizational deviance variable of production deviance with most significant impact, followed by anti-organizational behaviour, a variable of interpersonal deviance, followed by members’ behaviour and attribution, a leader-member exchange variable among the key factors affecting deviant workplace behaviour using Chinese experience.

Table 4 also shows that the standardized coefficient of the relationship between exhibition of counterproductive work behaviours and reduction of performance of construction organisation is 0.628 with a p-value of 0.000 < 0.05 significant level. This implies rejecting hypothesis 2, which indicates that the exhibition of counterproductive work behaviours has direct positive effect on the reduction of the performance of construction organisations in the study area. The exhibition of verbal deviance, physical deviance, material deviance and, work-related deviance behaviours by craftsmen, will reduce construction organisations’ performance by inhibiting the cost, time, quality and productivity outcomes of projects and services. This finding is similar to that by Dunlop and Lee (2004) which found that workplace deviant behaviour was negatively and significantly associated with business unit performance, with the implication that the presence of deviant employees among business units impinges upon the performance of the business unit as a whole. It also align with the finding of Akikibofori and Akikibofori (2014) and Roopa, Nanjundeswaraswamy and Swamy (2016) which concluded that workplace deviance behaviour impacts negatively on both the organization total output and the individual employee’s moral and motivation. The result also support the finding by

Adeyeye (2014) which established that organisational deviance and interpersonal deviance jointly and individually predict employee performance, with strong association between workplace deviance behaviour variables adopted and business performance in Unilever Manufacturing Plc, Lagos, Nigeria.

The result also with a standardized coefficient of 0.399 suggested some level of indirect relationship exist between the counterproductive behaviour factors and reduction of the performance of construction organisations. This indicates that the factors also have indirect positive relationship with the inhibition of performance of firms operating in the construction industry in the study area.

## **CONCLUSION AND RECOMMENDATION**

This study has attempted to model the causes and effect of counterproductive work behaviours of construction craftsmen on reduction of organisational performance, with a view to enhancing project delivery through better organizational reputation, increased productivity, better costs, time and quality performance of construction organisations in Nigeria. The finding of the study on the relationship between some influencing factors and the exhibition of counterproductive work behaviours of construction craftsmen is that the factors have positive relationship with the exhibition of counterproductive work behaviours of construction craftsmen. This means that the more the influence of the factors are neglected the more the exhibition of counterproductive work behaviours by construction craftsmen. The factors were classified into workers' features, political influence, organizational situation and individual difference factors, while the counterproductive work behaviours of construction craftsmen were classified into verbal deviance, physical deviance, material deviance and, work-related deviance behaviours. The implication of this finding is that if construction organizations do not understand and adopt strategies and processes to reduce, manage or prevent craftsmen deviant behaviours at workplaces, Nigeria will continue to witness failed construction projects. Another finding from the study is that a positive relationship exists between the exhibition of counterproductive work behaviours of construction craftsmen and reduction of construction organisations performance in terms of time, cost, quality and productivity. The finding is an indication that the understanding and adoption of strategies and processes to reduce, manage or prevent deviant behaviours by craftsmen at construction workplaces will lead to improvement in the performance of construction organisations in the study area. The implication on this is that if managers of construction industry firms under play the understanding and management of deviant behaviours by craftsmen at construction workplaces then sustainability, competitiveness and survival of the firms will be endangered. An indirect positive relationship also exist between the identified instigators and the construction organisations' performance.

It is therefore recommended construction organisations should not undermine the management and control of causes of counterproductive workplace behaviour of craftsmen. Since it has been established that deviant behaviours lead to huge economic and psychological costs, poor quality and productivity, organizations need to adopt strategies and processes to reduce, manage or prevent deviant behaviours by craftsmen at construction workplaces. Possible strategies suggested by Rana and Punia (2014) include: ethical organisational culture, effective personnel selection, integrity tests, maintaining psychological contract, organisational justice and adopting green organisational behaviour.

### **Limitation of the study**

This study is limited to the twenty one counterproductive work behaviours, twenty influencing factors and four firm performance indicators selected from literature and the views of managers who represented the various construction organisations operating in three cities in, Nigeria. Since the study was also limited to the views of 256 managers who returned their questionnaire, the result could be improved by further studies on other stakeholders, other counterproductive work behaviours, other factors and other cities not covered in this study. In spite of these limitations the result could provide reasonable insight into the factors construction managers can control to ensure the non-deviant workplace behaviours of artisans for enhanced construction firms' performance in Nigeria, as well as guide for further studies.

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**Appendix 1: Regression Weights: (Group number 1 - Default model)**

	Estimate	S.E.	C.R.	P	Label
CWB <--- WBF	1.000				
VDB <--- CWB	.357	.151	2.367	.018	par_19
MDB <--- CWB	.816	.193	4.220	***	par_22
WDB <--- CWB	.512	.156	3.277	.001	par_23
OPF <--- WBF	.668	.318	2.102	.036	par_24
IDF <--- WBF	1.000				
OSF <--- WBF	.932	.300	3.110	.002	par_25
OPI <--- CWB	1.000				
VDH <--- CWB	.623	.197	3.165	.002	par_30
WFF <--- WBF	1.000				
MDB3 <--- MDB	.968	.030	32.581	***	par_1
MDB2 <--- MDB	.994	.020	49.101	***	par_2
MDB1 <--- MDB	.963	.031	31.430	***	par_3
WDB3 <--- WDB	.956	.037	25.557	***	par_4
WDB2 <--- WDB	1.000				
WDB1 <--- WDB	.982	.034	29.302	***	par_5
IDF3 <--- IDF	1.000				
OPF3 <--- OPF	1.000				
OPF2 <--- OPF	.941	.035	27.046	***	par_6
OPF1 <--- OPF	.985	.039	25.052	***	par_7
OSF4 <--- OSF	.955	.029	33.044	***	par_8
OSF3 <--- OSF	.932	.031	30.241	***	par_9
OSF2 <--- OSF	1.000				
OPI3 <--- OPI	.901	.032	27.897	***	par_10
OPI1 <--- OPI	.985	.031	32.043	***	par_11
OPF4 <--- OPF	.961	.035	27.688	***	par_12
IDF1 <--- IDF	.986	.051	19.456	***	par_13
MDB4 <--- MDB	1.000				
VDB6 <--- VDB	1.006	.013	77.860	***	par_14
VDB5 <--- VDB	1.067	.024	45.043	***	par_15



	Estimate	S.E.	C.R.	P	Label
VDB4 <--- VDB	1.000				
VDB3 <--- VDB	.960	.023	40.876	***	par_16
VDB2 <--- VDB	1.004	.026	39.262	***	par_17
VDB1 <--- VDB	1.009	.012	84.579	***	par_18
OP14 <--- OPI	1.000				
OPI2 <--- OPI	.949	.034	27.878	***	par_20
IDF2 <--- IDF	.993	.037	26.914	***	par_21
PDB1 <--- VDH	.989	.059	16.736	***	par_26
PDB2 <--- VDH	.835	.061	13.584	***	par_27
PDB3 <--- VDH	.827	.061	13.495	***	par_28
PDB4 <--- VDH	.801	.063	12.658	***	par_29
PDB5 <--- VDH	1.000				
WFF5 <--- WFF	1.000				
WFF4 <--- WFF	.820	.066	12.422	***	par_31
WFF3 <--- WFF	.926	.063	14.684	***	par_32
WFF2 <--- WFF	.987	.064	15.413	***	par_33
WFF1 <--- WFF	.898	.061	14.762	***	par_34
OSF1 <--- OSF	.990	.056	17.598	***	par_35

**Appendix 2: Standardized Regression Weights: (Group number 1 - Default model)**

	Estimate
CWB <--- WBF	.635
VDB <--- CWB	.208
MDB <--- CWB	.499
WDB <--- CWB	.317
OPF <--- WBF	.210
IDF <--- WBF	.391
OSF <--- WBF	.344
OPI <--- CWB	.628
VDH <--- CWB	.314
WFF <--- WBF	.453
MDB3 <--- MDB	.931
MDB2 <--- MDB	.992
MDB1 <--- MDB	.924
WDB3 <--- WDB	.895
WDB2 <--- WDB	.957
WDB1 <--- WDB	.934
IDF3 <--- IDF	.936
OPF3 <--- OPF	.936
OPF2 <--- OPF	.922
OPF1 <--- OPF	.900
OSF4 <--- OSF	.954
OSF3 <--- OSF	.934
OSF2 <--- OSF	.949
OPI3 <--- OPI	.927
OPI1 <--- OPI	.960
OPF4 <--- OPF	.928
IDF1 <--- IDF	.824
MDB4 <--- MDB	.961
VDB6 <--- VDB	.993

	Estimate
VDB5 <--- VDB	.955
VDB4 <--- VDB	.986
VDB3 <--- VDB	.943
VDB2 <--- VDB	.938
VDB1 <--- VDB	.996
OP14 <--- OPI	.934
OPI2 <--- OPI	.927
IDF2 <--- IDF	.952
PDB1 <--- VDH	.862
PDB2 <--- VDH	.745
PDB3 <--- VDH	.741
PDB4 <--- VDH	.708
PDB5 <--- VDH	.856
WFF5 <--- WFF	.839
WFF4 <--- WFF	.706
WFF3 <--- WFF	.797
WFF2 <--- WFF	.825
WFF1 <--- WFF	.800
OSF1 <--- OSF	.773

## RESIDENTIAL AREA DISSONANCE AND COPING STRATEGIES IN IKOT EKPENE URBAN, AKWA IBOM STATE, NIGERIA.

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### Abstract

The paper examined residential area dissonance in Ikot Ekpene Urban, Nigeria. Data were obtained through the administration of questionnaire. A total of 500 households were systematically sampled for questionnaire administration. Frequency counts were used in analysing the determinants of residential area dissonance, and the relative dissonance index (RDI) was also employed to determine levels of residential area dissonance. Spearman's ranked correlation and factor analysis were used to assess the relationships between socio-economic variables and residential area dissonance. It was noted that the major determinants of residential area dissonance were the inadequacy of basic facilities and utilities, insecurity and long distances between home and workplaces. The spearman's ranked correlation indicated a positive relationship between income level, household sizes and age with residential area dissonance, subjecting the socio-economic characteristics of respondents to factor analysis, it was found that income and age could explain 34.115% and 31.807% of respondents' residential area dissonance respectively. On dissonance coping strategy, the majority of respondents (48%) intended to move out of their current neighbourhood to others that were better serviced. The RDI of Ikot Ekpene urban was found to be 2.72 on a scale of 5, which shows that residents are marginally dissatisfied with their residential area, on this premise; it was suggested that facilities that are capable of improving the livability of the area should be provided and security institutions should be equipped and strengthened. community-based security groups could also be set up to complement the efforts of the state actors.

Keywords; Dissonance; Housing, Residential area, Housing satisfaction, Liveability.

### 1. Introduction

Housing has been universally accepted as the second most important essential human need, after food. Housing in all its ramifications is more than mere shelter since it embraces all the social services and utilities that go to make a community or neighbourhood a liveable environment (AKS, 2009). Housing has been conceptualized in various ways by scholars. In its basic meaning, housing encompasses the totality of the residential environment that man uses for shelter. It is a structure that is highly needed for man's physical, mental health and social well-being (Ajom *et al.*, 2022; Eteng *et al.*, 2022). Housing can also be defined as the process of providing functional shelter in a proper setting in a neighbourhood supported by sustainable maintenance of the built environment for the day – to- day living and activities of individuals and families within the community (AKS, 2009). The residential area in which a structure is situated is of utmost importance even more than the structure itself because it carries the bundle of goods which will be enjoyed by the inhabitants of the housing units therein. Regrettably, it is near impossible for a resident to be satisfied maximally with a given residential area due to pre-conceived housing aspiration.

Residential area dissonance refers to the gap between the residential area currently being occupied by an individual and that which the individual would have loved to live in ideally. In general, architects and urban planners seek to create a sustainable and liveable environment through the provision of sound structures, and the ordering and re-ordering of land uses to enhance the well-being of people. This is why studies on drivers of residential area dissonance are apt to the professions as residential areas are seen as a micro-unit of planning where other things evolve. Studies on residential area dissonance/ satisfaction help in assessing the success of a public-sector, private-sector, or joint housing project, help policymakers to understand the factors of intra-urban housing mobility and to determine the type of public and/or private efforts (financial and human) that are to be invested in the improvement of a residential environment, and such investments are to be prioritized based on the resident's perceptions of inadequacies in the existing amenities in their area (Afon, 2006). This paper aims to examine the relative residential area dissonance level of respondents in Ikot Ekpene Urban.

## II. Literature Review and Conceptual Review.

The impossibility of everyone living where they would prefer is not debatable. This presupposes some form of competition for the most desired locations, resulting in a situation where price plays a crucial role in limiting the options available. However, the restricted choice which is an offshoot of this competition for the most desired locations may be considerably reduced as a result of the variation between people in the locations and lifestyles they prefer (Etim, 2015). Residential area dissonance is defined as the incongruence in terms of land use patterns between the neighbourhood type in which an individual is currently residing and the individual's preference structure regarding such characteristics of the residential environment. This definition links residential area dissonance directly to one dimension of residential satisfaction, which can be seen as a product of the congruence between the actual residential environment and the subjects' opinions about what this environment should look like (Schwanen and Moksarian, 2004).

At least three types of factors explain the existence of residential area dissonance; those relating to residential preferences; those that are associated with the residential choice process; and those that have to do with dynamics in the life course and attitudes of individuals. Residential area dissonance may also result from the fact that residential choice is a household decision, and housing preference structures may vary across individuals within the same household. Disagreement about the importance of features of the residential area among household members may lead to residential type mismatch in the level of the individual or even the household (Schwanen and Moksarian, 2004). Further, the extent of dissonance may be associated with the size and heterogeneity of the choice set of housing alternatives available in the residential choice process. The trade-off between housing attributes becomes more complicated as the constraints on choice are larger.

Households are often bonded to certain locations by the various ties of family members, jobs, and attachments to housing units and neighbourhoods. The strength of these attachments may be measured as the degree of satisfaction or dissonance expressed. Dissonance arises as the housing fit is altered by family cycle changes. For example, a new birth may necessitate an additional bedroom, or conversely, the house may seem larger after the last child is of age and decides to leave home.

Residential area dissonance often leads to the thought of moving out of the neighbourhood, but it is not a sufficient condition for mobility (Deane, 1990). Residents often attempt to make their situation and aspiration pictures as congruent as possible by changing either their aspirations or their environment. Adjustments in aspirations may involve a change of use or change of attitude towards the residence, such that the dissonance level is reduced even when there is no change in the environmental parameters. Any dissonance coping strategy that involves changes in the environmental parameters (including change of location) is often termed active adjustment. Adaptation may be through mobility or structural conversion. Aspiration changes are psychic and quite difficult to capture while changes in the environment are empirically evident adjustments and rather easily measured as housing changes or alterations.

Numerous researchers have shown that housing preferences vary not only with household structure and income but also with lifestyles and personality factors. Because residential preferences play a central part in residential area dissonance, it is logical to infer that factors affecting residential location preferences are also associated with the existence of residential area dissonance. Empirical findings on factors affecting residential preferences are summarized as follows: The determinants of residential area preferences within Ibadan metropolitan city according to Sanni and Akinyemi (2009) are factors that deal with the quality of the environment and those that are socio-cultural in nature. Among factors that deal with the quality of the environment, such reasons as a well-planned area with necessary infrastructural facilities such as good roads, water supply etc that make a place conducive for living, were highly regarded. The study also revealed that each category of residential areas in Ibadan had a distinct and peculiar arrangement of determinants of residential district preferences and that broad generalization of such determinants should not be done for the whole city. Udoh (2020) in his work on housing and environmental quality in rural Akwa Ibom State, found out that the majority (78%) of households were dissatisfied with water source and quality, and frequent flooding made 76% of respondents to be dissatisfied with their residential area, poor waste disposal and management, drainage system and mice/ pest infestation were also main causes of residential area dissonance.

Etim (2015) examined determinants of residential area preference in Ikot Ekpene urban. The study showed that access to land determined largely the future choice of residents. In order of dominance, the serenity of the environment accounted for the second largest percentage (24.5%) only bettered by access to land (25.25%) Closeness to the workplace (21.5%), Availability of basic facilities (12%), security (10%) and family ties (6.75%) were seen as minor determinants of residential area preference in Ikot Ekpene urban. It was inferred that residents believed that with a good road network and mass transit schemes in place, there will be no need to live near workplaces since they can access such places easily, also government should ensure the provision and maintenance of basic facilities and utilities in the town.

It is believed that the socio-economic status of a household plays a major role in the quality of their housing satisfaction or dissonance. A socio-economic characteristic is a term used to stratify a population according to the interplay of social and economic factors. It may also be defined as a measure of an individual's place within a social group based on various factors, including income and education (Hwang *et al.*, 1999). According to Okpoechi (2018), the socio-economic factors that significantly affect housing satisfaction among the middle-income group in Owerri are income, nature of employment, and socialization habits. Other factors like family size, family structure and level of education were found not to be significant determinants of housing satisfaction among this group. Previous researchers have found linkages between housing (dis)satisfaction and socio-economic factors like age (Varady and Preiser, 1998), family structure (Theodori, 2001), education, income, employment status, length of residency, and physical characteristics of the house (Yeh, 1972). Additionally, fulfilled housing preferences have also been shown to predict the quality of life (O'Connell *et al.*, 2006). This presumes that the subjectivity of housing satisfaction notwithstanding, it is still a very important predictor of the overall quality of life of housing residents.

## **Conceptual Framework**

### **a) The concept of Sustainable Housing Provision**

Sustainable housing provision is the gradual, continual and replicable process of meeting the housing needs of the populace, the vast majority of who are poor and are incapable of providing adequately for themselves (Olutuah and Bobadoye, 2009). It ensures housing programmes that are able to satisfy the preferences and aspirations of the people are carried out instead of policies that are based on political or cultural bias. Sustainable housing provision requires proper definition of housing needs, and the participation of the end users to ensure their satisfaction (Ayoola and Amole, 2014). The general goal of sustainable development is to meet the essential needs of the present population while ensuring that future generations have an adequate resource base to meet their own needs (WCED, 1987). Sustainable housing is, however, yet to gain its due prominence in developing countries. It is rare that the social, cultural, environmental and economic facets of housing are addressed there in an integrated policy. In order to realize sustainable housing provision, the housing needs of the people have to be put into proper consideration, and a framework to achieve this has be thoroughly worked out. Sustainable housing provision is thus contingent on such underlying factors as policy formulation and decision making, policy execution and monitoring, and social acceptability and economic feasibility. These factors must take into cognizance the bottom-up participatory approach in housing provision involving genuine local participation by people at the grassroots level (Olutuah and Bobadoye, 2009). Without reference to the preferences, perceptions and values of the people, most housing programmes often fail because people are in the best position to identify their needs, and order their priorities. Attitudes towards space, use and organization of space, are all linked to cultural traditions, which are often best understood by the housing end users themselves. Thus housing that will be acceptable by the people must put into consideration the cultural, climatic, socio-economic circumstances of the people. Sustainable housing development can only be achievable if suggestions and feedbacks are welcomed from within the communities.

### III. Materials and Methods

#### Study Area

Ikot Ekpene urban extends from Latitudes 5°08' to 5°12' North of the Equator and longitudes 7°38' to 7°45' East of the Greenwich meridian. Ikot Ekpene urban is known as the “Raffia City”. The area is an historic town in the Niger Delta region of Nigeria. It is the second most populated urban centre in Akwa Ibom State after Uyo the State capital. It is also the political and cultural capital of the Annang ethnic group. Ikot Ekpene urban is made up of eight (8) settlements, these are Ikot Abia Idem, Ikot Obong Edong, Abiakpo Ikot Essien, Ikot Ekpene, Uruk Uso, Ifuhu, GRA and Ibiakpan Akan Anwan (NPC, 1991). The population figures of Ikot Ekpene urban is 131, 292, projected based on 1991 census data using 3.4% growth rate. The area has retained some of its traditional values such as male heading families, and relatively large households though it has also acquired a series of urbanism such as having a younger population; most of who are economically active, attain tertiary education status and have moderate income levels. Ikot Ekpene urban is located in an oil palm belt. Consequently, the people have palm oil and kernel extraction as their major occupation. Other economic activities in the area include farming, trading, artisan, carpentry, mechanic and vulcanizing work. A handful of the populations are civil servants.

Road pattern has played an important role in forming the settlement pattern of the area as the tendency to build houses close to the road has led to a linear settlement pattern. Traditional buildings of simple structure constructed with local materials have gradually been displaced by sandcrete blocks and corrugated metal sheets upon sawn timber and cement plastered wall. Most houses are put into mixed use and set out in a haphazard manner. The use of inferior, poor and sub –standard building materials coupled with the fact that these materials are poorly put together with low level technology greatly lowers the performance of this facility. The health consequences occasioned by the inadequate housing conditions on the urban population has gained notoriety (Akpabio, 2010).

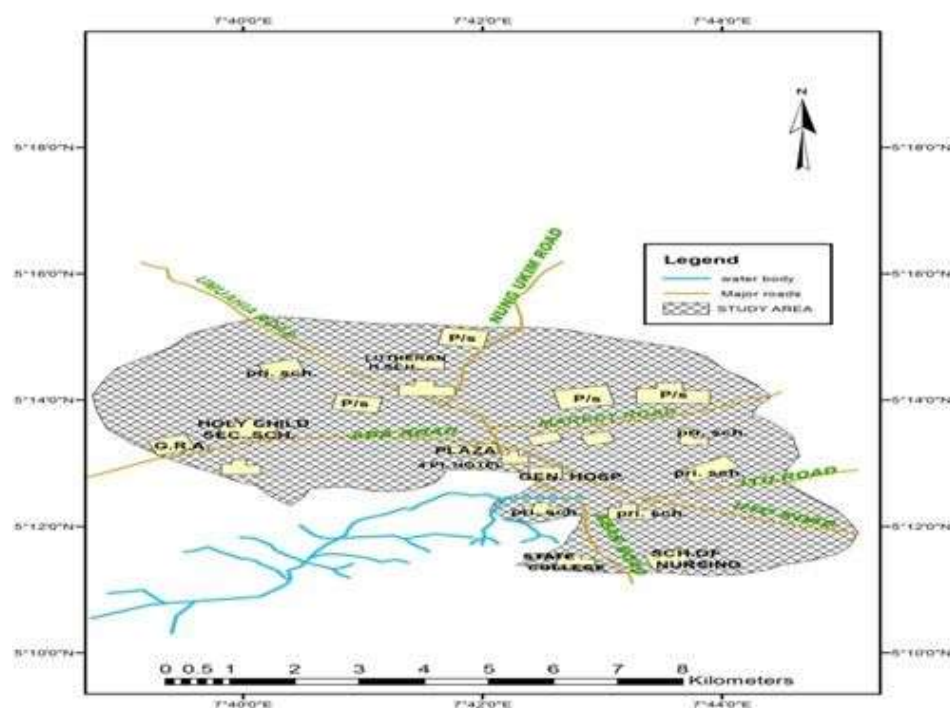


Fig.1. Map of Ikot Ekpene Urban.

#### Research Methodology

Ikot Ekpene urban is made up of eight (8) settlements. These are Ikot Abia Idem, Ikot Obong Edong, Abiakpo Ikot Essien, Ikot Ekpene Town, GRA, Uruk Uso, Ifuhu and Ibiakpan Akan Anwan (NPC, 1991). With reference to the National population policy (1998), to acquire the number of households

in a settlement, the projected population figure is often divided by the estimated average household size of six.

The Taro Yamane formula was used in deducing the sample size. The formula is as follows;  $n = \frac{N}{1 + N(e)^2}$  ..... Equation 1

Where: n= sample Population, N= finite population, e = the level of significance, 1=constant

However, application of the formula resulted in 400 but the sample size was increased to 500 for a wider coverage. To arrive at the sample size for each settlement, the number of households in each settlement will be divided by the sum of the households in the study area, and then multiplied by the total number of sample size of 500. The systematic random sampling was used in selecting the households which questionnaire were administered in each village. The variables that lead to residential area dissonance were analyzed using frequencies, The respondents' level of dissonance in relation to their residential area condition was evaluated in terms of Relative dissonance Index (RDI) on a five –point scale. Very dissatisfied (5), dissatisfied (4), indifferent (3), satisfied (2) and very Satisfied (1). The RDI was calculated using the formula;

$$RDI = \frac{5N_1 + 4N_2 + 3N_3 + 2N_4 + 1N_5}{N_1 + N_2 + N_3 + N_4 + N_5} \quad \text{Equation}_2$$

**Where:** N<sub>1</sub> - Number of respondents who indicated “very dissatisfied, N<sub>2</sub> - Number of respondents who indicated “dissatisfied”, N<sub>3</sub> - Number of respondents who indicated “indifferent”, N<sub>4</sub> - Number of respondents who indicated “satisfied” and N<sub>5</sub> - Number of respondents who indicated “Very satisfied”

The relationship between socio-economic characteristics and residential dissonance index of respondents was investigated using the spearman’s ranked correlation. Factor analysis was later used to reduce the data to two variables.

**IV. Findings and Discussions**

**Table 1: Determinants of Residential Area Dissonance in Ikot Ekpene Urban**

S/n	Factor	Frequency	Percentage
1.	Inadequacy of basic facilities/utilities	160	32%
2.	Insecurity within the area	128	25.6%
3.	Distance to workplace/school	116	23.2%
4.	Housing condition	96	19.2%
		500	100.00%

**Field Survey, 2023**

Table 1 shows the major determinant of residential area dissonance among respondents is the inadequacy of basic facilities and utilities in the area. 32% of respondents decried the erratic nature of the power supply, poor drainage network and poor methods of waste disposal. This is in tandem with the assertion of Ajom *et al* (2022) that in the determination of locations for residential housing development, the place of urban infrastructure cannot be over-emphasized in that the availability of infrastructure such as water, electricity, telecommunication systems, waste disposal system and roads all promote land use development and increase property values in an urban area. This is because property demand in districts that have the needed infrastructure is always higher than in areas where there is a shortage in infrastructure.

The insecurity in Ikot Ekpene urban is gradually becoming alarming, 25.6% of respondents experienced residential area dissonance because they were not certain of the security of their lives and properties. Key drivers of crime include poverty, migration, unemployment, endemic drug abuse, small arms and light weapons trafficking and incessant political violence (Usip and Ayadu, 2022). It should however be noted that the rise in insecurity in urban centres is a global phenomenon hence the need to adopt best practices to curtail it. 23.5% of respondents were not satisfied with the distance to

their workplace/school while 19% of respondents stated the condition of their housing as the cause of their residential area dissonance. This goes to show that housing is more than a mere shelter, as 81% of factors causing residential dissonance were external to the dwelling unit itself.

**Table 2: Dissonance Levels of Respondents**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very satisfied	123	24.6	24.6
	Satisfied	145	29.0	53.6
	Indifferent	71	14.2	67.8
	Dissatisfied	69	13.8	81.6
	Very dissatisfied	92	18.4	100.0
	Total	500	100.0	100.0

Source: Statistical Computations, 2023

Relative dissonance index:

$$RDI = \frac{5N_1 + 4N_2 + 3N_3 + 2N_4 + 1N_5}{N_1 + N_2 + N_3 + N_4 + N_5}$$

$$N_1 + N_2 + N_3 + N_4 + N_5$$

$N_1 = 92, N_2 = 69, N_3 = 71, N_4 = 145$  and  $N_5 = 123$

$$= \frac{5(92) + 4(69) + 3(71) + 2(145) + 1(123)}{500} = \frac{1362}{500}$$

=2.72

The relative dissonance index of respondents with regards to their residential area in Ikot Ekpene urban is 2.72 on a scale of 5. This means that currently respondents are marginally dissatisfied with their residential area.

**Table 3: Correlation between Socio economic characteristics and Residential Area Dissonance**

	RDI	Income	Household Size	Marital Status	Age	Sex
Spearman's Rho Correlation coefficient	1.000	.618**	-.228**	.103*	.515**	.251**
Sig (1-Tailed)		.000	.000	.010	.000	.000
N	500	500	500	500	500	500

SPSS Analysis, 2023

From the spearman's ranked correlation analysis done with the help of SPSS, the correlation coefficient between residential area dissonance and socio-economic characteristics like income, household size, marital status, age and sex was 0.618, -.228, 0.103, 0.515 and 0.251 respectively. The socio-economic variables were subjected to factor analysis. The result showed that age and income were undermining variables influencing the residential area dissonance of respondents. Income and age explained 34.114% and 31.807% respectively of variation in respondents' residential dissonance levels. (See Appendix)

The analysis shows that higher income levels are related positively with higher dissonance levels (0.618) this further validates the assertion of Goodall (1972) that as income rises housing behaves as a superior good, for the household spends proportionately more of its increased income on purchasing larger and/ or better residential areas. Higher household sizes correlated negatively with residential area dissonance (-.228), this could be attributed to the likelihood of those with large family size owning their residential units and not just renting, single individuals (.103) were found to be more dissatisfied with their residential area than the married and widowed. The elderly were more dissatisfied than the younger once, while males were more dissatisfied than females.



**Table 4: Residential Area Dissonance coping Strategies in Ikot Ekpene Urban**

Coping Strategies	Frequency	Percent
Increase spending on housing improvement	80	16%
Moving to another residential area	240	48%
Adapting by reducing housing aspiration	180	36%
	500	100%

Source: Field Survey, 2023

Table 4 shows that 16% of respondents will like to spend more in order to improve their housing condition, 36% of respondents agreed that they will reduce their housing aspirations so as to adapt comfortably to the current housing condition, majority of respondents 48% asserted that they are likely to move to another housing unit where their aspirations can be met. This infers that there is a high tendency for intra-urban mobility in Ikot Ekpene Urban.

## V. Conclusion

This paper examined residential area dissonance in Ikot Ekpene Urban, Akwa Ibom State, Nigeria. The determinants of residential area dissonance were identified as inadequate facilities/utilities, high insecurity rate and long distances to commute to workplaces/schools. These factors help to lower the livability level of the area hence it was found that the residential dissonance index of respondents was 2.7 measured on a scale of 5. This portrays that residents were marginally dissatisfied with their residential area currently, if nothing is done to address this, intra-urban housing mobility rates will be on the rise as stated by the majority of respondents who regarded such measures as a dissonance coping strategy. The relationship between socio-economic variables and housing dissonance was also investigated, however, income and age were found to be highly correlated positively with residential area dissonance.

In order to improve the livability of Ikot Ekpene urban, security of lives and properties must be given utmost attention, this may entail the deployment of urban surveillance systems, technology and GIS in security planning and the use of community-based security groups. The town planning agencies can exert a direct influence on crime reduction by delineating territories, reducing or increasing accessibility by the creation or elimination of boundaries and circulation networks, and facilitating surveillance by the citizenry and the police. The government should ensure that there is adequate provision of basic facilities and amenities; such should also be maintained in order to keep them in a usable state.

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**Factor Analysis Extract****Communalities**

	Initial	Extraction
Income	1.000	.764
Age	1.000	.764
HouseholdSize	1.000	.542
sex	1.000	.657
Marital Status	1.000	.569

Extraction Method: Principal Component Analysis.

**Total Variance Explained**

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %		% of Variance	Cumulative %
1	2.030	40.596	40.596	2.030	40.596	40.596	1.706	<b>34.115</b>	34.115
2	1.266	25.325	65.921	1.266	25.325	65.921	1.590	<b>31.807</b>	65.921
3	.766	15.313	81.235						
4	.544	10.890	92.125						
5	.394	7.875	100.000						

Extraction Method: Principal Component Analysis.

**Component Matrix<sup>a</sup>**

	Component	
	1	2
Income	.508	-.711
Age	.823	-.294
HouseholdSize	.590	.441
Sex	.797	.148
maritalStatus	.333	.677

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

**Rotated Component Matrix<sup>a</sup>**

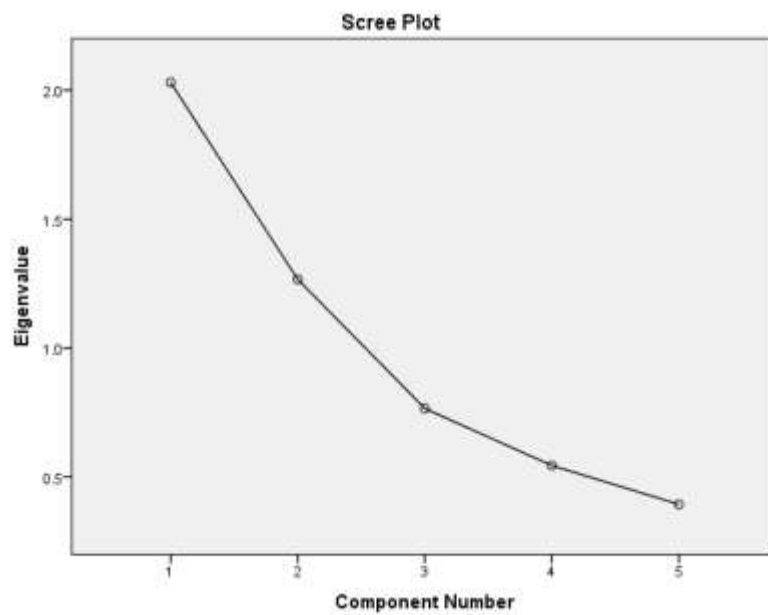
	Component	
	1	2
income	.849	-.208
Age	.816	.313
householdSize	.160	.719
sex	.508	.631
maritalStatus	-.189	.730

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.  
a. Rotation converged in 3 iterations.

**Component Transformation Matrix**

Component	1	2
1	.759	.651
2	-.651	.759

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.



## ANALYSING THE IMPLICATIONS OF PHYSICAL DEVELOPMENT ON ALTERATION OF SWAMPY LANDS IN PORT HARCOURT NIGERIA

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### Abstract

*The trajectory of Population growth and the physical development of swampy lands are topical issues among environmentalists globally. This is pertinent given the socio-environmental implications of building-up swampy lands. However, this appears not to be so in a developing country like Nigeria going by both practice and research attention. This study therefore set out to unravel pertinent issues with swampland development in Port Harcourt and determine the pattern and consequences of the encroachment into swampy lands. The research employed structured questionnaire techniques for data collection while Spearman Ranked Correlation and Mathematical percentage were the analytical tools used. The findings show that population, technological advancement, household income and community affairs were the key significant factors for sprawling and by extension the encroachments of development on the swampy land areas in Port Harcourt urban space. The consequences of swampland disappearance include loss of fishing settlements, water front dispute, and loss of agrarian land. Others are obstruction of water ways, flooding and pollution of natural water bodies. The study recommends deliberate planning and development of the sub-urban areas as means of reducing pressure on Port Harcourt swampy land areas among others.*

**Keywords:** *Physical Development, Swampland, encroachment, Alteration and Port Harcourt.*

### Introduction

Increase in human population appears to prompt concentration of anthropogenic activities in swamp areas that should have been used for other uses like agrarian, recreational or other less intensive related developments. This hampers access to swampland especially for nature designated land uses like agriculture, forest reserved and natural open spaces. Swampland denotes a woody and transitory wetland constituted by land and aquifer environment. According to RobMcInnes (2010) swamplands include lakes and rivers, swamps and marshes, wet grasslands and peat lands, oases, estuaries, deltas and tidal flats, near shore marine areas, mangroves and coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans. Swampland advantages include provision of services such as food and fibre which are essential for human welfare, and regulating services, such as recharge of groundwater and protection from natural hazards which are critical to sustaining vital ecosystem and functions. Wetlands also have considerable aesthetic, cultural, educational and spiritual values and provide sustainable opportunities for recreation and tourism. The impacts of human activities on wetland include; direct habitat loss (from development, land reclamation, roads, in-stream dredging), altered water regime (from dams/barriers, stream redirection, hard surfacing, water extraction), pollution (from garbage, sewage, oil and chemical spills, pesticides, airborne toxins), introduction of exotic species (weeds, pests and domestic pets) and other ecosystem modifications (for example, altered fire regimes, dieback and changes in salinity (Guto, 2010). The size and location of swampy regions varies all over the globe while the area may be dominated by fresh water, brackish water, or seawater. The freshwater swamps could be creek, lake, river, proud, brook and stream commonly found inland, however saline swamps are typically located within the coastal regions. Both freshwater and saline swamps exist in Port Harcourt urban areas. Although Port Harcourt appears to be endowed with huge tract of swampland, encroachments on freshwater swamps particularly, permanent structures have become a common phenomenon. This is worrisome in view of the socio-environmental implications of the physical development (built-up) of swampland on the city system.

In developed countries, the place of socio-environmental implications of the physical development encroachment on swampland among the environmental experts have long been a focus of critical discussion among researchers, but less attention has been paid to it in developing countries and Nigeria in particular. This is evident from the wanton destruction of swampland through concentration and concerted anthropogenic encroachment among others. The scale and speedy urbanisation in Port

Harcourt urban space has created the physical development (built-up) of preserved swampy lands. These built-up areas are caused by population pressure and associated with different socio-environmental problems. The physical development on swampy lands increased when democratic leadership that granted access to looting of public fund took over Nigeria urban governance since 1999-date (Ubani, Bumaa and Alaci, 2020)

As the physical development or encroachment continues in swampy environment, there is need to get better understanding of the major land use activities that encroaches swampy area. Studies that establish nexus of environment and physical development are few and not address such issues relating to swamp land. For example, Asad, Sana and Muhammad (2014) study on population growth and urban expansion focused on Bahawalpur region of Pakistan, just as Hannes and Jennifer (2019) did a broad examination on the effect of population growth on the environment across the European regions. Sverre (1996) examined Population pressure and land degradation in Ethiopia. Local studies on Nigeria including Digha, Imaitor, Ariwadum and Osuji (2018) addressed the influence of population growth on land-use in Calabar Metropolis; Ignatius (2019) did a broad study on spatial impacts of rural population pressure on agricultural land use in Nigeria while Tifwa and Alaci (2016) studied Goods as Alternative Payment Vehicle in Contingent Valuation focused on wetlands in around the confluence in Lokoja, Kogi State. Indeed, available literatures are either about other parts of the world or about other parts of Nigeria and has not address the peculiar situation of the study area. Therefore, the aim of this research is to investigate the socio-environmental implications of swampy land development in Port Harcourt urban space through an empirical discussion of the causes of vanishing swampland and the consequences of population pressure on swamplands Sverre (1996) analysed the population pressure hypothesis of Ethiopian highlands through quantitative methods. The hypothesis stressed that underneath comparable physical conditions deeply battered areas occur in extremely populated regions, the result implies that as pressure from people and livestock surpasses some threshold, a rapid degradation of land take place.

Employing multiple data sets from the Chitwan Valley Family Study in Nepal, Dirgha and Lynette (2007) tested the impact of land use on early child bearing. The analyst stressed that agricultural lands must encourage early childbirth in the settlement while land earmarked for public purposes should be discouraged from it in totality. However, their findings demonstrated that people from districts with larger proportions of land under farming experienced early childbirth at rates higher than those from areas with slighter scopes. Meanwhile, people from districts with larger sizes of land under public infrastructure experienced early child birth at rates lower than those from zones with smaller proportions. Hamisai, Musisi, Raban and Frank (2005) observed worsening environmental direction in the form of deforestation, increased soil erosion, decline in grazing resources and expansion of arable land into marginal areas. In furtherance, they maintained that high population density is in continuous initiation of unsustainable land use practices, releasing population pressure by land redistribution promises to offer long-term alternatives. Anette (2001) addressed matters related to field encroachment and land use changes and pattern in the desert regions. The research developed a model that identified land use pattern or changes as a-driven element. The picture that supports development efforts and policy works for environmental improvement in the said region often designates changes in agricultural landscape systems as a single steering expansion of land in response to population pressure and resource degradation. The work concluded that the proposed models of land use pattern paths as well as the resilience systems have to recognise a strong random element related to unforeseeable events.

In the assessment of the effect of population growth on carbon dioxide (CO<sub>2</sub>) discharges and urban land use change from the year 1990 – 2006, Hannes and Jennifer (2019) employed the statistics of 1062 counties of 22 European nation and the data was analysed via panel regressions, spatial econometric models. The result stressed that regional population growth was responsible for carbon dioxide (CO<sub>2</sub>) release and urban land use that expanded in Western Europe. But the study of Ignatius (2019), determined the magnitude of impacts of population pressure on agricultural land practices in Nigeria. His studies pointed out that inadequate qualified pragmatic research is required for holistic inferences on the dynamics of population-land connexion and the associated agrarian land use in the

country. However, the investigation applied linear regression coefficients for multiplication of the impacted variables through the STIRPAT prototypical. Subsequently, classified the state conferring to their points of impacts based hierarchical gathering breakdown and plotted by GIS and Arc View 3.2a. The findings proved that the model explained 95% of the disparity of effect on agricultural land use and that the south eastern states are witnessing the critical impact as a result of rural population pressure. The study also provides an outline for ordering the regions in the country for suitable cultivation and rural development. Masahiro, Yukio, Taro, and Ryutaro (2000) were of the opinion that comparable nature of population increase impacted on the land fluctuated distinctly. But in the area of Heli, a decline in land efficiency in respect of disproportionate agricultural persuaded agriculturalists to curtail the unplanted period but bring about more land degradation and difficulties in increasing food production. With regard to divergence, Wenani residents managed to survive with the population increase that expanded districts for farming and probably stand to increase the people's contemporary invention glassy, even if gradually normal disagreements on land privileges ought to decline the residents's opportunity to fruitful zones. That in 1994 climatic worries, land and means of crops harvesting had three spells higher in Wenani than Heli where residents are under hardship and critical food scarcity. Their analysis revealed that the current impacts of population pressure on food security varies among the communities, based on native setting and survival design while deforestation, urban enlargement, farming, and other anthropogenic concentration has significantly changed the Terrain's scenery.

Within the sub region of Pakistan and Sri Lanka of India, Khalid, Himayatullah, Muhammad, Zohra, and Muhammad (2011) found that uncontrolled population growth rate encourage injurious changes on the environment or settlement between 1985 - 2009. They buttressed that population increase encourages high demand of more production which may be triggered by escalation of arable land and rising population that gives pressure on farming land, pressurising the agriculture on land inferior and poorer eminence weakening. Amadi, Youdewei and Ogbuji (2021) revealed that major land use types identified in the research alongside wetlands are built up areas, water bodies, farmland, and vegetation. The findings from the research revealed that in 1990, wetland occupied a spatial extent of 123.23sqm of the lands in the study zones. Consequently, in the year 2020, there was a drastic change as wetland size reduced to 9.74% of the total land use of the study area, conversely, built up area increased drastically.

Despite the recreational and tourism benefits of swampy lands, such as the control of flood and storm water flow, water resources useful for household consumption and as habitats to fishes and shellfish, swampy land areas especially in the urban areas are usually encroached on and converted to other forms of incompatible uses. Accordingly, relevant and tropical trees found in fresh water swamp, usually absorb higher capacities of carbon and enhance standardize environmental temperature. Beside the shoreline, mangroves swamp deters storm, function as greenbelt and absorb more carbon at the same rate with the terrestrial forest. The community of swampland also retains plants, animals and supports other tremendous biodiversity that could be monetized and tagged zones of recreational occasions as a result of sightseeing, hiking, fishing, hunting, boating, bird watching, and photography services. Also, it provides spiritual, religious, and sacred important connected with the aboriginal spiritualities and subclass of socio-cultural significance while the codification and spiritual knowledge beacons on myth, allegory, personification of divinities, enchanted properties, and demonstration of spiritual life expectancy.

Wali (2015) concluded that urban development in swampland ecosystem for human settlement, agriculture and industrial development is one of the biggest threats to wetland conversion and management. The analysis calls for intelligent uses of swampland resources and advancement of formal preparation to ensure that swampland strategies may be completely involved in physical planning process across environmental profession.

### **Statement of the Research Problem**

Generally, there is increase of encroachments on swampy lands across riparian urban locations in Nigeria. In the 90s, when Nigerian towns and cities like Port Harcourt experienced less level of urbanisation, population pressure and sprawl, the use of swampy lands appear to be initially limited to



agricultural, spiritual, recreational and tourism values. However, practical analysis has established that swamplands declined from 170.19km<sup>2</sup> in 1999 to 37.61km<sup>2</sup> in 2009 and additional abridged to 22.70km<sup>2</sup> in 2021 (Amadi, Youdewei and Ogbuji, 2021). The increasing level of urbanisation nationally and the primate nature of Port Harcourt in its region may have accentuated the current development in the city. In and around Port-Harcourt and almost on a continuous basis, swamplands are being swallowed up with hard surfaces in the form of residential or commercial land use development. Urban sprawling has not spared the swamps either. This is not minding the attendant environmental and health implication including structural failure of buildings and waterborne sicknesses. The speedy urbanisation in Port Harcourt urban space has created physical development that has encroached on the preserved swamplands in the city. The encroachments on the swampy land areas are caused by population pressure and associated with different socio-environmental problems. As the physical development or encroachments continue in swampy environment, there is the need to get to understand the major land use activities that encroached on swampland in the study area. Port Harcourt the study area, the capital of Rivers State is one of the mega cities in south-south geopolitical zone of Nigeria. The city was founded in 1912 according to Colonial Administration of the Brittan. As at 1915, Port Harcourt had the estimated population of 500 persons but more than two million human populations presently. The built-up swampy areas of Port Harcourt comprise Awkuzu Street, Bishop Johnson, Bundu, Baptise, Captain Amangala and Cemetery area. Others are Egede/Akokwa, Emenike, Agrey, Eastern by pass, Elechi Beach and Igbukulu. Others include Marine base, Ndoke, Nepa area, Nanka, Nembe, Bonny, Okujagu and Uruala as well as Prison zone, Rax Lawson, Timber/Okwelle, Tourism Beach, Udi Street, Nsukka and Borikiri are all important areas built for various land uses through environmental landfilling procedure (Olatunde and Olalekan 2015).

Buildings in swamplands are not only caused by the demand for housing but also as a result of public interest on reclamation of swamplands for urban development are responsible for the outcome of speedy sprawl (Sithole and Goredema 2013). The situation in the city may be summed up to mean the scale and speed of urbanisation in Port Harcourt urban space has led to the physical development of swampy lands. This is a consequence of population pressure and associated socio-environmental issues of access to land for housing. The rising rate of swampland development is worrisome. The encroachment via physical development despite its implications may suggest that policy makers are not interested in evolving pragmatic measures capable of reducing urbanization encroachment on swamplands. Therefore, the incidence of wetland losses within urban areas is not likely to abate. While sand-filling of wetlands for economic uses appears to be gainful not minding persistent flooding associated with it, among other implications is the loss of valuable properties which are painful realities associated with such practices. Thus, the study x-rays the factors responsible for the conversion of swampy land areas to physical built-up areas in Part Harcourt as well as examines the consequences of this encroachment.

### **Methodology**

The survey research design was adopted in this study through primary and secondary sources of information. The secondary data were obtained from previous and relevant work on socio-environmental implications of the physical development of swampland and related areas from published materials. The published materials were sourced from textbooks, conference materials and journals. The primary data utilized by the research was gotten from environmental observations and questionnaire designed on 4-point likert scale that encompasses very strong reason, strong reason, good reason and not a reason at all. The questionnaire draws responses from the households residing in swampy communities of Port Harcourt. The questionnaire contained questions narrow to consequences of population growth on spatial extent of available swampland, physical development, socio-economic implications and respondent's personal traits. The research sample frame originated from the area delineated for examination and distributed the total number of Six hundred and thirty-two (632) questionnaire while an average of one (1) household was sampled in every selected individual compound of the selected communities. The larger nature of the area under research encouraged the sampling of six communities built on swampland. The sampled are Okwelle, Nsukka, Udi, Tourism beach, Bonny Street and Elechi Beach. Five hundred and sixty-one (561) copies of the

questionnaire representing 92 percent were returned from respondents. Details of numbers and the percentages of the questionnaires distributed to the six sampled communities is presented in Table 1

**Table 1: Distribution of Questionnaire across Sampled Communities**

s/n	Urban Streets	Projected Population	Household Population	Sample Size	%
1	Okwelle	20684	4500	122	20
2	Nsukka	11593	1954	97	15
3	Udi	9903	964	122	20
4	Tourism Beach	18473	2743	97	15
5	Bonny Street	28878	6813	72	10
6	Elechi Beach	40534	8453	122	20
	Total	130065	25427	632	100

Researchers field work 2020

### Discussions

The analysis of spearman’s rho correlation coefficient proved that significant relationship exists between the causes (technological advancement, population, income and indigenous factor) and built-up spatial zones of swamplands. The analysis buttressed that technological or technical facet gained from high education exposed residents about the formal concentration of anthropogenic or physical activities on swamp land. The analysis detailed a correlation coefficient of .274 and thus, implies that positive link exists between technological advancement and physical development of swamp and arable lands in Port Harcourt region of Nigeria. However, the level of technological advancement and application in physical development of Nigeria swampy areas stood at higher rate as engineering technology and environmental professional remains the key drivers for loss of swamp values. These keep on increasing domestics vanishing of swampland such as water bodies, farmland, and vegetation and sometimes lead adverse environmental problems unlike the western world where cities are built on the sea and marshland without adverse effect.

The analysis between income and built-up urban swampy areas in Port Harcourt donated association factor of .258 and thus, suggests that there is a positive connection between individual, cooperate bodies and organisations income and loss of urban preserved swampy areas to other land uses in Port Harcourt Nigeria. This implies that, the political class, purchase and sand fill swampy areas in the name of acquiring at least a particular property formally or informally in the guarding city of Port Harcourt and its environs. The breakdown for population growth and physical development (built-up) of swampy lands in Port Harcourt urban was found to correlate with r-value of .268 and thus implies that there is a significant relationship between population pressure and conversion of urban swamp land to human settlement in Port Harcourt urban space. This implies that the escalated and uncontrolled human population struggled for available land and where suitable lands are not readily available, swampy land areas becomes an option. The implication of this is that about 27% increase in population between 1999- 2020 needs land to occupy, forcing low-income class in particular to settle in areas characterise as slums, shanties, squatters’ settlement including available swampy areas. On the side of built-up swampy areas and community members, the analysis held that significantly positive relationship exists between selling and leasing of swampland by the community members of Port Harcourt urban (.295). This means that 29% increase in built-up swampy areas in Port Harcourt urban is cause by community members who exercise ownership over the swamp property and sales the zones for perpetuity and without the consideration of its natural values. The research suggested that the quest for money making venture triggers the perpetual sale of swamp among the community members who felt that the only source for enriching themselves is by selling and reselling of already sold or leasing of swamplands favourable and naturally designated for agriculture purposes to other uses.

**Table 2: Reasons behind the Conversion of Swamplands Spaces in Port Harcourt**

s/n	Swamp/Wetland Land Losses	Spearman Coefficient Square Statistics	Sig	Number
1	Technological advancement	.262 **	.000	632
2	Household Income	.258**	.000	632
3	Population	.268**	.000	632
4	Community Affairs	.295**	.000	632

Source: Field Survey, 2022

The mathematical percentage (M.P-%) analysis as presented in Table 3, shows the consequences of encroachment on swamplands. The Table shows the factors responsible for the conversion of swampy land areas to built-up areas and its consequences on Port Harcourt landscape.

**Table 3: Consequences of Swamplands Alteration in Port Harcourt Urban, Nigeria**

s/n	Environmental problems	Mathematical percentage	Metro-observation
1	Loss of agrarian land	21	Urban growth
2	Obstruction of water ways	20	Urban growth
3	Loss of fishing settlement	17	Urban growth
4	Flooding	14	Urban growth
5	Pollution of water bodies	115	Urban growth
6	Water front dispute	13	Urban growth

Field Survey 2022

Several factors were identified and associated with population pressure on swampy land areas of Port Harcourt. The highest factor is the loss of agrarian land to physical development or built-up area while the list is water front disputes in the swampy land areas (Table 3). Physical development such as residential, transportation, commercial, industrial and institutional land uses has encroached immensely into swampy regions regardless of the adverse socio-environmental implications on fishing settlement, water front dispute, building collapse/structural deflection, loss of agrarian land, obstruction of water ways and pollution of natural water bodies. The quantity and the percentage loss are as shown in Table 4.

**Table 4: Physical Alteration of Swamplands in Port Harcourt Nigeria from 1999-2021**

s/n	year	Swampland Type	Built-up changes(km <sup>2</sup> )	Percentage
1	1999-2009	Fresh water & Sea	170.19km <sup>2</sup> – 37.61km <sup>2</sup>	45.00
2	2010-2015	Fresh water & Sea	37.61km <sup>2</sup> - 22.19 km <sup>2</sup>	35.00
3	2015-2021	Fresh water & Sea	22.19km <sup>2</sup> -11.07km <sup>2</sup>	20.00
	Total	Fresh water & Sea	2229,99km <sup>2</sup> -70.87km <sup>2</sup>	100.00

(Adapted from Amadi, Youdewei and Ogbuji 2021)

The consistent pressure and competition for the swerving of reserved swampy areas is alarming and the present analysis discovered that the probability of other land uses taken the natural designation of swamplands may record 0.123 (15.5%) in 2030, 0.212 (25.3%) in 2040 and 0.3133 (58.2%) in 2050. This implies that urban expansion triggers higher demand or physical consumption of swampy regions and upsurge the indefensible environmental ecosystem of Port Harcourt swamp areas. The analysis and observation upheld the work of Olatunde and Olalekan (2015) who stressed that swamplands are sand-filled for physical development purposes. Their work revealed that wetland diminished from 150.17km<sup>2</sup> to 42.70m<sup>2</sup> 1984 and thick vegetation and water bodies declined by 35.6% and 41.48 respectively while built up area or zone increase from 18.63km<sup>2</sup> to 205.89km<sup>2</sup> .between 1984 – 2015. However, wetland gained 12.51%, 23.73%, and 32.88% opportunities of converting to settlement in the next 10, 20 and 30 years respectively. The study summarised that farming and construction activities need to reduce drastically. See Table 5 below.

**Table 5: Forecast/Prediction for Disappearance/ Alteration of swampland in Port Harcourt**

s/n	Projected year	Spatial Reduction (SR)	Percentage (%)
1	2030	0.123	18.5
2	2040	0.212	27.3
3	2050	0.313	54.2
	Total	0.648	100.0

Field Survey 2021

**Conclusion and Recommendations**

This research has made known the reasons, consequences and predictions of physical development, alteration or built-up environment taking over almost all the swamp or wetlands of Port Harcourt. Although all of technological advancement, income, and population and community affairs showed positive correlation but population and community affairs were the most significant reasons for the alteration. In the same way, the loss of agricultural land and obstruction of water ways was found to be the most significant consequential effect of alteration of swampland among the display of six (6) consequences. It is in view of the afore-mentioned that the following recommendations are put forward. It is the utmost view of the analysis that since physical development in Port Harcourt is spreading and about taken over the swampy regions naturally protected for agriculture and other related uses, there is need to develop other satellite towns that will salvage Port Harcourt from the contributions of technological advancement, financial buoyancy, community commitment and load of population pressure in alterations of swampy areas. To reduce or decline the consequences of population pressure on swamplands areas, advocacy visit to the government should be embarked upon by stakeholders in the built environment. Such stakeholders like the Nigerian Institute of Town Planners (NITP) and Town Planners Registration Council (TOPREC) could pay encouragement visit to the leadership of the government, relevant Ministries, Department and Agencies (MDAs), among others to re-repeat or establish the menace and challenges of physical alteration/development of swampland and the need to focus on the development other small and medium sized urban centres in the state. Physical and regional planning measures should be adopted by the government to deflect physical alteration and predictions of swamplands disappearance in Port Harcourt through deliberate physical planning measures. This can take various forms including adopting but not limited to measures such as the preparation and implementation of master plan for small and medium sized urban centres, provision of serviced plots of land at encouragingly low cost, granting tax holiday for a period and security for industries and firms that locate outside the city of Port Harcourt.

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## STRATEGIES FOR IMPROVING THE PROFITABILITY OF NIGERIAN CONSTRUCTION CONTRACTORS

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### Abstract

The construction business environment has potential to undermine contractors' profitability. Yet, profitability is crucial to the success, growth and survival of construction contractors. This study identifies the strategies for improving profitability of construction contractors in Akwa Ibom State, Nigeria. It also determined if any agreement exists among small, medium and large construction contractors on the key strategies for improving profitability. Simple random sampling technique was used to select a sample size 279 contractors of different categories. Data were collected with the aid of a well-structured questionnaire and were analysed using mean scores and Kendall Coefficient of Concordance. A total of 173 adequately completed questionnaire were analysed. Efficient planning of site production process ranks as the most effective strategy for improving contractors' profitability. Other effective strategies for improving profitability of construction contractors include good site management, submission of bid with reasonable profit margin and timely completion of projects. Kendall Coefficient of Concordance ( $W=0.530$ ;  $p=0.000$ ) revealed that there is a moderate but statistically significant agreement among small, medium and large construction contractors on the strategies for improving profitability of contracting firms. It is recommended that construction contractors should efficiently manage site production process and endeavour to complete ongoing projects on schedule. Moreover, contractors' bids should include reasonable profit margins.

**Keywords:** Construction, contractors, profitability, strategies

### Introduction

Construction contractors are considered as entrepreneurs within the construction business environment. They include firms or organizations that execute construction work for a client and offer their expertise in exchange for financial rewards (Mafimidiwo and Iyagba, 2015). The Nigerian construction market provides opportunity for both foreign construction contractors (FCCs) and indigenous construction contractors (ICCs) to operate. However, a significantly larger volume of work is awarded to the FCCs, thereby giving them a substantial comparative advantage over the ICCs. The latter are therefore often left to struggle for survival in the face of intense competition and relatively low profit margin (Tunji-Olayeni, 2015). Traditional economic theory assumes that one of the major goals of firms is to maximize profit (Abu Bakar *et al.*, 2011; Macharia, 2016; Babalola and Anifowose, 2018; Barashkova, 2018). An appropriate level of profit is required by the contractors in order to survive and grow in the construction business environment (Lee, 2009; Lam, 2017). Profitability is one of the most important measure of a firm's performance (Skuflic *et al.*, 2018) and an important indicator of a firm's success (Ogunleye, Adeyemi and Adamu, 2018). It is a major factor in the going concern of a business and is the measure of management efficiency in the use of organizational resources as it reflects the relative ability to earn income on asset (Owolabi and Obida, 2012).

The risks inherent in construction business have threatened the level of profitability, and have also increased the possibility of failure among construction firms (Kivrak and Arslan, 2008). Besides, the dynamic nature of the construction industry, coupled with the impact of globalisation, technological advancement and changing client need, pose a huge challenge for the profitability, survival and success of construction enterprises (Abd-Hamid, Aziza and Sorooshia, 2015; Buys and Rooyen, 2014; Adamu *et al.*, 2011). Moreover, construction-contracting business is highly competitive; there is a strong and unhealthy level of competition in the industry as construction contracts are often awarded to the lowest responsive bidder. Construction contractors are therefore often compelled to reduce profit margins in an attempt to secure contracts as the lowest bidder (Jagafa and Wood, 2012). It therefore suggests that construction contractors are often faced with a difficult situation in which they must submit tenders with a reasonable profit level to keep them in business and at the same time remain competitive against other contractors in the sector (Akintoye and Skitmore, 1991). Sadly,

studies have shown that more than 50% of failure in construction business were due to low profit margins resulting from the very intense competition (Kivrak and Arslan, 2008).

The construction sector is a key contributor to the nation's economy, and contractors are important participants in the sector. The failure rate of construction firm has increased significantly (Abd-Hamid *et al.*, 2015), and profitability is considered a key contributor (Marachia, 2016). According to Chan and Martek (2017), evidence suggests that construction companies reporting low profitability are at increased risk of collapse, and failure to acknowledge this may lead to serious implication for the construction industry and the economy. Periods of recession or economic downturn are particularly challenging for construction firms as there is a general decline in the volume of construction activities, and profit margin is usually low due to increased competition. Nigeria's economy slump into recession in 2016 and is still recovering from the consequences of that catastrophic economic disaster. Moreover, the advent of the COVID-19 pandemic has further significantly affected construction sector output. It is therefore imperative for competing construction companies to formulate and implement strategies for survival (Buys and Rooyen, 2014).

Despite the harsh construction business environment in Nigeria that has limited contractors' capabilities (Bala *et al.*, 2009) and threatened their survival, growth and competitiveness (Adamu *et al.*, 2011; Odediran *et al.*, 2013; Tunji-Olayeni, 2015), there are few empirical studies on construction contractors' profitability. Few related studies have been undertaken in the United Kingdom (Akintoye and Skitmore, 1991), Hong Kong (Lee, 2009), United States of America (Arora, 2012), Poland (Bolek and Wilinski, 2012), Malaysia (Yin, 2013; Zaid *et al.*, 2014; Lam, 2017), and Croatia (Skufflic *et al.*, 2018). At the continental level, Macharia (2016) carried out a study on the relationship between capital structure and profitability of construction firms in Nairobi, Kenya. In addition, Adjei *et al.* (2018) explored the significant cash flow factors influencing profitability of large construction contractors in Ghana. However, studies on construction contractors' profitability in Nigeria are scarce, as most research works on firms' profitability in Nigeria appear to concentrate mainly on the manufacturing sector. The dearth of sector-specific local studies on the subject implies that the formulation of profitability improvement strategies for construction contractors may be difficult. It is against this background that this study was undertaken to identify the strategies for improving profitability of construction contractors in Nigeria.

It has been established from literature that the construction business environment has potential to undermine contractors' profitability, with grave implications for the contracting firms, the construction industry and the national economy at large. Although construction managers have the onerous task of ensuring that their organisations are profitable, they often have limited knowledge of strategies for maximizing profitability of the firms (Adesiyani, 2016). Generally, empirical and theoretical literature on construction contractors' profitability in Nigeria are scarce. The objective of this study therefore is to identify the strategies for improving the profitability of construction contractors. According to Lee (2009), profitability varies with firm size, yet studies that examine the views of different sizes of construction contractors on profitability are scarce. Consequently, the study also examined the influence of contractors' size on the strategies adopted for improving profitability.

## **REVIEW OF RELATED LITERATURE**

### **Profitability of construction firms**

Babalola and Anifowose (2018) argued that despite being closely related, and mutually inter-dependent, profit and profitability are two distinct concepts. Lee (2009) posited that while profit refers to the revenue obtained by a firm in excess of its expenditure, profitability is a measure of the return on capital invested or committed to a business. In other words, profitability reflects the final outcome of business operations (Babalola and Anifowose, 2018). Profitability is a common measure of an organisations growth and progress in terms of its efficiency and productivity (Foyeke *et al.*, 2016). It is an important measure of the performance of a construction firm (Skufflic *et al.*, 2018). It is also a key indicator of a firm's competitiveness as well as the quality of its management (Lee, 2009). It is believed that profitability of construction firms is capable of promoting growth and sustainability of

firms as well as the construction industry at large (Tunji-Olayeni, 2015). Profitability is therefore very crucial to the survival and success of construction contractors.

### **Factors affecting profitability of construction firms**

According to Bolek and Wilinski (2012), profitability of construction contractors is affected by internal and external factors. While the internal factors are within the control of the firm, and depend on the firm's resource, structure and working capital, the external factors include phenomena beyond the control of the firm. In other words, the external factors comprise everything that is not the result of the decision taken by the management of the firm. The risks inherent in construction business has often threatened the level of profitability of contractors, and has also increased the likelihood of failure among construction firms (Kivrak and Arslan, 2008). Furthermore, the dynamic nature of the industry, coupled with the impact of competition, globalization, technological advancement and changing client need, poses a monumental challenge for the profitability, survival and success of construction companies (Abd-Hamid, Aziza and Sorooshia, 2015; Buys and Rooyen, 2014; Adamu *et al.*, 2011; Jahan *et al.*, 2022). In most cases, construction contractors are faced with a difficult situation in which they must submit tenders with a reasonable profit level to keep them in business and at the same time remain competitive against other contractors (Akintoye and Skitmore, 1991).

Studies have shown that more than 50% of failure in construction businesses were due to low profit margins resulting from the very intense competition for works among contractors (Kivrak and Arslan, 2008). Construction contracting business is highly competitive, with the strong and unwholesome level of competition being attributed to the large number of contractors in the sector (Arslan and Kivrak, 2008; Oyewobi, Windapo and Cattel, 2014). In the construction industry, contracts are often awarded to contractors who submits the lowest responsible and responsive bid. Therefore, construction industry profit is significantly affected by the degree of competition among existing firms (Tunji-Olayeni, 2015), as very stiff competition may compel construction companies to reduce profit margins in their tenders in an attempt to secure the contract as the lowest responsive bidder (Jagafa and Wood, 2012).

Fluctuations in construction demand is also a major concern of the construction sector (Christidis and Kalfakakou, 1996). Dwindling demand suggests a reduction in the volume of construction works available to contractors, and by implication a reduction in business turnover. Lee (2009) observed that profitability is a function of sales volume or turnover, and that most construction firms experienced a reduction in business turnover, which negatively affected their profits and threatened their survival. Failure rates and bankruptcy are also known to be high among construction contracting firms (Abd-Hamid *et al.*, 2015; Zaid *et al.*, 2014), and financial factors have been attributed to be an important causal agent of construction business failure (Holt, 2013). Some of these financial factors include payment issues and liquidity problems which are known to influence the profitability of construction enterprises (Bolek and Wilinski, 2012; Lam, 2017; Jahan *et al.*, 2022). In the light of the foregoing, one may be compelled to agree with Akintoye and Skitmore (1991) that the low profitability level that is endemic in construction contracting business may be traceable to the highly competitive construction business environment, the desire by contracting firms to gain more market share or lack of familiarity with the numerous risks involved in construction.

Other factors influencing firm profitability include the rising cost of construction materials (Jahan *et al.*, 2022), size of the firm (Zaid *et al.*, 2014; and Macharia, 2016; Le *et al.*, 2020), degree of subcontracting (Lee, 2009; Arora, 2012), competitiveness of firm (Tunji-Olayeni, 2015), and macroeconomic factors (Zaid *et al.*, 2014; Lim, 2017). Moreover, Lee (2009) suggested that management competence, productivity, complexity of project, technical expertise of firm, degree of mechanization of site operations, profit margin, interest rates and recession are capable of influencing the overall profitability of construction contractors.

### **Strategies for Improving Profitability of Construction Contractors**

Due to the importance of profitability in construction contracting business, stakeholders have suggested some measures for improving profitability. Construction firms can increase profitability by improving profit margins on contracts or through effectively managing its capital. Moreover,



contractors could increase sales volume by tendering for more works. It has been demonstrated that the factors that effectively determine profitability are those that influence the margin on sales and the volume of activities, those that affect the use of capital, and those that affect the capital structure. Studies have shown that efficiently managed firms are able to maintain their turnover and profitability regardless of the level of total demand on the industry. Firms that engage in better site management, including improved cost estimations practices and site efficiency, often record a reduction in their overhead costs, and this in turn leads to increased profitability (Lee, 2009). Subcontracting has potential to enhance productivity and profitability, as profits tended to be higher when less work is subcontracted (Akintoye and Skitmore, 1991). However, this position remains contentious, as previous studies have also shown that a reduction in subcontracting could lead to increased overhead costs and subsequently to lower profitability (Lee, 2009).

Government actions significantly affect construction demand since it serves as the regulator and the major client for the construction industry (Christidis and Kalfakakou, 1996). This is even more noticeable in developing countries. It is obvious that construction companies earn higher profits during the peak of a property cycle, when demand for construction is high. Construction investment are often financed through loans. It is therefore apparent that fluctuations in construction output will follow changes in the interest rate. It is also evident that a rise in the interest rate could lower company profits (Christidis and Kalfakakou, 1996; Lee, 2009). Moreover, it is important for construction projects to be completed on time in order to avoid incurring liquidated damages. Additional overhead costs will be incurred where there is extension of construction period, and this undermines the predetermined profitability level required by the construction contractor (Lee, 2009).

Liquidity means the firm has adequate cash to pay bills as and when they due, and it also have sufficient cash reserves to meet emergencies and unforeseen demands (Achenef, 2016). Due to the lengthy period of time it takes to complete a construction project, Lim (2017) suggest that liquidity management be given serious attention by construction contractors. Prompt payment for construction work executed is considered as the lifeblood of a contractor's survival (Adjei *et al.*, 2018). Therefore, the fair amount of payment certified for work executed and timely progress payments are crucial for ensuring the survival and profitability of construction contractors (Lee, 2009). The construction market can change rapidly, and management is expected to respond positively to these changes by diversifying its operation. Diversification of the activities of a construction firm will help in spreading risk, and help maintain profitability even in economic downturn period. It helps in overcoming fluctuations in workloads and enhances better use of company resources. In addition, an effective manager would review the construction process from time-to-time to remove the non-productive tasks in order to increase profitability (Lee, 2009).

### **Empirical Studies on Construction Firm Profitability**

As a result of the importance of firms' profitability in the construction sector, a few international studies have been undertaken on the subject. A study by Akintoye and Skitmore (1991) examined the profitability of construction contractors in the United Kingdom (UK). The study noted that low profitability predominates the construction contracting business possibly due to the keen competition in the construction industry, the intention to gain more market share or due to lack of familiarity with risks involved in construction contracting. Christidis and Kalfakakou (1996) reviewed profitability in the Greek construction sector and concluded that the volatility of profitability severely inhibits long-term planning and investment. The study also identified liquidity as the main problem affecting profitability in the construction industry.

Lee (2009) conducted an investigation into the factors that affect the profitability of construction companies in Hong Kong. The thesis analysed income and expense data of 891 construction firms in Hong Kong from 1981-2002, and found that profitability varies with company's size, extent of subcontracting and material content in projects. Specifically, the result of the study shows that as size of a construction firm increases, profit margin declines initially, then increases up to a particular firm size and then slowly diminishes when the firm size exceeds the optimal level. The implication of the result is that there is an optimal size for a construction company that makes it more profitable. Bolek and Wilinski (2012) contended that liquidity and profitability are two fundamental aspects of a

company's activities, and are key indicators of its performance. The authors went further to confirm that financial liquidity influences the profitability of Polish construction firms. Furthermore, Zaid *et al.* (2014) examined the determinants of profitability of public construction companies in Malaysia from 2000-2012, using Return on Equity (ROE) as a measure of profitability and sales (turnover) as a measure of company size. The results indicate that liquidity and firm size have significant positive relationship with profitability while a negative non-significant relationship was found between capital structure and profitability. Interestingly, macroeconomic variables were found to exert non-significant impact of profitability.

Achenef (2016) investigated the factors affecting the profitability of twelve private construction firms in Ethiopia, using panel data covering for a five-year period from 2011-2015. Return on asset (ROA) was used as a measure of profitability, and secondary data obtained from individual construction firm's annual financial report were analysed. The results show that liquidity and working capital management have significant and negative relationships with profitability. However, firm size had negative and insignificant relationship with profitability. A study by Macharia (2016) examined the relationship between the capital structure and profitability of construction and allied firms listed at the Nairobi Securities Exchange. The outcome revealed that there is a weak negative relationship between long-term debt and profitability. The study also noted that firm size was positively related with profitability. Lim (2017) attempted to identify the macroeconomic variables influencing construction firm's profitability using a top construction contractor in Malaysia as a case study. The study used the Return on Asset (ROA) as a measure of profitability and result indicate that liquidity, GDP, inflation rate, exchange rate and total assets size are not significantly related with ROA, and therefore have low impact to the profitability.

Similarly, Adjei *et al.* (2018) revealed that delayed payment greatly impacts on the profitability of projects and on the survival of contractors in Ghana. Moreover, Skuflic *et al.* (2018) investigated the determinants of construction sector profitability in Croatia using data obtained from 8678 construction companies sampled between 2003 and 2014. The researchers used net profit after tax as a proxy for profitability. It was found that company size, sales growth, lagged profitability and number of employees show strong relationship with profitability. At the domestic level, studies that specifically focus on the profitability of firms in the construction sector are limited. Most of the available studies on firm profitability have been largely been undertaken among firms operating in the manufacturing sector. The results of a study by Ogunleye *et al.* (2018) revealed that there is a negative non-significant relationship between firm size and profitability of manufacturing firms. This was not consistent with findings of an earlier study by Babalola (2013) where firm size (measured by total asset and total sales) had a positive impact on profitability of manufacturing companies.

Pordea, David and Mates (2020) conducted a study on the influence of Operating Cash Flow and Current Ratio on profitability of construction firms in Romania, with Return on Equity used as measure of profitability. The result of the linear regression analysis suggest that both financial variable did not exert a statistically significant influence on profitability. Omopariola *et al.* (2021) examined the level of financial performance of 32 selected construction companies in South Africa. Result indicates that companies with specialisation in civil engineering and project management have higher liquidity and profitability. Moreover, a study by Daryanto, Rizki and Mahardhika (2021) analysed the financial performance of construction firms in Indonesia before and during the Covid-19 pandemic. The researcher used the Altman Z-score to measure the bankruptcy prediction of construction firms. Data were collected from the company quarterly financial statement from 2019-2020, and t-test was used to compare the data before and during the pandemic. Result shows a lower financial performance during the pandemic, suggesting that Covid-19 pandemic greatly affected company financial performance. Most of the available literature on firm profitability in Nigeria have been from studies undertaken among firms operating in the manufacturing sector. The paucity of construction-specific studies on the subject creates a huge challenge for the formulation of profitability improvement strategies.

## Research Methods

A survey research design is adopted in this study. The study area is Akwa Ibom State, which is located along the eastern coastline of the Niger-Delta and is in the South-South geopolitical zone of Nigeria. It has a land area of 6900 square kilometres (km<sup>2</sup>) and a population of 3.9 million people according to the 2006 national census (National Bureau of Statistics (NBS), 2013). It is one of the most densely populated states in Nigeria. It is also a leading oil producing state and has been receiving huge revenues from the federal allocation. Recently, the state has undertaken a large volume of construction activities, thereby attracting foreign and domestic contractors to the area. In addition, some indigenous contracting firms have emerged to take advantage of the boom in construction business in the area. Moreover, the high demand for residential, commercial and institutional buildings by private clients have created a robust construction market in the state. Some of the construction works and development projects are contracted to construction firms that are keen to make profit to survive.

The population of the study comprises building and civil engineering construction contractors of all sizes and categories that are based in or operating within Akwa Ibom State, Nigeria. These include small, medium and large construction contracting organisations. Citing an online business directory platform, Asuquo, Udo and Otali (2020) noted that there are 918 building and civil engineering construction contractors operating in the study area. The taxonomy of contractors was based on the classification of enterprises provided by NBS (2019). The classification was based on two criteria, which are the number of employees and value of asset (excluding land and buildings). The report classifies enterprises with less than 10 employees (or asset less than ₦5 million) as micro size, 10-49 employees (or asset of ₦5-49 million) as small size and 50-199 employees (or asset of ₦50-500 million) as medium size. This implies that enterprises with more than 200 employees can be designated as large-sized.

The NBS (2019) report also provided a decision rule referred to as the dual-criteria class limit. It implies that where a conflict of classification arises, the employment-based classification takes precedence. It therefore appears that the employment-based classification of firm size is given greater attention than other forms of classification. For the purpose of this study, the micro size enterprises have been put together with the small size category, since it may be difficult to find a truly micro size contractor in the construction contracting business. Table 1 presents the classification of contractors based on number of employees, which is an adaptation of the definition in NBS (2019).

**Table 1: Classification of Contractors Based on Number of Employees**

S/N	Size	Number of Employees
1	Small	1 – 49
2	Medium	50 – 199
3	Large	More than 200

Source: Adapted from NBS (2019).

The simple random sampling technique is adopted in this study. This is a probabilistic sampling technique where the study respondents have equal chance of being selected in the sample. The sample size was determined using Taro Yamane's formula for determination of sample size. According to Singh and Masuku (2014), the formula is given as follows:

$$n = N / [1 + N (e)^2]$$

Where n is the sample size, N is the population size, and e is the level of precision.

At 95% confidence level or 5% precision level, the sample size for a population of 918 construction contractors is calculated to be 279 contractors.

A structured questionnaire was used as the principal instrument for data collection. In an attempt to determine the suitability or reliability of the instrument to elicit the required responses from construction contractors, a pilot study was conducted by administering a test-questionnaire on four construction firms within the study area. The observations made were then be used to improve the final version of the questionnaire. Moreover, the content validity of the instrument was assessed by two senior academics in the Department of Quantity Surveying in the University of Uyo, Uyo, Akwa Ibom State. The questionnaire consists of two sections. The first section elicits information on the characteristics of the respondents, and include among others information about their professional background, nature of operation, and category and size of firms. The second section highlight the strategies for improving profitability of construction contractors and require the respondent to measure their level of effectiveness on an appropriate Likert scale. The questionnaire was administered by hand to the respondents, with the key personnel involved in the management of construction business of firms as targets

Data for the study was processed and analysed with the aid of SPSS (Statistical Packages for Social Science). Data measured on nominal and ordinal scale were analysed using descriptive statistics such as frequency distribution, percentages and mean score. The hypothesis of the study was tested using Kendall Coefficient of Concordance (W). Kendal Coefficient of Concordance (W) is a non-parametric used when there are three or more independent groups, and was therefore applied in resolving the hypothesis. Non-parametric statistics are more suitable to use in this study, since data were obtained using Likert-type scale where there may be wide variation in the opinion of respondents. Moreover, there is no need for the assumption of normality of the variables where non-parametric tests are adopted (Ostertagova, Ostertag and Kovac, 2014).

#### **Data Analysis and Presentation**

Data collected from the responses from the questionnaire were analysed and presented in tables and figure. The presentation is in order of the appearance of the inquiries from the research questionnaire. Table 2 shows the summary of the characteristics of the respondents. Engineers constitute the highest proportion of respondents with 34.1% while Builders, with 13.3%, make up the least proportion of respondents for the study. Majority of the respondents (53.3%) are engaged solely in building construction works while the least share of 19.7% were drawn from contractors concentrating on civil engineering operations. About 73% of the respondents have worked in the construction industry for more than 10 years, with about 47% of the respondents working in firms with not less than 50 employees.

More than 84% of the respondents have been engaged in more than one construction contracts in the last one year suggesting that they may currently have workload at hand. In terms of annual turnover, about 61.3% have made construction sale volume of not less N50 million, suggesting that there are more respondents be in the medium to large firm categories. In addition, majority (about 51%) of construction firms sampled in the study employ the net-profit-after-tax approach as a measure of firm profitability. Others use return on investment (about 27%) and amount of profit divided by turnover (22%) as a measure of firm's profitability. However, the result shows the net sales, return on asset, return on equity, debt-equity ratio and liquidity ratio are not used by construction contractors in the study area as a mean or approach to determination of profitability.

**Table 2: Respondents Characteristics**

	Frequency	Percentage (%)	Cumulative Percent %
<b>Designation of Respondents</b>			
Engineer	59	34.1	34.1
Architect	44	25.4	59.5
Quantity Surveyor	47	27.2	86.7
Builder	23	13.3	100.0
<b>Nature of Operation of Firm</b>			
Building construction	92	53.2	53.2
Civil engineering	34	19.7	72.8
Building and civil engineering	47	27.2	100.0
<b>Years of Experience in Construction Industry</b>			
1 - 5 years	12	6.9	6.9
6 - 10 years	34	19.7	26.6
11 - 15 years	65	37.6	64.2
16 -20 years	53	30.6	94.8
Above 20 years	9	5.2	100.0
<b>Size of Firm in terms of Number of Employees</b>			
1 - 49 employees	91	52.6	52.6
50 - 199 employees	68	39.3	91.9
Above 200 employees	14	8.1	100.0
<b>No. of Contracts Secured in Last One year</b>			
One	27	15.6	15.6
Two	68	39.3	54.9
Three	46	26.6	81.5
More than 3	32	18.5	100.0
<b>Average Annual Turnover in the last 3 years</b>			
N 1 - 50 million	67	38.7	38.7
N 51 - 500 million	79	45.7	84.4
More than N 500 million	27	15.6	100.0
<b>Approach to Determination of Profitability</b>			
Amount of profit divided by turnover	38	22.0	22.0
Return on investment	46	26.6	48.6
Net profit after tax	89	51.4	100.0

**Strategies for Improving Profitability of Construction Contractors**

Table 3 shows the mean score of the strategies for improving the profitability of construction contractors when rated by the respondents on a 5-point scale. The result revealed that efficient planning of site production process is, with mean score of 4.59 ranks as the most effective strategy for improving contractors' profitability. Other effective strategies for improving profitability of

construction contractors include good site management, submission of bid with reasonable profit margin and timely completion of projects. However, selection of appropriate market, which recorded the least mean score of 2.42, was considered as the least effective strategy for improving profitability of construction contractors. Other less effective measures for improving firm profitability include the efficient use of current assets and regulation of subcontracting with mean scores of 2.62 and 2.74 on a 5-point scale.

**Table 3: Strategies for Improving Profitability of Construction Contractors**

Strategies for improving profitability of contractors	Mean	Rank
Efficient planning of site production process	4.59	1
Good site management	4.55	2
Submission of bids with reasonable profit margin	4.40	3
Timely completion of projects	4.38	4
Better liquidity/cash flow management at firm level	4.37	5
Increased control activities by contractors	4.35	6
Increase in turnover or volume of sale	4.24	7
Improvement in managerial capability of contractor	4.20	8
Properly assessment of risks in complex projects	4.18	9
Improvement in site productivity	4.02	10
Improved payment system by construction clients	3.99	11
Close monitoring of economic environment	3.98	12
Appropriate mix of debt-equity ratio by contractors	3.82	13
Diversification of firm operations	3.80	14
Improvement of contractor's competitiveness	3.71	15
Economic order quantity (bulk purchase of materials)	3.67	16
Improvement of business skills of project manager	3.64	17
Statutory regulation of interest rates	3.61	18
Concentration of firm operations	3.60	19
Government policy to regulate market prices	3.45	20
Deployment of technology for site production	3.42	21
Engagement of technically sound team members	3.40	22
Stabilization of exchange rate regime	3.38	23
Regulation of subcontracting by contracting firms	2.74	14
Efficient use of current assets	2.62	25
Selection of appropriate market	2.42	26

#### **Agreement among Contractors on Measures for Improving Profitability**

It is hypothesized that there is no agreement among small, medium and large-sized construction contractors on the strategies adopted for improving the profitability. Kendall Coefficient of

Concordance was used to determine whether agreement exist among small, medium and large size construction contractors on the strategies for improving firm profitability. The Kendall Coefficient of Concordance (W) is used to assess the trend of agreement among respondents, and is measured on a scale of 0 to 1 (Legendre, 2005), with  $W = 0$  indicating no agreement and  $W = 1$  suggesting a perfect agreement among various groups on a particular subject. The result of the Kendall coefficient test to determine the measure of agreement among small, medium and large size contractors on the strategies for improving firm profitability indicates a moderate value for the Kendall's Coefficient of Concordance ( $W=0.530$ ). This implies that the strength of the agreement among small, medium and large size construction contractors on the strategies for improving profitability is moderate. Moreover, the asymptotic significance ( $p = 0.000$ ) suggests we reject the null hypothesis (Legendre, 2005). In other word, the researcher can deduce that there is an agreement among small, medium and large size contractors on the strategies for improving the profitability of firms.

### **Discussion of Findings**

The study considered efficient planning of site production process as the most effective measure for improving contractors' profitability. According to Lee (2009), studies have shown that efficiently managed firms are able to maintain their turnover and profitability regardless of the level of demand on the construction industry. The author further noted that firms that engage in better site management, including improved cost estimations practices and site efficiency, often record a reduction in their overhead costs, and a subsequent increase in profitability. Other effective measures for improving profitability of construction contractors, as revealed from the study include good site management, submission of bid with reasonable profit margin and timely completion of projects.

As earlier noted, the business environment in which construction operate is characterised by extreme competition. Most times, the situation constrain contractors to submit bids with comparatively low profit margin (Kivrak and Arslan, 2008). However, it is clear here that the submission of bids with reasonable level of profit margin is crucial in determining the profitability of construction contractors. Researchers have contended that more than 50% of failure in construction businesses were due to low profit margins resulting from the stiff competition for construction contracts among contractors (Kivrak and Arslan, 2008; Tunji-Olayeni, 2015). Construction contracting business is known to be highly competitive, with the unpleasant level of competition being attributed to the large number of contractors in the sector (Oyewobi, Windapo and Cattel, 2014). In the construction industry, contracts are often awarded to contractors who submits the lowest responsible and responsive bid.

Another key finding of the study is that there is a significant agreement among small, medium and large size contractors on the strategies for improving the profitability of firms. It therefore implies that the size of firm may not be important in determining the strategies to be adopted in improving contractor's profitability. This is consistent with the outcome of other studies (Akintoye and Skitmore, 1991; Lee, 2009) which reveal that there is no significant relationship between profitability and the size of a construction firm. The moderate strength of the agreement may result from the ability of large construction contractors to manage their resources much better than smaller construction firms.

### **Conclusions**

It can be concluded from the study that some of the most effective strategies for improving contractors' profitability are related to production process management, site management, tendering and time management practices of construction contractors. Another key conclusion reached in this study is that the size of the construction firm may not be important in determining the strategies to be adopted in improving the profitability of construction contractors. It is recommended that construction contractors should efficiently manage site production process and endeavour to complete ongoing projects on schedule. Moreover, contractors' bids should include reasonable profit margins. It is also recommended that construction contractors should submit bids with reasonable profit margins. In addition, it is recommended that the strategies to be adopted to improve the profitability of should be the same irrespective of the size of the construction firm, as the size of the construction firm may not be important in determining the strategies to be employed.

One of the major limitations of this study is that the findings reflect the perception of construction contractors operating in Akwa Ibom State. It would be inappropriate to use the result of study in a single resource-rich state in Nigeria to generalize on the practice of construction contractors across other states in the country. Therefore, to make a countrywide generalization of the outcomes would require a more representative sample of construction contractors across other states and regions in Nigeria. Future work could consider covering additional states in Nigeria, increasing the sample size and listing additional strategies for improving contractor's profitability. Despite the limitation, the study contributes to knowledge in that it provides insight into the strategies for improving profitability of construction contractors in Nigeria. It is an addition to the growing body of knowledge on the subject matter of construction contractors' profitability and complements existing literature on the subject, which presently are relatively scarce. The study sets the foundation upon which researchers and practitioners can develop effective measures for improving profitability of Nigerian construction contractors and provides a springboard upon which future studies can be conducted. Moreover, the study has provided location-specific strategies for improving contractors' profitability in a state in Nigeria, and has therefore provided an indication of, or insight into, the possible strategies for improving construction contractors' profitability in other parts of Nigeria.

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## NATIONAL HOUSING POLICY OF NIGERIA: IT'S EFFECTS ON AKWA IBOM STATE CIVIL SERVANTS

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### **Abstract**

*The challenges arising from the provision of affordable public housing to civil servants in many developing countries are suggested to be as a result of ineffective strategy on housing delivery. Hence, this study sought to assess national housing policy of Nigeria: its effects on housing delivery to civil servants in Akwa Ibom State. It further sought to review previous national housing policy and strategies on affordable public housing delivery to the group, it's benefits, challenges, identify and recommend measures of improving housing provision and delivery to the study group in the state. The study either accept or refute this assertion by adopting total enumeration research technique and convenience research method with a survey design to examine the subject matter. A sample size of 335 respondent civil servants drawn from Akwa Ibom State ministries were administered questionnaire to enable the researcher obtain suitable information. Data collected was then summarized using tables, frequency and simple percentages. More so, the hypothesis, effects of national housing policy on civil servants was analyzed using the Pearson's Product Moment correlation coefficient statistical tool. Findings therefore revealed that the previous national housing policy had been structured to favour the elites in the society, the strategies adopted in this regard was ineffective with 62% negative effect on housing provision and delivery to civil servants in Akwa Ibom State. Although previous housing policies were usually hindered with challenges based on this study finding, it was recommended that the present national policy should be restructured to align with the needs and yearning of the prospective users.*

**Key words:** National Housing Policy; Effects; Provision; Delivery; Civil Servants.

### **1.0 Background to the Study**

Ademola *et al.* (2015) opined that national housing policy is a set of principles outlined and pursued by government when supporting housing development, especially for civil servants. Hence, it has been recognized by United Nation Development Programme (2003) that majority of those in need of housing accommodations are the less privileged and low-income earners, which are predominantly identified in developing nations of Africa and Asia. Based on this thought, government therefore requires special housing policies to be able to assist them to afford a near decent accommodation since public property market for both renting and purchase are not always sufficient for housing demands as opined by Udoudoh (2016) and Omirin (1998).

Back here, in Akwa Ibom State, there have been existing serious challenge of housing accommodation as a result of the influx of people to the new State capital either in search of jobs or those transferring their services from Cross River State Civil Service Commission, for which they formerly belonged. This had necessitated the creation of a quasi-government agency called Akwa Ibom Property and Investment Company Limited (APICO) by the Obong Akpan Isemin-led administration with the function of developing housing units for acquisition by members of the public along a public-private sector development line as expressed in the National Housing Policy, 2003. An on the spot assessment has showed that the required estates are yet to be fully developed, while many others are at various levels of incumbent development, undertaken either by the government or through site and service scheme (Udoudoh, 2016). With this, many authors such as Ikurekong and Udoudoh (2016) and Akpan (2000) have observed that over the years the housing developed within the State by Akwa Ibom Property and Investment Company Limited (APICO) has been far beyond the financial capacity of an ordinary citizen and civil servants alike, thereby, defeating the primary objectives of forming the above parastatal (Ekott and Nseyen, 2006). It could be recalled that from the creation the of State, various governmental administrations have adopted several strategies for providing housing for the civil servants ranging from government-assisted core housing, shell stage, turnkey (build and sell) public-private partnership, site and services, but the present situation if evaluated concludes that there is little or no impact in reducing housing deficit within the State as a result of its purchase cost and the existing number of homeless people.

Also, the high cost of construction and building materials is indeed another serious problem to housing ownership by civil servants occasioned by high inflation rate. Now, the current housing policy has been in existence since 2009, and gradually running to its conclusion. Consequently, it is pertinent to assess National Housing Policy of Nigeria its effects on housing provision and delivery to Akwa Ibom State Civil Servants. It would further review previous national housing policy and strategies, its benefits and challenges to public housing delivery with a view to examining its effects, either negatively or positively, on the study group and recommend measures of improving on the housing provision so that its goal of enhancing effectiveness of housing provision and delivery could be fully achieved. This study therefore is aimed at achieving this premise

## **2.0 Review of Literature**

### **Implementation of Public Housing Delivery**

Akpan (2000) observed that from the creation of the State on 29th September, 1987, successive government either military or civilian has been doing their best to ameliorate the housing challenge in the State. This has resulted in the construction and delivery of several housing estates and extension such as Shelter Afrique, Esuene, Osongama, Ikot Akpan Abia, among others. The national housing policy has been the framework that gives direction on housing development and delivery in the country, although every State of the federation including Akwa Ibom State has the prerogative right of developing their own housing policy and programmes to assist the federal government reduce housing deficiency in their State for her citizens. In 2009, Akwa Ibom State came up with a draft housing policy with the objectives to develop and sustain the political will of government for the provision of housing for all including civil servants in Akwa Ibom State, provide adequate incentives and an enabling environment for greater private sector (formal and informal) participation in the provision of housing strength on existing public institution involved in housing delivery at the State level, encourage and promote active participation of other tiers of government in housing delivery, create necessary and appropriate institution to facilitate affective housing delivery, to promote measures that would mobilize long-term sustainable and cheap funding for the housing sector. From here it was hopeful that government shall by patronage develop and promote the use of certified locally produce building materials as a means of reducing construction cost, restructure and adequately capitalize the following institutions to effectively perform their statutory roles. Among such institutions were Akwa Savings and Loan Limited, and Akwa Ibom Property and Investment Company Limited (APICO). Also, there was need to establish and sustain secondary mortgage market to enhance greater accessibility to long-term fund for housing ownership among all segment of the State population. More so, the State government needed to grant fiscal incentives to small and medium-scale local manufacturers of building materials, provide site and services adequate for housing in the State that would cater for all categories of persons, provide statistical data for effective process of housing delivery in the State. Lastly, it needed to encourage the establishment of sustained land registries in the State and enacting supplementary law amended legislation of the Land Use Act 1978 through the National Housing Fund.

The Fund was aimed creating a reliable pool of continuous and regular flow of funds from which housing loans would be granted to the fund contributors (workers) at affordable terms of repayment (National Housing Fund Decree No. 3, 1992 now Act). The fund mobilized liquidity through fixed regular deductions/remittance from workers' salaries at 2.5% per month and feed same into the Nigerian mortgage system through the Federal Mortgage Bank of Nigeria (FMBN). This proposed a non-recourse fixed interest mortgage funding to assist the fund contributors to own adequate housing. The loan was proposed to be available to contributors at the interest rate of 9% annually. However, on evaluation, this programme has so far failed to meet the aspiration of Nigerians. The failure of the scheme so far has been attributed to a number of causes which according to Ogwo (2006) included that the banks and insurance companies refused to contribute/invest in the fund for what they described as "unattractive terms". The commercial and merchant banks were reluctant to apply their funds sourced through short term to finance housing on long term; the federal government which should have been the prime mover failed to contribute to the fund; there is lack of support from government agencies and stakeholders many of whom have refused to deduct and remit staff contributions to the funding bank. Many State governments until recently had stopped deducting and remitting their staff contributions to the fund, difficulty in land acquisition and the corresponding

high cost of land transfers in Nigeria and the Federal Mortgage Bank of Nigeria is not empowered to prosecute any defaulters of the National Housing Fund Act of 1992.

In addition, the absence of a secondary mortgage market in Nigeria has denied the system the necessary guarantee and confidence which a viable secondary mortgage market could have engendered in the mortgage market. Also, the failure of many previous government interventions in the housing sector created a credibility gap for the scheme. As a result, most financial institutions have no confidence in the existing mortgage industry. However, there have been some recent efforts at improving the performance of the scheme. The bank in 2004 had approved the introduction of 10% down payment for loan of ₦5,000,000 and below, 20% for loan above ₦5,000,000 up to ₦10,000,000 and 30% for loans above ₦10,000,000 up to new ceiling of ₦15,000,000 (Guardian Newspaper, 2020), but this is still very high for a civil servant at ₦30,000/month on Grade Level 1. Hence, the introduction of the graded down-payments however has not augured well for many low-income earners. The national housing fund money would be inaccessible to them because of their inability to afford the down payment. In Akwa Ibom Civil Service since the introduction of this scheme on 1st of May, 1993, there have been deductions in favour of the programme for all grades of staff but on the spot assessment has it that none of the staff has got housing ownership through this scheme.

### **Impediments to Effective Policy Implementation in Nigeria**

In ideal situations, the government is known and desired essentially for its reliability, efficiency, speed, dependability, and effectiveness in implementing policies. This is what it is, to a very reasonable extent, in developed nations. However, in developing nations like Nigeria, the government appears to be obviously far from being such as its operations and activities are very much tense with some challenges arising from the existence of certain negative factors and circumstances. Basically, Nigeria operates under ineffective and corrupt political leadership. Oyewole (2000) rightly suggested that keeping an average Nigerian politician from being corrupt is like keeping a goat from eating yam. He highlighted that corruption has also led to the diversion of developmental resources of the society to private or personal use. The corruption in leadership, and incompetence, for instance, affects the content and quality of policy at formulation stage. For instance, policies are more often than not made for purposes of the selfish and egoistic interest of the political leaders and sometimes only to attract public acclaim and attention with less regard to their appropriateness in addressing given problems or the possibility of their effective practical implementation by the public organizations. Indeed, most policy making goals in Nigeria are subordinated to the personal rewards and interests of the political leaders and their colleagues with the result that policy is judged more on its political merits with the real development need rarely factored into consideration. For these, most policies in Nigeria are either inappropriate or lack a well-defined objective and programmes for their effective implementation. It is perhaps for this that Bello (2007) stated that implementation of policies in Nigeria takes the form of "learning process" or "trial and error." In this context, policies or programmes are haphazardly implemented and even sometimes abandoned or dismantled midway because the basis for formulating the policy was not, in the first instance, predicated on existing data, realities or need. Indeed, in Nigeria, there are usually no comprehensive policy standards and objectives to guide the government in its policy implementation activities and procedures (Akpan, 2005).

Another factor that constitutes an obstacle for the government in the effective implementation of policies is the over ambitious nature of some public policies in Nigeria. Some policies tend to be over ambitious, sweeping and overly fundamental (Akpan, 2005). In most cases, the formulation of such over ambitious policies is not even borne out of genuine or sincere effort to bring about rapid and radical development but just to boost the ego of the political leaders. An example of such policies is policies having as their basic objectives the provision of housing for all, free education, free health services for all the citizens or the total eradication of poverty amongst the citizens. For such policies, there are usually inadequate resources (men and materials) for the public organization to effectively implement them. For instance, the policy of free education, free food for students and free health services for all in some states in Nigeria have witnessed such very ineffective implementation resulting in deterioration in quality and standard of service that some people prefer to send their children to private primary and secondary schools and to seek medical services from private hospitals, even though their service fees are very high.

Another critical factor inhibiting effective implementation of policies in Nigeria is that some agencies or institutions saddled with the responsibility of implementing given policies do not possess the requisite skills, manpower, and financial resources to implement them effectively. On the issue of inadequate resources, for instance, Government, sometimes, do not budget adequately to enable the public administration properly implement formulated policies (Aluko, 2006 and Dick, 2003). Indeed, to effectively implement policies, the implementing agency needs resources in adequate and timely manner and such not being the case in Nigeria explains, in part, the failure of certain public policies to achieve a desirable end (Nweke, 2006 and Ikelegbe, 2000). Sometimes, though, government gives out sufficient fund but the corrupt activities within the public organizations do not allow for its judicious use to efficiently execute programmes. In any case, insufficient financial resources have resulted in situations where laws could not be enforced, services were not provided and reasonable regulation not developed and applied (Makinde, 2005). In Nigeria, the National Poverty Alleviation Policy, for instance, is brilliantly articulated but yet to realize its essence due largely to inadequate fund or resources (Nweke, 2006). On the issue of skills and inadequate human resources, the public administrations in Nigeria do not, indeed, have adequate skilled staff regarding overall numbers and more importantly regarding specific areas of professional, technical or managerial competence and expertise, Aluko and Nubi, 2002. This is counterproductive as the capabilities of government regarding expertise and skill determine, to a large extent, policy implementation success or failure (Ikelegbe, 1996). Where abilities exist, policies could be confidently formulated with reasonable assurance of their effective implementation. Indeed, as Adegoke (2013) as cited in Ugwuanyi and Amadi (2015) noted, development policies have, in contemporary times, assumed complex and sophisticated dimension that require highly skilled and experienced officials for their effective implementation. It is worthy of note that the inadequacy of personnel, particularly as it relates to expertise and skilled manpower, results in part, from the personnel recruitment policies into the Nigerian public organizations which are essentially based on non-bureaucratic criteria such as the state of origin or ethnic group against objectively measurable criteria like qualification and professional competence (Akpan-Idiok, 2017). The application of the principle, popularly known as Quota System or Federal Character results to putting people in job positions where they do not have the basic competence and skill. This, ultimately, affects the ability of the Nigerian public organizations to effectively implement policies, which is one strong factor hindering the implementation of affordable public housing policies in Nigeria, especially to civil servants.

Again, the challenge of keeping away personal interest, prejudice and the influence of primordial values in the conduct of official business by officials is equally very critical in Nigeria. Usually, if the officials are not favorably disposed towards a policy, they may not approach its implementation with the enthusiasm and zeal that is required and its effective implementation may be hindered. Makinde (2005) in this respect contended that the enthusiasm with which officials in Nigeria implement policy depends on how they see the policy as affecting their personal, ethnic and organizational interest and aspirations which are the case seen in the public housing sector. Positive effects will induce enthusiastic implementation while the contrary may mean that implementation may be resisted, thwarted and even sabotaged (Ikelegbe, 2006). The ultimate result of this is an ineffective implementation of policies that make the realization of their goals and objectives difficult. Indeed, some policy implementing agencies or bureaucracy in Nigeria possess certain primordial interests or values which hindered implementation, this could favour, clog, delay, distort or mar proper and effective policy implementation. Agbola (2005) noted that some policies in Nigeria, because of sectional or personal interests of the officials, are implemented in a negative manner which ends up hindering the success in achieving a policy goal.

Another constraining factor to effective policy implementation in Nigeria is an undue pervasive political influence on the public organizations (Amao, 2000). Usually, in Nigeria, the political leaders formulate policies and as well control and direct the implementation activities of the policy. This situation is not proper as such control and directive are mostly motivated by selfish personal or political interests. Indeed, the government cannot effectively implement policies and meaningfully contribute to national development if it is fettered, controlled and directed by political authorities. This is more so as in extreme cases of such political control, in Nigeria, the officials are not even allowed to take decisions or actions on basic routine administrative matters without consultation and the consent of relevant political authorities. In this process, much time and energy

are wasted and prompt actions required for effective implementation of policies hampered. Given this, therefore, one could suggest that the extent to which politics influence the organizational activities would continue to determine and shape the extent to which policies could be properly and effectively implemented by the public organizations in Nigeria. Very worrisome is the fact that the political influence or hold on the public organizations is becoming tighter, public officials are most time promoted based on political patronage or loyalty, and not on the basis of relevant or cognate experience and seniority, and the officials promoted under such circumstance would be more morally bound to subject their official decisions and actions, substantially, to the wishes, preferences, control, and endorsement of their political masters which is where corruption penetrates to circulate in the system.

Finally, repeal of policy also effects their implementation by the public organizations in Nigeria. It is observable that each new political leadership in Nigeria is usually and primarily concerned with making its impression on public programmes and projects, especially in the housing sector. For this, certain policies or programmes which are already on implementation process are shelved by the succeeding administration (Nnamdi, 2001). Presidents, ministers, governors, local government chairmen and heads of institutions (both governmental and political heads) in Nigeria exhibit the tendency to link their administration with distinct social and economic policies or programmes. Consequently, the policies of preceding administrations are rarely pursued by succeeding ones and such personal styles of administration help to explain why so little attention is paid to the issue of maintenance of projects or programmes created or initiated by preceding regimes. Indeed, succeeding regimes conceive the maintenance of existing programmes as not politically expedient as it does not bring direct personal glory or credit. In this circumstance, the public organizations in Nigeria do not have the opportunity and time to effectively and conclusively implement policies. An instance of this tendency for a succeeding regime to discontinue the implementation of the policy of a predecessor was the abrogation of the Operation Feed the Nation (OFN) policy of General Olusegun Obasanjo and the introduction of Green Revolution by Alhaji Shehu Shagari who succeeded him. When General Mohammed Buhari came into power, he also discontinued the implementation of the Green Revolution introduced by Alhaji Shehu Shagari and introduced "Go back to land policy." When General Ibrahim Babangida took over the government, he again abandoned the policy of "Go back to Land" and introduced the Directorate of Foods, Roads and Rural Infrastructure (DFRFRI) (Ebie, 2012). It is noteworthy that the various policies as were respectively abrogated and introduced had as their basic goals or objectives to make Nigeria self-sufficient in food production and to curtail food importation.

### **Contradictions in Framing Nigerian National Housing Policy**

The Habitat Agenda and the "Istanbul Declaration" marked a new era of cooperation, an era of partnership and solidarity in pursuing a common agenda of ensuring adequate shelter to all and sustainable human settlement development. About 171 countries (including Nigeria) signed the Istanbul Declaration document. In ratifying the Declaration, these countries and all other parties involved committed themselves to the challenge of "ensuring adequate shelter for all and making human settlement safer, healthier and more livable, equitable, sustainable and productive". This agenda reconfirmed the legal status of human rights to adequate housing as outlined in the relevant international instruments and stressed that the right should be progressively but fully realized. The Declaration in paragraph 8 reaffirms this commitment and stated that " We shall seek the active participation of our public, private and non-governmental partners at all levels to ensure the legal security of tenure, protection from discrimination and equal access to affordable, adequate housing for all persons and families." To achieve these laudable objectives, the Habitat II Agenda in 1996 sought to provide an integrated framework to implement the Global Shelter Strategy and enhance national housing policies to pursue the goal of providing adequate shelter for all. In fact, it is made up of a mix of broad and specific ideas that seek to ensure coherence between different levels, sectors, and instruments in international, national, regional and local housing development efforts. However, the attempt to reform the Nigerian housing policy in conformity with the key provisions of Habitat II Agenda, under the framework of the enablement approach has exposed some basic contradictions and challenges that need to be addressed; and policy implementation which is seen as major part of the agenda opened the gap for this research which seeks to propose a model to guide its improvement.

These however agreed with the suggestion of Aluko and Ibitoye (2016) who confirmed that the problems that are associated with the national housing policy include implementation, inadequate research, and studies on the formulation and execution of the policy, inadequate funding, shortage of skilled manpower in the building industry, insufficient infrastructural amenities, as well as ineffective housing finance. Other problems are rural-urban migration and high rate of 81 urbanization, lack of effective planning, development of shanty towns, availability of dilapidated houses, as well as high cost of building materials.

### **Factors Hindering Public Housing Delivery**

There are several factors why the previous government sponsored housing scheme in the country and states are not providing the desired results. Akpan-Idiok, (2005) suggested the following factors, namely land supply, financial factors, corruption and cumbersome titling process and project management success criteria among other as the variable for not providing the desired result. For example, with regards to land supply, the Land Use Act of 1978 now Cap 202. Law of Federal Republic of Nigeria which vested all land to the government is a barrier to making land available for housing development especially to private investors. Hence, the required arm of government especially the legislators cannot continue to come up with strategies to reviewing since it has inflicted serious negative impact on the housing sector. Again, the national assembly has not proposed a better land use legislation which should remove the encumbrance from land transaction projected by the present Act, to create easy access to land by genuine housing investors in the country. Law makers have not made an attractive law which could increase investors' appetite in the housing sector. Related reform bills have not been focused and pursued by law-makers to complement housing policies and programmes. If the encumbrance in the use of land could be removed to give easy access to land users, many who have issues with housing would be motivated to making additional private efforts to provide their housing. The major barrier posed to housing in Nigeria is the limited access to land which has made access to land costly in the country beyond the reach of an ordinary salary earner (Akpan-Idiok, 2005).

Furthermore, Aduwo *et al.* (2016) suggested that government sponsored mass housing schemes have not been based on a three-tier institutional framework, involving federal, state and local government as outlined in the National Housing Policy in 1991 and 2012. However, while the Federal Housing Authority, Federal Ministry of Land and Housing and the various State housing corporations have been actively involved in the previous schemes, the third tier of government-the local government areas and community-based organizations such as housing co-operative societies representing the interest of the grassroots people, have not been actively involved in such schemes. They argued that the lack of stakeholder's participation such as the local urban authorities and non-governmental organizations in such schemes have accounted for the massive failure of those programmes in making any reasonable impact on the housing conditions of Nigeria. This implies that the housing programmes targeted at different groups were from the onset doomed to fail due to a dysfunctional institutional framework.

Akpan (2016) further suggested that there is also the issue of lack of adequate data on the exact number of civil servants and households who need housing in Nigeria, worst of all many are ghost workers. They suggested that poor data capturing on the rate of urban population growth has been the bane of planning and programming in Nigeria. Although a number of population censuses have been conducted in Nigeria, the results in many cases are still being contested in the regular courts. Thus, there is no accurate and reliable data system on the number of households in urban areas for which provision is to be made. Therefore, without accurate data, it is difficult to generate effective plans or initiate a programme that would have tangible impacts on the housing need of the people. Therefore, these have been the principal challenges in the design of targeted housing programmes for the people in the State and country. Hence, it is difficult to know how many people are born, dead or project the future growth trend. Thus, this has majorly accounted for the failure of most public housing programmes in the country.

Housing finance is another critical factor in the housing delivery framework. This refers to the money required for the development of housing units, provision of housing infrastructure and purchase or acquisition of housing units. Without the availability of finance, funding the



implementation of housing policies would not be easily achieved (Federal Government of Nigeria, 2012). With \$39/barrel of crude oil, the Federal Mortgage Bank of Nigeria (FMBN) as the apex housing finance institution continually suffers from a lack of funds as it receives from the national budget analysis only 2% allocation annually. Over 70% of Nigerians live below the international poverty line as indicated by United Nation Development Programme (1997) following declining economic fortunes in the last one to two decades. The direct implication is that implementation of housing policies would not be easy, and the ability of the self-help developers that accounts for a majority of housing units in the urban and rural areas may be hindered without making finance available (United Nation Habitat, 2001). Furthermore, the past global economic down-turn has forced mortgage rates down to as low as 3% in some countries, especially the United Kingdom and United States of America, which happens to be the country's sponsor. But the case of Nigeria is no different with interest rate getting as high as 18% to 22%. Alao (2009) mentioned that it is difficult for many civil servants to loan at such a high-interest rate, which also affects accessibility. World Bank (2022) noted that a well-functioning housing finance system not only contributes to home ownership, it improves implementation process and also positively affects the general economy, job creation, socio-political stability and long-term wealth creation, but this is a direct opposite of the situation we find in Nigeria today. Therefore, there is need to improve housing finance and adequately fund the public housing sector so that it could be effective to housing delivery.

According to Nwankwo (2004), bribery and corruption is also one of the challenges facing the Nigerian housing sector. Allocation, acquisition and approval for housing construction are prone to manipulation due to corruption which is backed by cumbersome bureaucratic processes in the sector. Clients may find it difficult to obtain the necessary documentation to embark on projects due to bribery and corruption, and so many housing investors find it difficult to engage in housing investments.

Building a house is highly expensive in Nigeria due to the cost of construction. The cost of construction is high for three reasons namely high costs of building materials, high skilled labour costs, and cost associated with technological infrastructure. The high cost of building materials has negatively affected the rate of building housing units in the country. The main reason for this high cost of materials is the reliance on imported materials, which has overtaken 90% of our production economy. Most of our local building material industries are incapacitated in their operations or even extinct, hence not meeting up with the demand for the products. This condition is further worsened by lack of public infrastructures such as roads, power supply, etc. to facilitate such factories.

Project management and post-project maintenance has been a huge issue hindering policy implementation success. Nigeria needs to develop appropriate pre-and post-project management strategies, and also set effective success criterion to properly measure project output success. According to Cooke-Davies (2002), project-success criteria could be defined as measures by which success or failure of a project could be judged. The author opined that success criteria is a set of principles or standards by which success could be evaluated, hence, suggested the following criteria for measuring project- success, namely, project completion on time, within budget and to specified quality; safety, efficiency, effectiveness, free from defect, meet stakeholders' expectation and minimal construction disputes and conflicts. Atkinson (1999) suggested that success criteria are classified into two measures namely, success at the delivery stage and success at the post-delivery stage. The success criteria at the delivery stage include cost, time and quality while success at post-delivery stage has to do with satisfaction, comfort and security associated with such project. The post-delivery stage is divided into product success criteria and organizational success criteria. The product success criteria include end-user satisfaction, environmental impact, contractors' profit, team members' satisfaction, etc., while the organizational success criteria are the benefit to the organization, which includes improved efficiency, improved effectiveness, increased profits, reduced waste and promotion of organizational housing goal. Therefore, from this review, it could be noted that criteria for project success are beyond the traditional measures of time, cost and quality, which mainly measures project management success. However, additional criteria emerging from this include end-user satisfaction, stakeholder satisfaction, safety, environmental impact and minimal disputes or the absence of any legal proceedings. Based on the above study, this criterion would be applied to measure the success of public housing projects based on the measurement of the project completion within time, budget, specified quality standard and to meet the end-user satisfaction. If these measures are adequately put

in place and effectively managed, it becomes easy for the government to measure public housing implementation success or otherwise and to improve its inefficiency (Aluko, 2012).

Distribution does not work in lines with the best practice established in the theories of public interest and distributive justice as highlighted already this work. The concern about the impact of regulatory barriers against the housing market has existed for decades. Politicization of housing is a big issue in Nigeria. Government involvement in what Onibokun (1983) referred to as the "game of number." What is on papers do not always reflect on what is on the ground even when the bills are paid. Basically, and very critical is that the bureaucracy in Nigeria operates under ineffective and corrupt political leadership. Leadership style, corruption, and ineptitude affect the content and quality of policy at formulation stage. Sometimes, policies are more often made for purposes of the self-seeking interest of the political leaders and sometimes only to attract public acclaim and attention with less regard to their appropriateness in addressing given problems or the possibility of their effective practical implementation by the public bureaucracy. Most of the policy making goals in Nigeria are subordinated to the personal rewards and interests of the political leaders, and their colleagues with the result that policy is judged more on its political merits with the real development need rarely factored into consideration. Money made available for the implementation of policy backed projects grows wings and disappears into the individual pockets of the ruling class mainly the politicians. The problem did not only lie much in the conditions of allocation and payment but the corruption that swept the distribution (Olayiwola, 2005). These issues as identified are the factors limiting progressive implementation of affordable housing policies. The backwardness in corruption, political pressure, and official indecision have so far resulted in the non-allocation of many of the completed public housing units completed years before by the past governments which finally became homes for squatters. The gap in the allocation of completed government public housing units, which always delays up till many years in most cases as government always refer the delays to lack of provision of infrastructure, but always remains the method which government officials use to play the shady game in the corrupt allocation of the completed projects to themselves. The whole issue of delays in the allocation and distribution of completed public housing project points to corruption and political pressures. Corruption is a great danger to economic development, and without a good economy, affordable public housing would remain but a dream. Implementation of affordable housing policies would be easily achieved when there are less corrupt persons standing as managers of implementation system. In an economy where a higher percentage of those working in the public sector are assumed corrupt is never a good ground for implementation of public policies.

The problem of infrastructure in Nigeria is another issue which stands as a problem to sitting affordable housing projects, inadequate infrastructure such as road, electricity, and water which facilitates housing construction are lacking in some area, especially areas inhabiting the low-income group which affects implementation of policy designated housing projects in such areas. Infrastructures should be made available in the regions designated for affordable housing projects to avoid its delays in implementation. The provision of residential infrastructure can encourage housing development and supply (World Bank, 1993 as cited by Ndubueze, 2009). It does not only enhance the value of houses and hence makes a site attractive to house developers, but also ensures ordinary development which will prevent poor environmental situation caused by lack of environmental infrastructure services. Most low-income housing projects are not implemented due to lack of residential infrastructure in the areas they were sited. Many parts of Nigerian cities particularly the suburban localities lack environmental facilities, although town planning laws indicate procedure for installation of infrastructure, they are usually implemented only in Government acquired sections (Ogu, 1999). Many residential developments, particularly in the suburban localities in Nigeria took place without being preceded by the provision of infrastructure services. This has left these areas with residential environmental quality implications. The improvement of the country's infrastructure is necessary to make all area accessible and attractive to facilitate policy implementation and housing development. Most affordable housing projects are abandoned at their early stages due to lack of road network, water, and electricity which always affect the cost of housing delivery because, without good road, cost of transferring building materials may be very high, without electricity, it will influence cost of generating power for tools needed for housing development. Residential infrastructure plays a huge part in the implementation of housing policy; implementation is facilitated when the needed residential infrastructure is put in place. The government should do more in the area of infrastructural

enhancement and put to place needed infrastructure such as road, electricity, and water before selecting sites for an affordable housing project. Areas where the major needed residential infrastructures are lacking such as identified above, it becomes difficult to implement policy backed affordable housing projects.

On the issue of inadequate human resources, the public bureaucracy in Nigeria do not indeed have adequate staff regarding overall numbers, and more importantly regarding specific areas of professional, technical or managerial competence and expertise. This is counterproductive as the capabilities of government bureaucracy regarding expertise and skill determine to a large extent, policy implementation success or failure (Amucheazi, 1980). Where abilities exist, policies could be confidently formulated with reasonable assurance of their practical implementation. Indeed, development policies have in contemporary times assumed complex and sophisticated dimension that require highly skilled and experienced bureaucrats for their effective implementation. It is worthy of note that the inadequacy of personnel, particularly as it relates to expertise and skilled manpower results in part, from the personnel recruitment policies into the Nigerian public bureaucracy which is essentially based on no bureaucratic criteria such as the state of origin or ethnic group against objectively measurable criteria like qualification and professional competence (Amucheazi, 1980).

Even when the implementation orders are accurately communicated, the absence of needed manpower and material resources can result in implementation failure. Resources such as human and material are the engine driving policy implementation. On the issue of inadequate financial resources, for instance, Government sometimes do not budget adequately to enable the public bureaucracy properly implement formulated policies (Ikelegbe, 2006 and Dick, 2003). Indeed, to effectively implement policies, the implementing agency needs resources in adequate and timely manner and such not being the case in Nigeria explains, in part, the failure of certain public policies to achieve desirable ends, (Nweke, 2006 and Ikelegbe, 1996). Sometimes, though, the government gives out sufficient fund, but the corrupt activities within the public bureaucratic organizations do not allow for its judicious use to effectively execute policy programs. In any case, insufficient financial resources have resulted in situations where laws could not be enforced, services were not provided and reasonable regulation not developed and applied. Lack of sufficient resources to back policies makes it difficult to deliver the policy successfully. Housing policies in Nigeria lack both human and material resources; policies are made but are underfunded with no well-trained personnel to drive implementation. That is one major problem that brings about the failure in implementation of Nigerian housing policies.

These are other keys to success/hindrance in policy implementation. The way policy implementers exercise their pleasure depends to a large extent on their disposition toward the policy. Where a policy will reduce some given benefits of the implementers, the attitude/disposition will be adversely affected. Tribe and religion are another such influencers of attitude and disposition toward public policies in Nigeria such as housing. Where a fanatic Muslim from the North is heading the implementation of affordable housing policies in favour of the Southern Christians, an implementation may be affected if not completely hindered. The government needs to closely monitor the religious and ethnic barriers which sabotage policy implementations, especially in the housing sectors. The challenge with keeping away personal interest, prejudice and the influence of primordial values in the conduct of official business by civil servants is equally very critical in Nigeria. Makinde (2005), in this respect, contends that the zeal with which bureaucrats in Nigeria implement housing policy depends on how they see the policy as affecting their personal, ethnic and organizational interest and aspirations. Usually, in Nigeria, the political leaders formulate policies and as well control the implementation processes of the policy. This situation is not proper as such control is mostly engineered by religious or political interests. Indeed, the government cannot effectively implement policies which can meaningfully contribute to national development if it is fettered, controlled and directed by political authorities. Implementer's attitude and dispositions in Nigeria is mostly affected by the differences in the political views and opinions, and where a chosen implementer is from another political camp, sound public policies may be sabotaged just to score cheap political points.

Therefore, if the government could closely monitor policy implementation and also build up the courage to either sanction or punish saboteurs in the system, it will improve trust from the masses and the investors who will see government willingness and implementation sincerity. The Nigerian housing authorities need to re-educate their officials on the necessity to drop religious and sectional

sentiments destroying the system; they should initiate a proper strategy to carry along all regions for an improved housing development. Also, the politicians driving the economy should also desist from making policies which benefit a particular region more than others but reflect justice in the development and distribution of scarce and essential commodities such as housing, especially affordable housing for the low-income groups.

With regards to administrative structure, it is to be noted that even if all of the above is gotten right by the government, it does not guarantee implementation success if the implementation is driven by a weak administrative structure. If there is no efficient bureaucratic structure, the problem of implementation can still arise especially when dealing with complex policies such as affordable public housing for the low-income groups. As observed by Edward (1980) as cited in Ikelegbe (1996) suggested that where there is organizational fragmentation, it may hinder the coordination that is necessary to successfully implement a complex policy especially one that requires the cooperation of many people. Affordable housing policies are such that require the input of all stakeholders to contribute to a better structure which could effectively deliver the required housing stock.

Therefore, lack of reliable structure in Nigerian public housing sector has been a barrier to policy implementation, it is the major contributor of corruption and wastage of the available scarce resources such as finance meant for the implementation of positive housing policies, it is also the main factor bringing confusion that leads most policies working at cross-purpose which at the results to implementation failure. The public bureaucracy in Nigeria does not indeed have adequate staff regarding overall numbers, more importantly regarding specific areas of professional, technical or managerial competence and expertise (Ikelegbe, 1996). Where abilities exist, policies could be confidently formulated with reasonable assurance of their effective implementation. Government need to embark on a programme for improving working conditions of the public bureaucrats as this will help to build their morale, dedication and commitment to implementing policies. Specifically, an improvement in pay packages will go a long way to significantly diminish the corruption tendencies among the public officials in the system.

There is also the need for a conscious effort by government leadership to reduce the extent to which politics infiltrates bureaucratic activities in Nigeria. That will ensure that bureaucrats in authority are allowed to exercise proper control to function freely and apply some basic goals and a good model of governance in their administrative processes and procedures. Also, the culture of discontinuity of policies in cases of changes in government or organizational leadership should be discouraged. That is necessary because even though government comes and goes the public organizations remains and should continue the implementation of existing policies unless fundamental developments render their continued implementation impossible or unnecessary. Furthermore, if every leader who comes into position keeps putting aside good housing programmes which are in place before they assume office, Nigeria will never witness progressive development or growth in the public housing sector, and there will be no end to the housing struggles of the low-income groups especially those in the South-South region where it bites harder.

### **Public Housing Provision and Delivery Strategies**

Globally, the implementation of every social programme follows define measures or strategies. Consequently, the outcome of such programme depends on the strategies used in their implementation. It is for this reason that this section examines the different housing delivery strategies used in the implementation of the public housing within the State. Housing delivery strategies in this study refers to the activities or processes employed in the transformation of housing policies, programme, objectives, human and material resources into public housing limits and related services. They include site-and-services strategy. Amadu (2019) confirmed that one strategy adopted by the government in addressing the shortage of urban housing in Nigeria is the sites-and-services scheme (SSS). This strategy is based on the idea of assisted self-help housing postulated by John Turner in 1926. Aduwo *et al.* (2016) noted that the conception this is designed to enable the workers gain access to housing by encouraging them to construct their homes over a period. They further explained that in the site-and-service strategy, government and development agencies usually provide serviced plots for individuals to erect their own houses. According to them, this was first introduced in Nigeria

in the mid-1970s in the then newly created states of Bauchi, Benue, Gongola, Imo, Niger, Ogun, and Ondo as well as in Lagos. In this initiative, governments provided land, administrative support and counterpart funding and about 24,397 serviced plots were made available in the States already mentioned (United Nation-Habitat, 2006). This strategy was not able to be extended to other states such as some of the South-South states immediately because of funding challenges but between 1984 and 1986, the scheme was resuscitated in Lagos, Kano, Imo, Kwara, Ondo, and the south-south States beginning with Rivers, Cross River, Akwa Ibom State and the Federal Capital Territory, Abuja. The Federal Ministry of Works and Housing and the Federal Housing Authority (FHA) provided serviced plots and basic infrastructure (e.g. roads, water, and electricity) on the plots. Ajanlekoko (2001) noted that between 1984 and 1991 about ₦85,000,000 was expended in the provision of 20,000 serviced plots in 20 States of the federation. Also, in 1999, the Federal Government of Nigeria awarded contracts for this project involving 7,730 plots in parts of the country. Ibem *et al.* (2013) however observed that there were no records that many of the sites were made available for the people to build their houses especially the civil servants. Public-Private-Partnership (PPP) under the strategy to public housing, the site-and-service strategy was reintroduced as a mortgage-based housing scheme. In this strategy, the government provided land, while the private sector provided basic services to the site. Ibem (2011) also observed that 2,000 serviced plots at an average cost of ₦500,000 were allocated for low-income, the middle-income workers bought at ₦1,000,000, and the high-income bought at ₦1,500,000. All these were located at Ikorodu, Lagos State. In Akwa Ibom State, Akpan-Idiok (2005) observed that this strategy was experimented between 1990 to 1993 within significant success since high cost and the modalities for allocating serviced plots were lopsided in favour of government officials, politicians, and their associates. This contributed to the failure of this strategy. However, the introduction of mortgage acquisition in these strategies was a step in the right direction in ensuring that such schemes were affordable to civil servants in Nigeria, but inadequate finance system hindered this group from sourcing fund for acquisition and development. Hence, the programme as expected has not improved the housing situation of the focused group in the State.

Another is direct construction of housing units. Aduwo *et al.* (2016) explained that direct construction of housing units by the government appears to be the most controversial of all the strategies so far adopted in resolving urban housing crisis in Nigeria. The authors observed that under this strategy, government agencies were engaged in the direct construction of housing units, which are either rented or sold to the public below market prices. They also confirmed that beginning with the colonial era, government's involvement in the direct construction of housing units in the government reserves area's and African Quarters for expatriate and senior indigenous staff, respectively, was through the now defunct Public Works Department (PWD) of the presidency. The establishment of housing corporations by the defunct regional governments in 1958 was an attempt by the government to provide 5,000 housing units for the people. Onibokun (1985) however explained that due to the lack of funding and requisite manpower, many Nigerians did not benefit from the activities of the regional housing corporations.

However, Aduwo *et al.* (2016) further suggested that between 1975 and 2010, some social housing programmes involving the direct construction of housing by the government were initiated by both the federal military and civilian governments in Nigeria. Some of these housing programmes included the National Low-Cost Housing Scheme (1975-1980), Shagari's Low-Cost Housing Programme (1980-1985), the National Housing Programme (1994-1995), the National Prototype Housing Programme (2000-2003), the Presidential Housing Mandate Scheme (PMHS) (2004-2006) and public private partnership housing schemes. Although there are conflicting figures on the actual number of housing units completed in each of these programmes, it's obvious that this programme as others only benefitted selected political few, hence, the yearning of Nigerians in housing was far from being made. Back in Akwa Ibom State the government has been using Akwa Ibom Property and Investment Company (APICO) in direct housing construction but as opined by Ekott and Nseyen (2006), the price of these houses was always high to various civil servants. For example, between 2015 to 2018, the agency sold 206 housing units of three-bedroom and two bedrooms at the cost of ₦12 million and ₦8 million respectively (Udoudoh, 2016).

Also, Federal Government of Nigeria (2012) confirmed that the federal government in partnership with all relevant stakeholders, initiate, defined and coordinated the policy options and instruments for achieving the objectives in the housing sector. The actual implementation was

undertaken by appropriate agencies at federal, state, and local government levels, as well as other community associations and other special groups. The Federal Housing Authority (FHA) was established by the federal government of Nigeria under Decree No. 40 of 1973, which was amended to CAP. 136, LFN of 1990. However, it began real operations in 1976 with the following responsibilities and functions of supervising the implementation of federal housing policies and programme, developing and managing real estate on a commercial basis in all States of the federation and the Federal Capital Territory (FCT), providing sites and services for all income groups with a special emphasis on the low-income earning group, providing low-income, cooperative, rental and rural housing in all States of the federation and the capital territory from funds provided by the government and other source, executing such housing programmes in the public interest as may be approved by the federal government, mobilizing off-shore funding for housing development, acquiring, holding and managing movable or immovable property, acquiring, constructing and maintaining dwelling houses, schools, communal and commercial buildings, and other structures, entering into contracts for the construction, maintenance, management or repairs of any property, purchasing or otherwise acquire any assets, business or other property where, in the opinion of the authority, such purchase or acquisition is necessary for the proper discharge of its functions under this Act, selling, letting, leasing or otherwise dispose of any property vested in the authority, undertaking or sponsoring the undertaking of such research as may be necessary for the performance of its functions, and training managerial, technical and other staff to run the authority's operations (Federal Government of Nigeria, 2012 and Ihuah, 2015).

State housing authorities are state established housing organization whose duty it is to facilitate housing delivery and its management by undertaking the following suggested measures, namely, promoting and facilitating the development of site and services schemes, playing an active role in the identification, production and use of building materials from local resources in order to ensure availability of inexpensive building materials for housing development, carrying out re-development and upgrading of existing blighted residential areas either alone or in collaboration with federal, international bodies and the private sector, strengthening institutions for housing delivery at the State level, strengthening and encouraging housing cooperatives, or housing associations, thrifts and credit societies in housing development, promoting the formation of more Primary Mortgage Institutions (PMI) and Building Societies (BS) in collaboration with the private sector, promoting intergovernmental synergies, linkages and peer review in housing delivery, strengthening existing planning authorities, establishing the same in all local government areas where there are none, undertaking social housing schemes and projects, and encouraging all local governments to do so, and establishing, maintaining and resuscitating dilapidated public housing in the state and implementation of all state housing programmes (Federal Government of Nigeria, 2012).

Furthermore, the State governments were also empowered to formulate, monitor and evaluate government policies on housing; coordinate the activities of other agencies of government in the area of housing; provide and maintain infrastructure for the housing stock of State ministries; upgrade and maintain the housing stock of the State ministries; develop a data bank for housing needs and cooperate by forwarding the same to the national data bank for purposes of coordination; encourage the adoption of the national building code and for effective housing delivery and safety in collaboration with relevant professional bodies; review all existing legislation, regulations and ordinances in the housing sector with a view to achieving the goal of adequate housing for all; supporting and encouraging indigenous construction companies, building materials producers and manufacturers, to participate actively in the provision of housing; develop and sustain the determination and political will to succeed in the provision of houses for its people; and actively encourage capacity building and its sustainability for personnel who provide services in the built environment (Ebie, 2012 and Federal Government of Nigeria, 2012).

For the purpose of enhancing smooth access to housing finance for prospective real estate developers in Nigeria, the federal government of Nigeria upgraded the Nigerian Building Society (NBS) through Decree No 7 of 1977 to become the Federal Mortgage Bank of Nigeria (FMBN) and thus, became the apex mortgage institution in the country. This however inherited from the defunct National Building Societies assets and liabilities. Funds were injected into the said Federal Mortgage Bank of Nigeria by the Central Bank of Nigeria (CBN) with the Federal Government owning a total equity share of 60%, while the Central Bank of Nigeria had 40% equity share. By 1981, the bank had

established branches in all the State capitals and major urban centres including Abuja, the nation's capital.

The functions of the bank included, among others, provision of long-term credit facilities to mortgage institutions to enhance credit facilities to Nigerian to develop or acquire houses of their own, to encourage, supervise and control of activities of mortgage institutions established by the state government and corporate organization in Nigeria, it also had the responsibility to invest in companies engaged in manufacturing and production of building materials in Nigeria and the bank also provided technical assistance where need arose, advised mortgage institutions on financial activities on real estate development and construction in Nigeria.

The enlargement of the function of Federal Mortgage Bank of Nigeria (FMBN) by the federal government through the promulgation of the Mortgage Institution Decree No 53 of 1989 which included among others as to process the licensing of primary mortgage institution(s) in Nigeria, To protect the stakeholders and depositor's funds in the primary mortgage institutions, and the Federal Mortgage Bank of Nigeria (FMBN) also had as its responsibility to manage the national housing fund.

### 3.0 Research Methodology

The sampling technique adopted in this study was total enumeration sampling technique and convenience sampling technique. These allowed each respondent an opportunity to be selected to form the sample size irrespective of class. Convenience sampling method was used to collect data samples from respondents who are seen as the most convenience people (civil servants) to provide data for this research. This study adopted survey research design. Survey research was defined as "the collection of information from a sample of individuals through their responses to questions" Udo (2004). This type of research allowed for a variety of methods to recruit participants, collect data, and utilize various methods of instrumentation. The survey research design in the word of Mokoro *et al.* (2014) was suitable for investigating the present situation of a phenomenon. The survey design was considered appropriate for this study because of the aim of this study which was to assess and evaluate the effect of national housing policy on housing delivery with reference to civil servants in Akwa Ibom State. The population of this study was drawn from the total number of civil servants in the Akwa Ibom State employed which stands presently at forty-two thousand five hundred and fifty-three (42,553) staff as obtained from the civil service commission and local government commission. Results obtained were summarized using tables, frequency and simple percentages. The use of Likert scale was also applied to analyze the data. To achieve the effects of the national housing policy on civil servants, the correlation analysis statistical tool was employed, with the formula:

$$r = \frac{n\sum XY - \sum X \sum Y}{\sqrt{n\sum X^2 - (\sum X)^2} \times \sqrt{n\sum Y^2 - (\sum Y)^2}}$$

### 4.0 Result and Discussion of Findings

**Table 1: Provision of Public Housing for Civil Servant in the State**

Items	No. of Respondents	Percentage (%)
Provision of adequate housing	25	7.6
Non-provision of adequate housing	303	91.2
No idea	2	0.6
<b>Total</b>	<b>330</b>	<b>100.00</b>

Source: Researcher's Computation (2022)

It has been shown in the study that previous National Housing Policies were structured and implemented to favour the elites in the society. This has aligned with Oyewole (2010), on a critical review of public housing delivery system in Nigeria, where he noted that housing delivery system in Nigeria over time has been to favour the rich and privilege citizens in the society. Table 1 indicated that 303 Respondents representing (91.2%) of the total respondents had no public housing provision while 25 Respondents representing (7.6%) in the sampled population which is highly insignificant had public housing provision.

**Table 2: Benefits of Public Housing Strategies**

Items	No. of Respondents	Percentage (%)
Benefited	3	0.9
No benefits	327	99.1
<b>Total</b>	<b>330</b>	<b>100.00</b>

Source: Researcher's Computation (2022)

The strategies adopted by government on housing provision and delivery relatively were ineffective, hence 327 respondents of this research work representing (99.1%) indicated that they have not benefited from public housing delivery which called for the restructuring of the strategies and implementation of the policy.

**Table 3: Challenges in the Provision of Public housing to Civil Servants in the State**

Items	No. of Respondents	Percentage (%)
Land supply	66	19.9
Finance Factor	66	19.9
Corruption and cumbersome titling process	66	19.9
High cost of property development	66	19.9
Project management and success criteria	66	19.9
<b>Total</b>	<b>330</b>	<b>100.00</b>

Source: Researcher's Computation (2022)

Again, the study highlighted challenges in the provision of public housing to civil servants as indicated that equal respondents of 66 representing (19.9%) agrees that land supply, financial factors, high cost of property development among other hindered public housing provision and delivery to the study group.

**Table 4: Measure to be put in place to improve public housing to civil servants in the state**

Items	No. of Respondent	Percentage (%)
Site and service strategy	66	19.9
Direct construction of housing unit	66	19.9
National Housing fund scheme	66	19.9
Federal Housing authority	66	19.9
State housing authority	66	19.9
<b>Total</b>	<b>330</b>	<b>100.00</b>

Source: Researcher's Computation (2022)

Table 4 in this research however recommended measures to be put in place to improve public housing to civil servant in the State which includes among others site and service strategy, direct construction of housing unit, National Housing Fund scheme, Federal and State Housing Authority. The work further shown that equal number of respondents of 66 representing (19.9%) were in support of each of the factors which aligned with Ikurekong and Udoudoh (2014) on Housing satisfaction factors in urbanized village of Uyo.

**Table 5: Correlation Analysis**

Year	X	Y	Xy	x <sup>2</sup>	y <sup>2</sup>
	2018	236	15	3540	55,696
2017	254	22	5588	64,516	484
2016	314	27	8478	98,596	729
2015	268	30	8040	71,824	900
2014	304	28	8512	92,416	784
2013	277	29	8033	76,729	841
2012	326	18	5868	106,279	324
2011	282	21	5922	79,524	441
2010	321	28	8988	103,041	784
2009	297	27	8019	88,209	729
<b>Total</b>	<b>2,879</b>	<b>245</b>	<b>70988</b>	<b>836,827</b>	<b>6,241</b>

Source: Researcher's Computation (2023)



$$r = \frac{n\sum XY - \sum X \sum Y}{\sqrt{n\sum X^2 - (\sum X)^2} \times \sqrt{n\sum Y^2 - (\sum Y)^2}}$$

$$r = \frac{4525}{2745.7979 \times 48.8365}$$

$$r = \frac{4525}{134095.1591}$$

r = 0.03 - Ineffectiveness

In analyzing the effect of National Housing Policy on housing provision for civil servants, Pearson's Product Moment Correlation coefficient statistical tool was adopted and the result showed that National Housing Policy has negative effects on housing provision and delivery to Civil Servant in Akwa Ibom State as indicated in table 5 being the bane of this research work.

## 5. Conclusion and Recommendations

This research has shown that National Housing Policy of Nigeria has serious negative effects on civil servants in Akwa Ibom State. The previous National Housing Policies were targeting the elites and the privilege in the society, it further indicated that the policies failed in its formation and implementation to have carried every class of persons along. With this, the strategies adopted on housing provision and delivery were ineffective with no direct benefits to the study group.

Again, the study shown that although National Housing Policy of Nigeria is challenged with various militating factors such as land supply, finance factors, corruption and cumbersome titling among others, it is pertinent however to restructure the present National Housing Policy to meet the needs and yearning of civil servants in the State.

Based on this research it has shown that relatively all class of persons need to be considered and carried along in the formation and implementation of subsequence housing policy in Nigeria. Again, the housing policy makers should adopt strategies that would be of benefits to all citizens irrespective of class, land and financial incentives should be made available and accessible since these among others are the challenges of housing provision and delivery to the study group. Finally, government should partner more with private sector and show more commitment in housing provision and delivery to civil servants if actually the country and state needs improved service delivery from the study group.

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## **APPLICATION OF COST-BENEFIT APPRAISAL TECHNIQUE IN PUBLIC PHYSICAL INFRASTRUCTURE IN UYO URBAN, AKWA IBOM STATE, NIGERIA**

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### **ABSTRACT**

*Cost-benefit appraisal technique is a sophisticated pre-investment appraisal technique suitable for the evaluation of the economic prospects of any public physical infrastructural proposal in the face of geometric decay that Nigerian urban areas are experiencing. This study aimed at applying cost-benefit appraisal technique on public physical infrastructure located within Uyo urban, Akwa Ibom State with the expectation that its viability could be realized. Hence, to achieve this aim, the study adopted a longitudinal research design type on a 48 respondents sample size drawn from different ministries within the study area. More so, questionnaire was administered to elicit relevant information. The study revealed that the condition of public physical infrastructure was in bad state; most public physical infrastructure was funded by debt/revenue from the State government; most public physical infrastructure in Uyo urban did not undergo cost-benefit appraisal before embarking on such project and that cost-benefit appraisal technique could determine the viability of any public physical infrastructure if applied appropriately. Based on these findings, it was recommended that government should revamp all public physical infrastructure in Uyo urban and more funds should be made available for the maintenance of all existing public physical infrastructure. Furthermore, it was recommended that in carrying out any project, government should ensure that such project undergo a pre-investment appraisal to ascertain the actual costs of the project and its benefits to the people. Also, government should ensure that all public project appraisers are able to apply cost-benefit appraisal technique effectively and appropriately.*

### **INTRODUCTION**

Public physical infrastructure is unarguably an integral part of a viable economically developed urban and rural area or community. It is in fact the bedrock on which a robust economic development stands as acknowledged by many scholars (Adebayo, 2006; Udoudoh, 2016). Within this framework, World Bank Report (1994) opined that public physical infrastructure should be defined in terms of all necessary services, facilities, equipment and devices needed or desired for the physical and mental health, and social wellbeing of each family and/or individuals living within an area or a community. Therefore, it is reasonable for one to reason in line with the thought of Udoudoh (2016) that it represents a wide range of economic and social amenities such as road provision, water supply and recreational facilities, among others, which are crucial to create an enabling environment for a sustainable urban or rural growth. Based on this point, Aluko and Ajayi (1992) affirmed that the provision of basic public physical infrastructure in any geographical area or community is essential for the economic development of such an area or community. Floyd and Allen (2005) further emphasized the importance of public physical infrastructure in the local development process and argued that public physical infrastructural development or the lack of its presence is often used as an administrative policy tool to either encourage or discourage area or communal growth. Hence, in this paper, public physical infrastructure was viewed to cover electricity, road and water supply located within Uyo urban.

It is sad to note that the greatest drag on Nigeria's economic growth in general is the country's substantive deficit in the number of basic public physical infrastructural provision over the years. For example, National Statistics Commission (2020) presented the fact that 83% of the total roads in most Nigerian cities were under the category of "bad", 96% of Nigeria's population living in major cities such as Port Harcourt, Lagos and Abuja lacked access to clean water supply and more than 78% of electricity supply in the country was deficit. Consequently, the list goes on and on even with the country's various development plan such as National Vision, 2020, and Economic Recovery and Growth Plan, 2017-2020, intended at various times to right the wrong were seemingly being executed. The working papers consistently highlighted the proliferation of weak public physical infrastructural development and/or its deficiency in most Nigerian cities as one of the factors that has seriously undermined the country's economic performance. In fact, it highlighted the deterioration of the total

public physical infrastructure by 72% annually. However, significant efforts have been made to address these known challenges by different governmental regimes in order to provide public physical infrastructure that marches the country's growing population, but sadly, they seem to be failing again and again. As acknowledged by Nigeria's various development plans already mentioned above and others, only 17% of Nigeria's roads are paved, compared on average to half the roads in the world's lower middle-income countries such as Ghana and South Africa.

Similarly, the World Bank Report (2020) presented the fact that approximately 60 million Nigerians within the major cities as Kano and Lagos are living without access to basic drinking water services, 80 million without access to improved sanitation facilities, and these are specific in both the rural and urban areas. Also, it has been observed by Ibok and Daniel (2014) that 39% of households lack access to at least basic water supply services, while only half have access to improved sanitation only compared to the country's global income peers. The situation for access to electricity supply is similar, in fact the figures are outrageous in numbers, as shown by the author. The need for change is apparent, and a number of Nigerian policy documents, including the Nigeria's Economic Recovery and Growth (ERGP), 2008 have acknowledged this and proposed various strategies with more or less specific objectives. Further, Nigeria's National Integrated Infrastructure Master plan (NIMP), 2015 had provided a strategic framework for the development of the country's weak public physical infrastructural base, but this has also failed in execution over the period. Another critic of the framework, Iseh (2003) opined that energy and roads seemed to be the forefront of public policy and budgetary allocations as they were marked as Nigeria's priority.

Public physical infrastructural decay is not only a general Nigerian issue; rather all State capitals including Uyo urban are experiencing the same condition. Hence, an evaluation over the years showed a specific look at public physical infrastructural growth in the country as declining and calls for a more rational questioning. In Uyo urban, a city dating back to 1987 when it was created as a State capital from the then Cross River State, its public physical infrastructure has continually reduced in appreciation. Udoudoh (2016) and Inyang-Eyen (2019) showed that the city began with well-funded and functional public physical infrastructure; constant electricity supply, good roads and adequate water supply to about five million persons living in the city as at then (National Population Commission, 1991).

However, the city required substantive repairs. For example, major streets such as Abak Road, Aka Road, Nwaniba Road, Ikot Ekpene Road and LOT-3D Roads constructed a few years behind were filled with port-holes and required substantive repairs. The author further recalled that Akwa Ibom Water Company (AKWC) created during the State creation was suffering from lack of adequate funding, and hence, could not even supply adequate water to the urban dwellers. More than 70% of the approximately 10 million persons living within Uyo urban, were living without adequate water supply in 2012. Also, there was inadequate supply of electricity; hence the proliferation of generator sets making noise and dirtying the entire city everywhere (example, Ikpa Road and Epic Plaza). This ugly situation caused the then governor, Architect Obong Victor Attah to initiate the IBOM Power Plant in 1994. However, this public physical infrastructure after being commissioned has not seen the light of the day since. Much more public physical infrastructure of this nature abound, and one is set to wonder whether any appropriate pre-investment exercise was conducted to determine its viability.

No wonder this situation, in general, has left many researchers thoughtful about not just the execution of public physical infrastructure, but its functionality since it is apparent that many new infrastructure are not sustainable in comparison to old ones (Umeh, 1977 and Ogbuefi, 2004). Poor functioning of our urban public physical infrastructure portrays Nigeria as being more interested in initiating and embarking on infrastructural development, without making provision for effective operation of such equipment and facilities to perform the functions they were established (Udoudoh and Udo-Idem, 2017). It is obvious that some of the existing public physical infrastructure require refurbishment and additional capacity needed to match the demand of the teaming future population in the country, especially in urban areas like Uyo urban that has moved from five million persons in 1987 to approximately 10 million persons in 2000 (National Population Commission, 2010). The challenges remain on how to provide and maintain the existing urban public physical infrastructure in the least expensive manner possible, in order to revitalize and grow the Nigerian economy, once again.

It is presumed that in achieving this ideology of sustainability, many schools of thought have advocated the need to adopt an appropriate pre-investment appraisal method. With this idea in place, there are several investment appraisal techniques such as payback period, cash-flow, internal rate of return, among others, but the use of cost-benefit analysis has been proved most appropriate for public projects (Umeh, 1977 and Udoudoh, 2016). The authors are of the reasoning that cost-benefit analysis should be an appraisal technique used in assessing the sustainability of public physical infrastructure, which is likely to have an impact on a group of people or the entire urban area or community (Udechukwu, 2006) since it is used with both quantitative and qualitative implications. Thus, it is mainly applied in the appraisal of public sector related projects with social, economic, financial or political implications (Udoudoh, 2016). This paper is justified on recognition that cost-benefit appraisal technique provides a sophisticated pre-investment appraisal technique suitable for the evaluation of the economic prospects of any public physical infrastructural proposal in the face of geometric decay that Nigerian cities are experiencing, and could be applied by subsisting governmental authorities. It is designed as a guide on the effective use of the required economic resources within the urban area or community, especially in Uyo urban. The aim of this research is to examine the application of cost-benefit appraisal technique on public physical infrastructure located within Uyo urban. To achieve this aim, the following objectives were set, namely, to identify the condition of public physical infrastructure located within Uyo urban; to examine if cost-benefit appraisal technique was carried out on these public physical infrastructure; to determine the viability of public physical infrastructure where cost-benefit appraisal technique was carried out and those for which it was not and to apply the technique to some public physical infrastructure located within Uyo urban for which it was not carried out.

## **REVIEW OF RELATED LITERATURE**

### **Identification of the State of Public Physical Infrastructure**

Generally, the term infrastructure has been used in a broad term to mean the provision of public goods and service such as electricity, clean water, drainage, roads, environmental restoration and rehabilitation utilities. According to Donald (1974), infrastructure refers to the physical structures and facilities that are developed or acquired by public agencies to enhance governmental functions and provide water, power, waste-disposal, transportation or similar services to facilitate the achievement of common social and economic objectives. To Nubi (2002), infrastructure is the aggregate of all facilities that allow a city to function effectively. It is also seen as a wide range of economic and social facilities crucial to creating an enabling environment for economic growth and enhances quality of life. Fox (1994) also defined infrastructure as those services derived from a set of public works traditionally provided by the public sector to enhance private sector production and to allow for household consumption. According to World Bank Reports (1994), infrastructure embodies all necessary services, facilities, equipment and devices needed or desired for the physical and mental health, and social wellbeing of the family and individuals. It represents a wide range of economic and social amenities which are crucial to create an enabling environment for sustainable urban growth (Udoudoh, 2016). Hence, urban infrastructure is a critical agent for the socio-economic development of any urban or rural area or community (Okusipe, 1999). Irrespective of the forms of definitions provided by various authors, public physical infrastructure includes all physical structures and facilities that supports the wellbeing of citizens in the society, and in a broader advantage promotes the economic growth of all entire nation. Public physical infrastructure covers the hardcore construction activities which relates to the provision of transportation, electricity, water and communication services. In the work of Udoudoh (2016), public physical or economic infrastructure has been further split into public utilities and works. The authors listed public utilities to include electric power, piped gas and heating, telecommunications, pipe borne water, sanitation and sewage, and solid waste, while public works include roads, major dams and canal works for irrigation and drainage and other transport projects like urban and inter-urban railways, urban transport, seaports, water ways and airport. According to Udoudoh (2016), the key types of public physical infrastructure include transportation, electricity and water infrastructure.

Transportation is an essential component of urban system. It aids the movement of goods and people from one location to another. Many Nigerian cities like Uyo urban have well-developed transportation road networks. For example, Akwa Ibom State Government have developed road networks such as

the construction of 1.5 kilometres outfall drain passage from Nsikak Eduwok to Tropicana and its environments, construction of 6.1 kilometres Atan-Offot-Usung Urua Road, among others. According to Uchegbu (2008), urban transportation systems and management is the different modes of urban travel and their component as well as the act of controlling and/or overseeing its operations and activities to ensure maximum operation. Transportation infrastructure involves the mode of travelling as well as the channel along which one travels as road, railways, waterway, coastline, pipelines and terminal facilities. Chapin (1976) added that transport infrastructure constitutes a major landscape in urban areas and as much as 20%-30% of the total built-up areas of the city are usually devoted to transportation. According to Delaney (2008), as the economy develops, more goods needed to be transported, more people would travel and more products would be produced. Transportation facilities in Nigeria do not increase at the same rate as urban population growth rate. The disequilibrium between the supply and demand of urban transportation has posed a great challenge to planner, policy makers and the economy. The growing world population and inherent need for increased transportation is straining existing transportation infrastructure and creating the need for megaprojects.

Electricity supply is one of the most important urban infrastructure in any nation. Electricity has been gathered at central stations since 1881 in the United Kingdom. The first power plants were run on water power or coal, nuclear, natural gas, hydro-electric and now petroleum with small amounts from solar energy, tidal harnesses, wind generators and geothermal sources (Etuk, 2009). Centralized power generation became possible when it was recognized that alternating current powerline could transport at very low costs great distance by taking advantage of the ability to raise and lower the voltage using power transformers. The supply of electric current commences with the process of generation. The other processes include electric power transmission, distribution, storage and recovery using pumped storage methods which are normally carried out by the electrical power industry (Udoudoh, 2016). In Nigeria, the electricity company of Nigeria was formed in 1950 as Nigerian Electric Company and was eventually merged with Niger Dams Authority in 1972 to form the National Electricity Power Authority (NEPA) and was given a monopolistic right to control every aspect of the power process from generation to transmission and distribution. According to Delaney (2008), the lack of forces driving the power has been absent from the bottom to the top. Government policy for the sector during the 1980s and 1990s, and until recently did not properly articulate national needs. A study carried out by Oluba (2008) on the provisions of public infrastructure in Nigeria revealed that the Kanji Hydroelectric Plant had been in operation since 1968 with the intent of distributing 960 megawatts of power from its 12 turbines. Unfortunately, only 10 turbines generating 760 megawatts have been installed. The operation of power supply in Nigeria has been faulty over the years such that most Nigerians are not satisfied with the performance in the sector because of either its complete lack or epileptic supply. The epileptic supply of electricity has wrought more havoc to the urban economy. The growth rate of electricity generation in Nigeria is far less than the growth rate of the population of its customers. From analyses, the energy generation available to Nigeria declined from installed capacity of 5906 megawatts to 1600 megawatts in 1999 with only 19 functioning generating units out of 79. Nigeria operates at one-third of its installed capacity due to aging equipment. Observably, there has not been any turn around maintenance on electricity generation, transmission and distribution installations for several years running into decade in Nigeria. Consequently, the existing Rader transmission lines have been completely run down, while many transformers and circuit breakers had become vulnerable and susceptible to reader breakdown (Udoudoh, 2016).

The problem of electricity supply in Nigeria is basically the inability of Power Holding Company of Nigeria (PHCN) to establish and maintain a reliable supply. Hence, effective operation at maximum capacity utilization is presently required. This is evident during the rainy seasons as observed by Lado (2009) when all the three hydro-power plants in the country namely Kanji, Jebba and Shiroro contribute only 1900 megawatts (representing on 30% of total national requirement) due to insufficient water in their reservoirs. Records show that at this period of the year, instead of the country experiencing tremendous improvement in power supply nationwide for more than 15 hours per day, the supply rather drops to a very low level of generating capacity (Udoh, 2016). To improve electricity supply, the federal government created the National Electricity Regulatory Commission (NERC) in 2006. The commission was poised to streamline and contain the excesses of Power

Holding Commission of Nigeria. One of such way is in the billing system where distribution companies are expected to read customers metres, rather than articulating, inflating and estimating usage by customers. This billing system has been a subject of debate for years running into decade in Nigeria.

Water, which is a unique natural resource, is essential for the sustainability of human life. It is one of the basic human needs required by every living thing on a daily basis. Good quality drinking water supply, sanitation and hygiene services is a basic human right with dedicated targets within the sustainable development goals and is fundamental to the wellbeing of all Nigerians. The supply of safe and adequate water to urban environment is an integral part of wholesome urban infrastructure (Udoudoh, 2016). Water infrastructure is a broad term for systems of water supply, treatment, storage, water resource management, flood prevention and hydropower (Oyebode, 2020). The term also includes water-based transportation systems such as canals. Traditionally, the water supply and services in Nigeria has remained a social responsibility of the various tiers of government. Unlike the constitutions of other African countries such as those of Ethiopia, Uganda, Gambia and South Africa, the 1999 Constitution of Nigeria does not establish any express entitlement or right to water supply. Section 20 grants power to States of the federation to protect and improve the environment and safeguard the water. However, there are legal and institutional arrangements put in place for water quality management, but enforcement of such regulations is lacking, and monitoring of water quality is very weak. In January 2000, the National Water Supply and Sanitation Policy (NWSSP) was introduced to provide the institutional arrangements for operation and funding of portable water supply for both urban and rural areas. One of such institution is the establishment of state water boards. The board has been expected to generate enough money through rates collection at least to facilitate the operation and maintenance of installed facilities, but the reverse was the case as the boards could not perform in the face of increased demand from the public. Oyebode (2020) observed that the existing water works for urban and semi-urban centres are confronted with problems associated with their designs, operation and maintenance, and lack of integrated management. Water delivery systems are also plagued by many problems like inequitable resource provision, leakages, damage of unmarked buried pipes, vandalism, greed and mismanagement. According to Udoudoh (2016), this situation has resulted in many existing water works supplying less water than they were designed. Other challenges faced by public water supply system include data collection, availability and accuracy, inadequate financial resources for effective operations, lack of skilled technical personnel, urbanization and unsustainable water consumption practices, lack of monitoring of water quality, health outcomes and economic returns, bacteriological contamination during distribution and storage, poor water quality, poor governance and stakeholder engagement and migration, technical inefficiencies and unreliability, over-dependence on government for finance (Zerah, 2000; Cohen, 2006; World Bank Report, 2007; Adnan, 2013; Adan and Iqbal, 2014; Haider and Tesfamariam, 2014 and Adams and Zulu, 2015).

The United Nation Population Information Network (1994) emphasized the importance of technology for achieving urban water needs. Technologies that were suitable to developed countries are unable to work in Nigeria and other developing African countries. This calls for need to develop other system that are self-reliant, thus, the emergence of boreholes and hand pumps as strategies to meet urban water need in Nigeria. Lack of adequate facilities by such schemes has resulted in low productivity, low-productivity, low-coverage and inefficient service delivery (Udoudoh, 2016). The World Health Organization recommended a total of 120 liters per capital per day for domestic use and 180 liters in 1984 (Mba, 2005). The United Nation Organization stipulated a minimum of 125 liters of water per capital per day for human needs. This is far above 65 liters of water per day available for each Nigerians' present consumption (Ekop, 2007 and Okafor, 1981). This shows that an average Nigerian consumes far less than the recommended water intake by both World Health Organization and United Nations Organization. Accordingly, water services have suffered from functionality and sustainable issues and frequent breakdown due largely to poor community management system. Ekop (2007) revealed that 31% of all public-used water schemes in Nigeria are non-functional. The survey further exposed Nigeria's sustainability issues by showing that slightly more than one in five water facilities broke down their first one year of operations, more than half of public facilities do not have community water management systems in place, while one in three do not have arrangements for



water point facility caretakers in place. Only 6% of public water systems are dependable with respect to their operations and maintenance system, and privately-owned, used and managed water system are about two times more dependable with respect to their design, configuration and systems' functionality than public water systems.

### **Exploration of Cost-Benefit Appraisal Technique**

Udoudoh (2016) showed that cost-benefit appraisal technique is a pre-investment tool used to analysis public physical infrastructure by measuring the cost and comparing it with the benefit. If the cost outweighs the benefit, then a loss/disadvantage vis-à-vis gain/advantage. Hence, developers and investors normally proceed on the assumption that their benefits would exceed their cost sometimes without appropriate assessment of the key elements to be considered before executing public physical infrastructure with huge capital outlays (Udoudoh and Oladokun, 2015; Udoudoh, 2016). This could go well with small public infrastructure but not with huge development such as the construction of a dam or flyover. Simple observations show that a wide range of practices are associated with the weighting of benefits and costs. Hence, cost-benefit analysis provides a leading example of the techniques used in evaluating the economic prospects of resource development proposals in most urban and rural areas or community. Cost-benefit analysis, sometimes called planning balance sheet, is one of the effective public investment appraisal technique which helps in weighing benefits and cost that are unique on different public physical infrastructure for effective decision-making. It is a primary tool that economist employs to determine whether a particular policy or policy proposal promotes economic efficiency (Kotchen, 2010). It is an appraisal technique necessary in assessing the desirability of a public physical infrastructure that is likely to have an impact on the host community or area and the public in general. In the study conducted by Ogunba and Ajayi (2018), cost-benefit analysis is a powerful and widely used tool for deciding whether to implement a public physical infrastructure. The authors further asserted that cost-benefit analysis technique is similar in concept to "net present value" (NPV) because it discounts costs and benefits. The difference is that it considers not just financial cost and benefits, but also social and environmental cost and benefits. Cost-benefits analysis is a means of establishing whether proposed public physical infrastructure are worthwhile to the community based on the analysis of financial, social and environmental cost versus benefits.

Cost-benefit analysis technique is concerned with economic choice and endeavors to assist decision-makers in making choices concerning scarce resources. In the private sector, the goal of the organization is purely financial, which is to maximize profits, hence, in its investment decisions, the organization is only concerned with private costs and benefits that are decided by the market mechanism. The organization would make those choices which contribute most to profit. The difficulty for the public sector is that it must consider the wider implications for the society – the social costs and benefits. For the most part, the public sector does not operate within the market mechanism for its goods and services and therefore the valuation of social costs and benefits is more difficult. Cost-benefit analysis technique estimates and totals up the equivalent money value of the benefits and costs to the community or area of public physical infrastructure to establish whether they are worthwhile. This means that all benefits and costs of a public physical infrastructure should be measured in terms of their equivalent money value and time. The most useful financial results in a cost-benefit analysis technique appear in a time-based cash-flow summary. The basic rule of cost-benefit analysis is that public physical infrastructure should be performed only then, when discounted benefits would be higher than discounted investment expenditures. An exact cost of investment and operation costs after project putting into life are treated as the investment expenditures. In the study conducted by Samuelson and Marks (1998), a comprehensive cost-benefit analysis consists of main three steps, namely, identification of all the factors which could flow into community or area because of that public physical infrastructure, financial valuation of cost and benefits, and choice of the best alternative with net social benefits. A valuation of benefits of non-market and intangible benefits should be based on one from three possible methods, namely, direct valuation, indirect market value and social values.

In practice, exact estimation of benefits and their amounts is very difficult. In many cases appealing to indirect intangible benefits has been useful. For example, valuation of people's lives could be

assessed in indirect ways through calculating discounted income (net present value) expected by each person or group of people or through determination of effective demand on life insurance or through calculating the perks for work in polluted or dangerous environment. Other example, an education brings with itself only intangible benefits in form of intellectual and cultural wealth of community, but simultaneously thanks to the better-educated people the more sophisticated and complicated works could be done in the region and in consequence would result in increased economic gains. One stream of benefits and costs should be compared with at least one other stream of benefits and costs. In essence, Alberini (2004) showed that the appeal of cost-benefit analysis is the monetization of the benefit policy. Hence, cost-benefit analysis facilitates decisions that should be undertaken by investors referring to cost projects and optimal choice among alternatives. Such solutions are especially crucial in a case of many social needs and scarce funds. Situations like those mentioned above, force investors to choosing the most important or the most effective public physical infrastructure. In other words, cost-benefit analysis when properly conducted would allow the urban analyst or policy-maker to identify potential Pareto improvements and measure the scale of the difference between gains and losses. Cost-benefit analysis provides information for decision-making process, but it does not by itself make decisions (Alberini, 2004 and Brzozwska, 2007). The purpose of cost-benefit analysis technique is to ensure that the public sector allocates scarce resource efficiently to competing public sector infrastructure. Cost-benefits analysis technique allows one to determine the socially optimal size of the public physical infrastructure, which means, the one that maximizes net benefit. At the socially optimum public physical infrastructural project, the marginal benefits of the project would be equal to its marginal costs.

To determine the net effect of a proposed public physical infrastructure, the investment analyst identifies those who stand to gain and those who stand to lose from the implementation of the policy, and then estimate their respective gains or losses. Hence, cost-benefit analysis adopts the principle of a potential Pareto improvement, where winners could potentially compensate the losers. In totality, the benefit and the costs examined in a cost-benefit analysis are the aggregate gains and losses experienced by the individuals who comprise the society. Hence, if no individual is made better off by the public physical infrastructural project, there are no benefits associated with it. If no one is made worse off by the infrastructure, there are no costs. Also, even though benefits and costs are expressed in monetary terms in cost-benefit analysis, it goes well beyond changes in individual's income. For example, if a citizen's wellbeing is improved because of cleaner air through a reduction in the physical discomfort or symptoms associated with pollution exposures, hence, such citizen experiences a benefit even though his or her income has not changed (Alberini, 2004).

Ogunba and Ajayi (2018) outlined certain necessary points to be noted in the use of cost-benefit analysis technique and the advantages of the analytical technique to include its flexibility and it could be used to choose among range of alternative, even where the alternative projects are differing lengths, and to identify instances where costs and benefits place identifiable groups at special advantage or disadvantages; the appraiser using cost-benefit analysis technique would have to analyze and include intangible social and environmental item in the analysis. In this regard, the technique is different from the traditional investment appraisals of the estate surveyor which considers only financial costs and benefits. The inclusion of social and environmental costs and benefits makes cost-benefit analysis technique to potentially capture all advantage and disadvantages of a project to the public; all costs and benefits of the public physical infrastructure must be expressed in terms of a common unit; and the most convenient common unit is money; intangible benefits and costs of a project which are not directly expressed in terms of money would have to be measured in terms of their estimated money value; usually, members of the urban or rural community who are recipients of the costs and benefits would be asked to state the money value they consider equivalent to the public physical infrastructure's benefits and costs.

Their valuation of intangible benefits and costs should reflect not just stated preferences but revealed preferences. The reasoning is that individuals demonstrate preferences with regard to social and environmental resources. The preferences in turn reveal the amount of value the individuals place on these resources. In environmental valuation, the preferences demonstrated are either by way of revealed preferences (individuals revealing their preferences through their behavior), or stated preferences (individuals stating their preferences in questionnaires and interviews surveys);

techniques of valuing stated preferences include contingent valuation and choice modeling. Techniques of valuing revealed preference include the travel cost/time method and hedonic modeling. These techniques are used in cost-benefit analysis technique to value intangible costs and benefits of the public physical infrastructure. The time value of money is taken account in cost-benefit analysis technique is the calculation of the costs and benefits.

Ogbuefi (2002) showed that the main trust of investment appraisal is the examination of costs and benefits emanating from a proposed public physical infrastructure. In any proposed public physical infrastructure, be it private, corporate or government, there are various implications in the form of costs and benefits to the investor(s), hence, individuals and institutions may directly or indirectly be affected by the proposed public physical infrastructure. The nature of the appraisal to be executed would, therefore, depend on the type of the public physical infrastructure and the motive for the infrastructure, the location of the infrastructure and the person or government embarking on the public physical infrastructure. From the foregoing, it is obvious that the aim is to determine the worthwhileness of the proposed public physical infrastructure. The concept of analyzing costs and benefits is aimed at answering a series of questions that states the appraisal criteria, both economic and non-economic, are clearly shown. To this end, while some are qualitative, others are quantitative. The qualitative criteria, otherwise referred to as non-economic indicators are usually appraised subjectively. On the other hand, the quantitative criteria, otherwise referred to as economic indicators are usually appraised quantitatively. In this regard, the amount and type of resources to be committed and their cost are examined. The nature and quantum of the expected return are also analyzed. More so to be considered is the time dimension of both the development of the public physical infrastructure and the productivity life span of the public infrastructure. The time value of money is the preference to have money now rather than receive the same amount in future. This is typified by the interest charged on borrowed money or opportunity cost of borrowed money. In investment appraisal, the author assumed that the original money borrowed or the equity capital invested would have to be 'returned on capital' plus 'return of capital'.

The major problem of cost-benefit appraisal technique is to assess the implications of the qualitative costs and benefits to the public physical infrastructure. These problems have even been extended to the interpretation of these unquantifiable costs and benefits often referred to as intangible costs and benefits. Some scholars like Lichfield (1974) classified costs and benefits into private and social. In this context, private costs and benefits are those that could be measured in money terms and are often referred to as tangibles, while social cost and benefits are those that cannot be measured in money terms. Social costs could also be seen as losses imposed on people not directly involved with the project without compensating them and social benefits as gains reaped by people not directly involved with the public physical infrastructure without paying for them. In other words, social cost and benefits are seen from this perspective as uncompensated costs and benefits. Others including Umeh (1977) see social costs as costs of public physical infrastructure borne by the urban or rural area or community in which the public physical infrastructure is sited or to be sited, while social benefits are benefits received by the rural or urban area or community from the public physical infrastructure. However, social costs and benefits cannot be quantified in terms of money. Within this background, it could be deduced that cost-benefit appraisal technique is a pre-investment tool that measures the cost implication against the benefit in a quantitative and qualitative process. This is in line with the thoughts of Udoudoh (2016).

#### Evaluation of Appraisal Technique and Infrastructure' Viability and Feasibility

By its very nature, cost-benefit appraisal technique has some inherent problems when dealing with infrastructure vitality and feasibility. According to Ogbuefi (2002), these include the difficulty of quantifying social cost and benefits. However, this could be minimized by weighting or ranking the different intangible costs and benefits. For example, in the present university course weighted system on 5-point grade unit, where A = 5, B = 4, C = 3, D = 2 and E = 1. If a particular item of cost is subjectively estimated to be of C level, this could be interpreted to mean 3. If on the other hand, a particular item of benefit is estimated to be of B level, it would be interpreted to mean 4. This would further be weighted by the application of appropriate multiplier depending on the unit of credit loading attached to each item of costs and benefits. This approach could be of tremendous use where

one is conducting a comparative analysis of social cost and benefit implications of two or more public physical infrastructure. The approach may help to throw up the project with higher social benefits even though the analysis is not strictly quantitative, but subjective with some spices of quantitative prognosis.

Another problem encountered in the use of this technique is that of differentiating between capital cost and benefits from viable costs and benefits or internal and external costs and benefits. Costs in some instances are not necessarily capital or variable. Some costs are semi-variable. They go up in volume or steps but not necessarily in the same proportion. Some may argue that an item of cost or benefit with a productive life longer than one service year makes that item capital rather than variable (Pyle *et al.*, 1978). This perception may be more suited to accounting practice than investment appraisal. There is also the problem of defining the cut-off point. When social costs and benefits are seen from the definition of being losses and gains to other persons, there would be complications in the analysis. For example, in urban land use development plan, apart from the complicated nature of trying to prepare a social cost and benefit balance sheet for each development scheme, the interdependence of urban land uses makes it almost impossible to avoid double counting of social costs and benefits (Lean and Goodall, 1975).

The argument is more obvious if social costs and benefits are seen from the perspective of being the costs borne by the community and benefits received by the community or area due to the execution of a public authority infrastructure (Pigou, 1960). If these definitions of social costs and benefits are used in conjunction with one another, there is likely to be double counting since items of social costs and benefits would be seen from the angle of having emanated from the public authority infrastructure and the point where to exert a ceiling becomes problematic. It is pertinent to mention that the problem of double counting may not exist under a situation where a private investor or developer could easily take into account private costs as well as internally absorbable social costs on the one hand and private benefits as well as internally recoverable social benefits on the other hand. Umeh (1977) argued that it is only a public authority such as planning office that should take into account all social costs and benefits depending on the circumstance of the public physical infrastructure. It has been argued that cost-benefit appraisal technique would only be appropriate if measured under perfect condition because monopolistic situation or control could distort the values of costs and benefits. This argument may to some extent be true especially in a free market economy. However, one may argue that in the true sense of it, no economy is completely free. Government fiscal policy decisions are often aimed at manipulating the operations of market forces.

### **Application of Cost-Benefit Appraisal Technique**

The application of cost-benefit appraisal technique to proposals for Town planning and urban redevelopment projects was pioneered by Lichfield (1974), but the documentary beginning of the technique has been traced to France with Dupuit's paper on the utility of works in 1844. Cost-benefit appraisal technique was used by public agencies in the United States in the formal evaluation of all water resource development projects proposed for federal funding such as irrigation development. According to Barlowe (1978) the use of the technique has been expanded to cover multiple-purpose projects including hydroelectric, power, navigation, flood control, watershed development, fish and wildlife, drainage, reforestation land clearing and other similar projects. In United Kingdom, the technique has been applied to transportation especially railways and road development.

Ogunba and Ajayi (2018) presented procedures for the effective application of cost-benefit appraisal technique on public physical infrastructure. According to the authors, the appraiser should first make a list of all monetary and non-monetary (intangible) costs and benefits that will be experienced on implementation of the project. Stakeholders in the community may be consulted in this regard. The non-monetary costs and benefits would be then quantified. The quantified positive and negative impacts of the project would be converted to their equivalent money value by some form of stated or revealed preference technique. As cost-benefit appraisal technique takes the form of a discounted cash flow analysis, the analysis of costs and benefits is best done on an annual rather than capital basis. The annual equivalent if the capital costs and benefits should be determined by dividing by the years purchase. Further, the costs and benefits would then be discounted at the adopted rate and summed. The discount rate chosen would be the government borrowing rate (the rate at which it borrows money from investors through the sale of bonds). Where inflation is built into the

analysis, then the discount rate recommended for use is the interest rate on government bonds less the inflation rate. Hence, a worthwhile project is one for which the present value of the benefits exceeds the discounted value of the costs; that is, the net present benefits are positive (in a manner similar to the net present value). The authors in practical terms presented the following example to illustrate the application of cost-benefit appraisal technique on public physical infrastructure: the federal government is considering locating an airport in Ille-Ife. There have been public proponents for and against the advisability of conducting such a project. As a result, your firm has been asked to conduct a cost-benefit appraisal to enable government decide as to whether or not to proceed with the project.

Accordingly, the expected costs of the proposed airport include compensation costs of 20 land owners who have been dispossessed of their single plots. The plots are estimated at ₦15,000.00 per plot; costs of constructing the airport, the architect’s drawings of the airport have been quantified by the quantity surveyors bill of quantities and priced at ₦50,000,000.00. An intangible cost not priced in the market is traffic congestion and the resulting longer road travel time in the vicinity to the airport due to congestion from airport arrivals per departure per airport taxis. In the regard you have estimated that 5,000 hours of travel time are wasted in jams per annum. You have used choice modeling to relate the cost of time to the average hourly wage which is ₦100.00 per hour. Another intangible is air pollution from airport fuel. This is estimated to result in pollution levels of up to 600 megafire per cube metres which would result in aggravation of respiratory and cardiovascular illnesses and irritation of the eyes. Valuation of the expected human illnesses per annum in terms of costs of treatment and loss of wages during illness suggest losses (costs) to the tune of ₦900,000.00. Still another intangible is noise pollution from airplanes, estimated to reach 110 decibels (dBA) for more than 3 hours every day. Contingent valuation of noise pollution suggests a capital sum of ₦9,500,000.00 (this should be brought to its annual equivalent). There is also another intangible of damage to trees and wildlife eco-systems from clearing the 20 plots for the airport. Approximately 120 economic trees are expected to be razed and several fauna ecosystems destroyed. Market valuation of economic trees and timber and contingent valuation suggest loss to the tune of ₦9,500,000.00. Expected benefits of the proposed airport include financial revenue from airport. The appraisal estimation in this regard is up to ₦50,000, 000.00 per annum. Employment opportunities at the airport, which are estimated at 200 new jobs. The average wage is ₦15,000.00 per annum per worker. Benefits not priced in the market include 400,000 hours of inter-city travel time saved per annum. Choice modeling has related this to the average hourly wage which is ₦100.00 per hour.

Your firm of appraisers is to determine whether the project is to determine whether the project is worthwhile to the community by developing a 10-year discounted cash flow table of annual costs and benefits. In the cash flow table, assume for simplicity that the costs and benefits do not change from year to year. Take the discount rate as the interest rate on long term bonds at 8% and the rate of inflation at 5%.

The appraisal is as follows;

Step 1: Analysis and pricing of costs.

**Table 1: Analysis and Pricing of Costs**

Cost	Means of Measurement	Method of Valuation/Pricing	Value in Capital Terms (₦)	Value in Annual Terms (₦)
Compensation	21 owners’ plots dispossessed	Valuation estimate	3,000,000.00	90,000.00
Construction costs	Quantity surveyor bill of quantities	Pricing of bill of quantities		50,000,000.00
Traffic congestion and longer road travel	5,000 hours of travel time per annum estimated to be wasted in jams	Choice modeling - The cost of time is calculated using the average hourly wage. ₦100.00 per hour		500,000.00
Air pollution	High air pollution levels expected at 600 megafire per	Valuation of human illnesses per annum in terms of costs of		900,000.00

	cubic metres leading to aggravation of respiratory and cardiovascular illnesses and irritation of the eyes	treatment and lost wages during illness		
Noise pollution	110 decibels (dBA) for more than three hours everyday	Contingent valuation		700,000.00
Clearance of flora (tree covers) and fauna	Approx. 120 trees razed and several fauna ecosystems destroyed	Market valuation of economic trees and timber and contingent valuation	9,500,000.00	285,000.00
			<b>Total Costs per Annum</b>	<b>52,475,000.00</b>

Source: Ogunba and Ajayi (2018)

The next step is the analysis and pricing of benefits as follows.

**Table 2: Analysis and Pricing of Benefits**

<b>Benefit</b>	<b>Means of Measurement</b>	<b>Method of Valuation/Pricing</b>	<b>Estimated Annual Price (per Annum)</b>
Revenue from airport		Appraisal estimation	50,000,000.00
Employment opportunities	200 new jobs estimated	Choice modeling: Average wage at ₦15,000.00 per annum per worker	3,000,000.00
Shorter air travel time	400,000 hours of inter-city travel time saved per annum	The cost of time is calculated using the average hourly wage. ₦100.00 per hour	40,000,000.00
<b>Total benefits per annum</b>			<b>93,000,000.00</b>

Source: Ogunba and Ajayi (2018)

The next step is to draw the cash flow table and discount costs and benefits. The discount rate is the interest rate on long term bonds which is 8% less the rate of inflation of 5% which gives 3% as shown in the following table.

**Table 3: 10-year Discounted Cash Flow**

<b>Year</b>	<b>Benefit (₦)</b>	<b>Cost (Sum) (₦)</b>	<b>Present Value of ₦1 @ 3%</b>	<b>Present Value (Benefit) (₦)</b>	<b>Present Value (Cost) (₦)</b>
1	93,000,000.00	52,475,000.00	1.0000	93,000,000.00	52,475,000.00
2	93,000,000.00	52,475,000.00	0.9708	90,284,400.00	50,942,730.00
3	93,000,000.00	52,475,000.00	0.9425	87,652,500.00	49,457,687.00
4	93,000,000.00	52,475,000.00	0.9151	85,104,300.00	48,019,872.00
5	93,000,000.00	52,475,000.00	0.8885	82,630,500.00	46,624,037.00
6	93,000,000.00	52,475,000.00	0.8626	80,221,800.00	45,264,935.00
7	93,000,000.00	52,475,000.00	0.8375	77,887,500.00	43,947,812.00
8	93,000,000.00	52,475,000.00	0.8131	75,618,300.00	42,667,422.00
9	93,000,000.00	52,475,000.00	0.7894	73,414,200.00	41,423,765.00
10	93,000,000.00	52,475,000.00	0.7664	71,275,200.00	40,216,840.00
			<b>Total</b>	<b>817,088,700.00</b>	<b>461,040,100.00</b>

Source: Ogunba and Ajayi (2018)

Cost-Benefit Analysis in terms of Net Present Value = ₦817,088,700.00 – ₦461,040,100.00

$$= \text{N}356,048,600.00$$

$$\text{Cost-Benefit Analysis in terms of Profitability Index} = \frac{\text{N}817,088,700.00}{\text{N}461,040,100.00} = 1.77$$

The advice to the government and the community is to go ahead with the project with the understanding that it confers more benefits than costs.

## RESEARCH METHODS

### Research Design

This study adopted a longitudinal research design type. Using this research design type, data adopted from this timeframe of 10 years (2011-2020) was covered and analysis included water supply, road provision and electricity supply. Each of the variables was applied using cost-benefit appraisal technique. Further comparison was made between those public physical infrastructure that the technique was applied and those that were not.

### Research Population and Sampling Design

The population for this study comprised all directors and senior staffs in Akwa Ibom State ministries related to the study. According to Table 4, Ministry of Lands and Water Resources, Finance and Akwa Ibom State Water Company had 9 (18.75%) directors and senior staff, Works and Fire Services had 11 (22.92%) directors and senior staff, while Akwa Ibom State Road Maintenance and Other Infrastructural Agency had 10 (20.83%) directors and senior staff. The researcher decided to use all of the directors and senior staff in the different ministries as sample size for the study as the population size is small and can be covered.

**Table 4: Directors and Senior Staff's Name of Ministry**

Item	Frequency	Percentage
Lands and Water Resources	8	17.39
Works and Fire Services	11	23.9
Finance	9	19.5
Akwa Ibom State Water Company Limited	9	19.5
Akwa Ibom State Road Maintenance and Other Infrastructural Agency	9	19.5
Total	46	100

Source: Researcher's Computation (2022)

### Techniques of Data Analysis

In this study, data was collected through the questionnaires distributed to respondents, analyzed electronically and presented in tables, charts and graphs using Microsoft Excel 2012 program. Further, the use of Pearson Product Moment Correlation was applied to analyze the hypothesis with the formula:

$$PPMC(r) = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2 \cdot n \sum y^2 - (\sum y)^2}} \dots \dots \dots \text{Equation 1}$$

Where x is the variable for application of cost-benefit technique and y is the variable for enhanced public physical infrastructure located within Uyo urban.

### Discussion of Findings

The discussion of the result was done based on the objectives and the aim of the study as follows.

#### Identification of the Condition of Public Physical Infrastructure Located Within Uyo Urban

From Table 5, it was shown that out of 46 respondents in the study area, 15 (32.6%) respondents were involved in road provision and electricity supply, while 16 (34.8%) respondents were involved in water supply.

**Table 5: Physical Infrastructure Involved by the Respondent**

Item	Frequency	Percentage
Road Provision	15	32.6
Electricity supply	15	32.6
Water supply	16	34.8
Total	46	100

Source: Researcher's Computation (2022)

Also, from Table 6, 6(13.04%) have work experience between 1 and 5 years. This implies that they are relatively in infrastructure development. It also shows that 28 (60.87%) respondents had 6-10 years of work experience. Twelve (12) (26.09%) have more than ten(10) years experience.

**Table 6: Working Duration of Respondent**

Item	Frequency	Percentage
1-5 years	6	13.04
6-10 years	28	60.87
10 years and above	12	26.09
Total	46	100

Source: Researcher's Computation (2022)

Further from Table 7, 2 (4.34%), 6 (13.04%), 8(17.39%), 28 (60.87%) , and 2 (4.34%),respondents said the infrastructure in their area was very good, good, fair, bad and very bad respectively.

**Table 7: Condition of the Public Physical Infrastructure**

Item	Frequency	Percentage
Very good	2	4.34
Good	6	13.04
Fair	8	17.39
Bad	28	60.87
Very Bad	2	4.34
Total	46	100

Source: Researcher's Computation (2022)

From Table 8, 15 (32.6%) respondents evaluated the condition of the public physical infrastructure as decay and dilapidated respectively, while 16 (34.8%) respondents evaluated it as obsolete.

**Table 8: Evaluation of the Public Physical Infrastructure**

Item	Frequency	Percentage
Decay	15	32.6
Dilapidation	15	32.6
Obsolescence	16	34.8
Total	46	100

Source: Researcher's Computation (2022)

From Table 9, 2 (4.34%) , 8( 17.39%), 22 (47.83%), 10(21.74%) and 4(8.70%) respondents assessed the level of depreciation of the infrastructure on a scale of 10-20%, 21-40%, 41-60%, 61-80% and 81-100% decay. Respectively.



**Table 9: Percentage Attributable to the level of dilapidation of infrastructure**

Item	Frequency	Percentage
10-20%	2	4.34
21-40%	8	17.39
41-60%	22	47.83
61-80%	10	21.74
81-100%	4	8.70
Total	46	100

Source: Researcher's Computation (2022)

From Table 10, 11 (23.91%) respondents said the factors responsible for the decay included mismanagement, lack of maintenance, neglect and poor conception

**Table 10: Factors responsible for the current state of the infrastructure**

Item	Frequency	Percentage
Mismanagement	11	23.91
Lack of maintenance	11	23.91
Neglect	11	23.91
Poor conception	11	23.91
No idea	2	4.34
Total	46	100

Source: Researcher's Computation (2022)

Lastly from Table 11, 42 (91.30%) respondents said that the infrastructure are not in the right condition. Summarily, it was identified that the condition of public physical infrastructure located within Uyo urban are in bad condition, in line with Udoudoh (2016) who emphasized that the condition of public physical infrastructure in Uyo urban is really poor. Hence, this study and others affirmed the bad condition of public physical infrastructure in Uyo urban, and as such should not be the right condition

**Table 11: Right condition of these public physical infrastructures**

Item	Frequency	Percentage
No	42	91.30
Yes	3	6.52
No idea	1	2.17
Total	46	100

Source: Researcher's Computation (2022)

#### **Examination of whether the Cost-Benefit Appraisal Technique was Carried out in these Physical Infrastructure or Otherwise**

From Table 12, it was shown that out of 46 respondents in the study area, 42 (91.30%) respondents agreed that they know about cost-benefit appraisal technique.

**Table 12: Knowledge of Technique**

Item	Frequency	Percentage
<b>Yes</b>	<b>42</b>	<b>91.30</b>
No	3	6.52
No idea	1	2.17
<b>Total</b>	<b>46</b>	<b>100</b>

Source: Researcher's Computation (2022)

From Table 13, 42 (91.30%) respondents have not used the technique., It also shows that 2.17% of the respondents have used the technique. Table 13 reveals that 6.52% cannot remember whether they have used the technique or not.

**Table 13: Use of Technique**

Item	Frequency	Percentage
Yes	1	2.17
Can't remember	3	6.52
No	42	91.30
Total	46	100

Source: Researcher's Computation (2022)

From Table 14, 40 (96.0%) respondents said it could be used in public infrastructure, In addition, 4(8.70%) respondents opined that it could be used in Private infrastructure. It was revealed that 2(4.34%) have no idea.

**Table 14: Infrastructure Applied**

Item	Frequency	Percentage
Public infrastructure	40	96.00
Private infrastructure	4	8.70
No idea	2	4.34
Total	46	100

Source: Researcher's Computation (2022)

From Table 15, 43 (91.48%) respondents said the technique was not applied on public physical infrastructure.

**Table 15: If Technique was Applied on the Public Physical Infrastructure**

Item	Frequency	Percentage
Yes	1	2.17
No	43	91.48
No idea	2	4.34
Total	46	100

Source: Researcher's Computation (2022)

From Table 16, 38 (82.61%) respondents said they were told. Summarily, cost-benefit appraisal technique was not carried out on these physical infrastructure since only one respondent agreed that he used the technique on the public physical infrastructure he was involved. Many authors have attested to the fact that cost-benefit appraisal technique has not been carried out on the public physical infrastructure they were involved.

**Table 16: Rationale for the use of the technique by respondents**

Item	Frequency	Percentage
I did it	1	2.17
Someone else did it	6	13.04
I was told	38	82.61
I don't have any idea	1	2.17
Total	46	100

Source: Researcher's Computation (2022)

**Determination of the Viability of Public Physical Infrastructure in which Cost-Benefit Appraisal Technique was Carried out and those for which it was not**

From Table 17, it was shown that out of 46 respondents in the study area, 44 (95.65%) respondents said that the technique can determine the viability of a public physical infrastructure.

**Table 17: Technique and Viability Determination**

Item	Frequency	Percentage
Yes	44	95.65
No	1	2.17
No idea	1	2.17
Total	46	100

Source: Researcher's Computation (2022)

Also, from Table 18, 11 (23.91%) respondents said they have used it before and someone else used it, while 12 (26.09%) respondents said they learnt it in school and have read about it respectively. This analysis shows that the determination of the viability of public physical infrastructure is possible using this appraisal technique. Hence, the study confirmed the works of Ogbuefi (2002) and others that postulated the determination of viability of public physical infrastructure with the application of cost-benefit appraisal technique.

**Table 18: Rationale on Technique and Viability Determination**

Item	Frequency	Percentage
I have used it before	11	23.91
Learnt it in school	12	26.09
Someone else used it	11	23.91
I have read about it	12	26.09
Total	46	100

Source: Researcher's Computation (2022)

Application of Cost-Benefit Appraisal Technique to all Public Physical Infrastructure Located within Uyo urban for which it was not Carried Out

From Table 19, it was shown that out of 46 respondents in the study area, 43 (91.48%) respondents ascertained that the technique could be applied by calculating the costs against the benefits. However, cost-benefit appraisal was not applied on the public physical infrastructure in this study

**Table 19: Application of Technique**

Item	Frequency	Percentage
Calculating the costs against the benefits	43	91.48
Assumptions	1	2.17
Other appraisers' values	2	4.34
No idea	1	2.17
Total	46	100

Source: Researcher's Computation (2022)

### **Application of Cost-Benefit Appraisal Technique Cannot Enhance Public Physical Infrastructure Located within Uyo urban**

Analysis from all the objectives, namely, to identify the condition of public physical infrastructure located within Uyo urban, to examine if cost-benefit appraisal technique was carried out on these public physical infrastructure or otherwise, to determine the viability of public physical infrastructure in which cost-benefit appraisal technique was carried out and those for which it was not, to apply the technique to all public physical infrastructure located within Uyo urban for which it was not carried out and from Table 20, it was shown that out of 46 respondents in the study area, 44 (95.65%) respondents stated that technique could enhance public physical infrastructure. However, they did not apply the technique on the public physical infrastructure in the study area.

**Table 20: Technique and Enhancement of Public Physical Infrastructure**

Item	Frequency	Percentage
Yes	44	95.65
No	1	2.17
No idea	1	2.17
Total	46	100

Source: Researcher’s Computation (2022)

Also, from table 21 and table 22, it was shown that the technique could enhance public physical infrastructure since the calculated value (6.16) is more than the other value, this means that there is a positive correlation between cost-benefit appraisal technique and enhanced public physical infrastructure and therefore it could enhance it.

**Table 21: Test of Hypothesis**

Year	No. of Infrastructure Developed	Cost #m	Average Cost	Benefit	Average Benefit	Cost-Benefit Application	Enhanced Public Physical Infrastructure
2011	30	400	13.3	100	3.3	10	15
2012	40	600	15	120	3	12	17
2013	45	350	7.7	150	3.3	4.4	10.4
2014	30	210	7	90	3	4	12
2015	48	480	10	98	2.0	8	14
2016	30	400	13	45	1.5	11.5	21.5
2017	46	430	9.3	65	1.4	7.9	16.9
2018	60	760	12	120	2	10	21
2019	35	320	9.1	140	4	5.1	10.1
2020	40	345	8.6	120	3	5.6	14.6
Total		4295	105	1048	26.5	78.5	152.5

Source: Researcher’s Computation (2022)

From Table 27, the variables are applied

$$PPMC(r) = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2 \cdot n \sum y^2 - (\sum y)^2}} \dots\dots\dots \text{from Equation 4.1}$$

Where *x* is the variable for application of cost-benefit technique and *y* is the variable for enhanced public physical infrastructure located within Uyo urban.

Hence,

**Table 22: Analytical Values**

X	y	xy	X <sup>2</sup>	Y <sup>2</sup>
10	15.0	150	100	225
12	17.0	204	144	289
4.4	10.4	45.7	19.4	108.1
4.0	12.0	48	24	144
8.0	14.0	112	64	196
11.5	21.5	247.2	132.2	462.2
7.9	16.9	133.5	62.4	285.6
10.0	21.0	210	100	441
5.1	10.1	51.5	28.0	102
5.6	14.6	81.7	31.3	213.1
78.5	138.9	1,283.6	705.3	2466

Source: Researcher’s Computation (2020)

$$PPMC(r) = \frac{10 \times 1283.6 - 78.5 \times 138.9}{\sqrt{10 \times (705.3)(6162.3) + \{10 \times (2466) \times 19293.2\}}}$$

$$PPMC(r) = 6.16$$

### Conclusion

The study investigated the application of cost-benefit appraisal technique in public physical infrastructure in Uyo urban with a view to determining the viability of those public physical infrastructure in which Cost-Benefit technique was carried out and those for which it was not. The research findings revealed that, most respondents have knowledge of cost-benefit appraisal technique and they have not applied the technique in public infrastructure. Their rationale for this thought was that they were told. They agreed that the technique can determine the viability of public physical infrastructure because someone else used it, they have read about it, they have used it before and learnt it in school.

From the study, an evaluation of the public physical infrastructure showed that the conditions of most of the public physical infrastructure executed were decayed, dilapidated and obsolete. The percentage attributable was 41-60%. The factors responsible were mismanagement, neglect and poor conception. Hence, this was not the right condition. The study also revealed that public physical infrastructure in the study did not undergo cost-benefit appraisal which is evidence in cost-overrun, projects abandonment and poor projects delivery in Uyo urban. In conclusion, cost-benefit analysis is required for any infrastructural projects with huge capital outlay and it is pertinent to carry out a holistic evaluation of such project before embarking on it. Hence, the study revealed that, the cost-benefit appraisal technique could enhance public physical infrastructure within Uyo urban.

### Recommendations

Based on the findings, the following recommendations are made, namely, efforts should be intensified by the government to revamp all public physical infrastructure in Uyo urban. Also, more funds should be made available to key agencies such as Akwa Ibom State Road Maintenance and other Infrastructural Agencies to do more in the area of infrastructural maintenance in the area. All public physical infrastructure require huge capital outlay; therefore, in carrying out any project, government should ensure that such project undergo a pre-investment appraisal to ascertain the actual costs of the project and its benefits to the people. Hence, project with high costs and low benefits should be discouraged while those with low costs and high benefits should be highly recommended. The importance of cost-benefit appraisal technique is clear most especially in projects where it is appropriate to compare costs and benefits in economic terms. Cost-benefit appraisal technique should be used during the design phase of public physical infrastructure to help determine the viability of such project before its execution. Hence, the sustainability of the project would be greatly enhanced; government should ensure that all public project appraisers are able to apply cost-benefit appraisal technique effectively by first making a list of all monetary and non-monetary costs and benefits that would be experienced in the course of implementing the project, quantify and discount their values and use the result to recommend or discourage the funding of such project(s).

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