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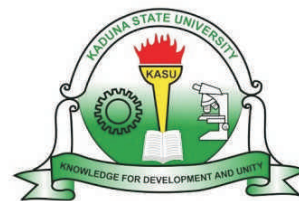
KADUNA STATE UNIVERSITY ENVIRONMENTAL SCIENCE JOURNAL(KESJ)

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ANALYSIS OF CONSTRAINTS TO VALUATION ACCURACY FOR DIFFERENT PURPOSES IN LAGOS AND ABUJA, NIGERIA

Wahab Muktar Babatunde¹, Ibuoye Adegboyega Ayodele², Adeogun Adekunle Sunday³ & Durosinmi Wasiu Ayobami⁴

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ABSTRACT

Accuracy of valuation exercise for various purposes has been universally emphasized in this current dispensation and as a matter of fact, it has been given a world-wide recognition by the World Bank, which encouraged the preparation of valuation list. The need to close the wider gap between the market value and valuation figure necessitated this study. The study firstly investigates inaccuracy and variance and further analyzed the factors and the extent to which these factors have contributed to valuation inaccuracy and variance. The study utilized reports of valuations on properties submitted to some selected banks to establish valuation variance by comparing the actual market sales (AMS) and valuation figures of the valuation firms to establish valuation inaccuracy. The study selected 100 and 150 estate surveying and valuation firms with more than 10 years experience in property valuation, through simple random sampling from Abuja and Lagos. The study further selected 15 banks that constantly requesting the valuation opinions of the selected firms in Abuja and Lagos. The result of analysis of variance (ANOVA) confirmed that there was significant valuation variance among the estate surveyors and valuers (F-ratio at 4.73, p-value at 0.42) and result of t-test showed that the mean difference between AMS and valuations (at p-values less 0.05) was significant. The result of factor analysis (FA) employed further revealed ten (10) the most emphasized groups of factors that contributed about 92.43% variance in determining accuracy of valuation. The study therefore recommends that all the stakeholders in property assessment and valuation exercises should address the most emphasized factors by adhering strictly to lay-down provisions of the profession and principles without compromise in order to achieve accuracy.

Keywords: valuation accuracy, variance, inaccuracy, valuation constraints, factor analysis

INTRODUCTION

The emergence of the study of valuation accuracy was triggered by Hager and Lord (1985) where a valuation is substantially required by the Institute and Faculty of Actuaries (IFA) in response to Investment Property Databank's (IPD) in order to measure property investment performance in UK. Since then, the accuracy of valuation exercise for various purposes has been universally emphasized in this current dispensation, where general down turn in economy is becoming a major concern. As a matter of fact, valuation accuracy has been given a world-wide recognition by the World

Bank, which encouraged the preparation of valuation list in the case of rating exercise (Kayuza, 2014). Property valuation as a core area of Estate Surveying and Valuation profession has continued to receive a constant knock in the area of accuracy. Also, it has become a matter of criticism to the academics, professionals and client not only in developing countries like Nigeria, but also in the developed countries of the world like USA, UK, Canada & Australia (Ayedun, Oloyede, Durodola, 2012). Also, the clients of the valuation exercise across the world have become more advanced and logical in their modes of investment thereby requiring valuation of their assets for various purposes

to progressively refine their financial techniques to meet up with their objectives, and any act of discrepancy or deviation in valuation figure might cause a collateral damage to their investment (Adegoke, Olaleye & Oloyede 2013). Consequently, valuation for any purpose ought to have been professionally accurate as a dependable bases and a guide toward clients' decision making as any discrepancy inform of valuation variance and inaccuracy might prove disastrous. Accuracy of valuation is the degree at which valuation figure is tangential to market prices otherwise it is called valuation inaccuracy, or the extent or degree of variation between two or more valuations on a particular property called valuation variance (Ibiyemi, 2013). Valuation inaccuracy and variance have become inevitable and therefore discrepancies in valuations among valuers have become a subject of discussion within the real estate profession. Variance and inaccuracy in valuation have also been identified by previous studies (Babawale, 2006; Babawale, 2008; Ayedun *et al.* 2012; Effiong, 2015). Valuation variance and inaccuracy have been a subject matter of discussion not only in developing countries like Nigeria but also advanced countries such as UK, US and Australia. For instance, in the US, issues of discrepancies in valuation were raised by Congress which led to congressional bill in the US; in like manner, two major commissions of enquiry were set up in the UK and one commission in Australia (Babawale, 2008). The pulse for addressing the discrepancies in valuation after the study of Hager and Lord (1985) in UK has since then, produced several studies (Boyd and Irons, 2002; Nasir, 2006; Babawale, 2008; Ayedun, Oloyede & Durodola, 2012; Akinjare *et al.*, 2013; Effiong, 2015; Munshifwa, Jain, Kaunda, Masiba, Lungu, Chunda-Mwango & Ngoma, 2016; Adegoke, 2016).

These aforementioned studies had emerged to address the menace which has bedeviled the integrity of valuation exercise. This paper therefore aimed at determining the amount of deviation that constraint factors contributed to valuation inaccuracy and variance with a view to identifying major constraints or factors that majorly affect valuation accuracy over and above other factors. In order to achieve this aim, the study firstly establishes valuation variance and inaccuracy using recent information to support the findings of previous studies before identifying the factors leading to inaccuracy and after identifying the factors, then the paper identified the factors and determine amount of variance contributed by the constraint factor using factor analysis.

CONSTRAINTS TO VALUATION ACCURACY: THE REVIEW OF LITERATURE

Hager and Lord (1985) investigated the results of ten surveyors commissioned to value two properties having a rack rental value of an office with a reversionary interest on retail property for Investment Property Databank's (IPD) to determine and measure the performance of the UK investment properties. The result revealed that 5% of the controlled figure was arrived at by four properties out of ten valuation properties. The study further found that 10% of the controlled figure was arrived at by five properties out of the remaining six properties. As regard to the retail properties, 5% of the valuations fall within the controlled figure, while 2 falls within 5% and the remaining three (valuations) produced valuation variance of 13.2% greater than the controlled property. Hager and Lord therefore concluded that the results cannot be used as measure of performance due to the large percentage variance that made the whole valuation unreliable.

In the analysis of accuracy in mortgage valuation exercise in Lagos, Aluko (2000) analyzed extent of accuracy between sub-sequential sale price of mortgaged properties used as collateral and valuation figure using the records of the banks on the

valuation of mortgage conducted by 59 registered estate firms. Thus, analysis of variance (ANOVA) was used to establish the difference in valuations, and regression analysis to determine the amount of variation in sale price explained by valuation figures. It is concluded that despite the inconsistencies discovered, valuations in Nigeria was still regarded as a good proxy for price. Therefore, the mortgage valuation to some extent predicted eventual sale price of mortgaged property.

Harvard (2001) carried out the study of valuation variance and valuers' behavior in UK. The study employed descriptive mean to identify factors with highest relative importance index (RII). The result revealed that inexperience of the valuer, error in procedure and survey, client pressure, differences in methodologies, and insufficient depth of investigation and quality of valuation control were prominent factors responsible for major variance in valuations. Boyd and Irons (2002), also confirmed the existence of difference in valuation in mortgage valuation in Australia, further used descriptive analysis to investigate the causes of valuation variance by assessing the decision made by Queensland Supreme Court through the court pronouncement. It was discovered that incorrect valuation data and error in methodology characterized the factors causing valuation variance as seen in the Meyer Centre case which was simply summarized as an act of negligence. An investigative study of possible factors causing of property valuation variance for secured mortgage loan in UK was carried out by Bretten & Wyatt (2002) using descriptive method to analyze 220 responses from financial institutions' stakeholders. The result revealed that heuristic behavior, principle associated with margin of error and client pressure contributed to variance. Bretten & Wyatt (2002) therefore concluded that variance might have been unconsciously included at some stage of valuation process due to external pressure. Crosby, Devaney, Keys & Matysiak (2003) investigated whether sale of the IPD Monthly index in 2002 clearly revealed dichotomy between

valuations and sale price in UK. Crosby *et al.* (2003) further concluded that the time of valuation was identified as a major cause of variance between prices and valuation figures. Ogunba (2004) studied the accuracy of valuation across the southwest Nigeria. The data from valuations and that of market prices from registered firms across Southwest Nigeria was utilized. The paper adopted descriptive tools (mean, mean deviation) and inferential techniques (regression and analysis of variance). The result therefore showed that valuation figures proved not to be good proxies for determining market prices; reason being that there was evidence of significant variance between valuation figures and actual prices because the coefficient of valuation figures in the model could not significantly improve the accuracy of market prices. Aluko (2004) studied the extent of reliability on mortgage valuation in Lagos as a good measure of market prices. The result of analysis of 42 lending institutions and 59 registered firms from stratified sampling, using correlation and regression analysis revealed that valuation figure is significantly correlated with market price at 78%, and 61% variation in market price was caused by inaccuracy in valuation values. The paper concluded that the degree of accuracy was relatively found in the open market valuation for secured mortgage loan.

Aluko (2007) studied valuers' judgment in property valuation in Lagos and analyzed 59 responses of registered firms selected randomly in Ikoyi. The responses were therefore analyzed using descriptive analysis and the result found that there was inconsistencies while interpreting the variables of the properties and therefore it was concluded that valuation variance is unavoidable but the opinion values must be within acceptable range. An investigation of heuristic behavioral patterns in valuation in an unfamiliar location in Nigeria was carried out by Adekoge (2008) applied simulated valuation method to assess a single commercial office. The result revealed that the evidence of variance in valuation outcomes and the result of mean variance analysis showed that the valuations were

unreliable, and also failed to examine factors that could have been responsible for this variance. The study of valuation accuracy by Ajibola (2010) in Lagos metropolis was carried out. The study analyzed 150 questionnaires administered through simple survey using descriptive analysis. The revealed that lack of market data and the use of outdated valuation techniques coupled with client pressure amounted to inaccuracy in the study area.

Ogunba and Iroham (2011) further searched for acceptable margin of error in valuation in Lagos Nigeria using descriptive analysis to determine the margin that could be acceptable in valuation. The study analyzed 195 responses obtained from registered firms in Lagos through stratified sampling technique. The result showed that the margin of $\pm 11.1\%$ and 13.16% suggested by valuers and mortgage clients were against the 5% to 9% respectively as recommended by UK courts for housing investment. Ayedun *et al.* (2012) examined the issues in valuation accuracy in Nigeria. The study analyzed 120 responses from registered firms using descriptive analysis. The result identified insufficient market data, inadequate training and inexperience as divergent causes of valuation inaccuracy and variance. It was recommended that the development of active data bank for valuation and strict adherence to valuation standards were required for accuracy. Akinjare *et al.* (2013) investigated the factors causing variance in valuation in Lagos. The authors utilized one hundred and thirty questionnaires administered on valuation firms and was analysed using relative important index (RII), and the finding revealed that different input variables and different methodologies were regarded as endogenous factors, while inadequate data and client influence were regarded as exogenous factors causing valuation variance.

Effiong (2015) investigated the level of valuation accuracy between Nigeria and UK, using survey method to administer the questionnaires to the registered estate firms in Uyo and Calabar metropolises, and analyzed the responses through descriptive

statistics. The findings revealed that poor standard, insufficient market data, weak regulatory framework, inappropriate methods, client's pressure, inadequate training, market imperfection, wrong assumptions inexperience and professional indiscipline on negligence were major factors to valuation accuracy. The finding further revealed that there was a high level of discrepancy in Nigeria compared to UK. Adegoke (2016) studied the valuation accuracy among non-statutory valuations in Nigeria using descriptive mean and relative important index to analyzed 160 samples from estate surveying and valuation firms. The result showed that valuer skill, valuer judgement, valuer experience and problems of relevant data formed major causes of valuation variance and inaccuracy. Munshifwa *et al.* (2016) investigated the application of mental models in assessing behavioral patterns of valuers in interpreting rating Act in Zambia using descriptive analysis to identify the causes of variance in rating valuation. The study identified that lack centralized market, market information, lack of comparable and errors constituted major factors causing valuation inaccuracy while negligence, inexperience, assumptions, inappropriate method, wrong attitudes and market stability accounted for 5% of the cause of valuation variance.

Ayedun, Durodola, Oloyede, Akinjare & Oni (2018) empirically evaluated the factors causing valuation inaccuracy in Lagos. The study analyzed 120 questionnaires from registered firms using descriptive technique. The finding revealed that inadequate data, weak regulatory framework and indiscipline, inappropriate training and non-adherence to Standard were major factors causing valuation inaccuracy. Aliyu *et al* (2018) examined the factors influencing accuracy of valuation for mortgage in Kaduna. The study analyzed 51 questionnaires administered through simple random sampling to the registered firms using mean and relative important index. The result revealed that market imperfection client pressure and inadequate market data were major factors influencing mortgage valuation inaccuracy. Atilola *et al*

(2019)evaluated the factors causing variance in property assessment in Kwara state. The study adopted purposive sampling to collect the responses from registered estate surveying and valuation firms using Relative Importance Index (RII). Findings revealed that inexperience, complexity law, wrong assumptions and inadequate data were responsible for variance. All the aforementioned studies have therefore established the existence of variance and inaccuracy as well as factors causing these discrepancies in valuation. However, the need to factorize these factors into group of factors and then determine a group of factors that contribute to variation in valuation accuracy is yet to be established, and this forms a basis for this study as it requires a step-forward investigation in which this study used factorial analysis.

METHODOLOGY

The study utilized a survey research as a scientific method of investigating factors affecting accuracy of valuation through estate surveying and valuation firms in Lagos and Abuja, Nigeria. according to NIESV Directory 2019, there are a total 150 and 300 registered estate firms in both Abuja and Lagos respectively. The study however selected 100 and 150 firms with more than 10 years' experience in property valuation through simple random sampling from Abuja and Lagos respectively, and 15 banks which constantly made use of valuation reports were also visited to collect valuation figures submitted by firms. The study employed both descriptive method and inferential method to analyze responses retrieved through simple random sampling techniques across the firms. The descriptive analysis employed for this study includes

mean and relative important index (RII) and inferential techniques (analysis of variance, T-test and factor analysis-principal component analysis). The study utilized analysis of variance (ANOVA) to establish the significance of variance in valuation figures (valuation variance), t-test was also adopted to test the significance of difference between two sample mean (market sale and valuation figures-valuation inaccuracy). The data was subjected to three set of reliability tests (Cronbach alpha, Kaiser-mayer-Olkin (KMO) and Bartlett's test of sphericity). For reliability purpose, cronbach alpha test was carried out on the factor items to establish level of internal consistency among the responses received from firms before the relative important index (RII). Also, KMO(Kaiser-mayer-Olkin)was adopted to measure of sampling adequacy of the data collected for factor analys is and Bartlett's test of sphericity was used to test significance of the correlation matrix of the items employed for the factor analysis in the study.

RESULT AND DISCUSSION

Table 1 showed the demographic characteristics of the respondents for the study. 88.4% represented male surveyors, about 52.4% majority of the sampled respondents had first degree and 45.6% had higher national diploma (HND) in their educational qualification. 65.2% of the sampled respondent were associate member of the professional body (ANIVS) and 66.4% had between 11-20years professional working experience. It can be inferred that majority of respondents sampled for the study were appropriate to give expert opinion for the study.

Table 1 Showing the Demographic Information of Estate Surveyors

		Lagos		Abuja		Total
Demographic information		Responses	%	Responses	%	
Gender	Male	131	85.1	90	90	221(88.4)
	Female	19	14.9	10	10	29(11.6)
	Total	150	100	100	100	250(100)

		Lagos	Abuja		Total	
Educational	ND	-				
	HND	75	50	39	39	114(45.6)
	PGD	5	3	-		5(2)
	B.sc/B.tch	70	47	61	61	131(52.4)
	M.sc/M.tech	-				
	PhD	-	-	-	-	
	Total	150	100	100	100	250(100)
Professional qualification						
	ANIVS	81	54	82	82	163(65.2)
	FNIVS	69	46	18	18	87(34.8)
	MRICS	-	-	-		
	FRICS	-	-	-		
	Total	150	100	100	100	250(100)
Years of practice as a qualified surveyor						
	1-5yrs	-	-			
	6-10yrs	-	-	-	-	
	11-20yrs	91	60.7	75	75	166(66.4)
	Above 20yrs	59	39.3	25	25	84(33.6)
	Total	150	100	150	100	250(100)

Table 2 showed the values submitted by two different valuers on the same property to banks for mortgage valuation purposes. The essence of this is to justify or buttress the finding of the previous studies on the existence of valuation discrepancies before proceeding into the factors. The result

revealed there were variances across the valuation figures submitted to the banks as observed in Table 2. But the differences or variance between the valuation figures submitted was tested using analysis of variance (ANOVA) and result is presented in Table 3.

Table 2 Valuation Reports Submitted to Nigerian Banks by Valuers on the Same Property

No of Banks	Property	(1 st)Valuer Figure (N:Million)	(2 nd)Valuer figure (N:Million)	Variance (N:Million)
Bank 1	A	35.23	70.55	35.32
Bank 1	B	51.41	90.12	38.71
Bank 1	C	91.34	150.52	59.18
Bank 1	D	79.51	62.19	17.32
Bank 2	E	111.56	100.44	11.45
Bank 2	F	58.53	100.11	41.58
Bank 2	G	98.43	71.20	27.23
Bank3	H	100.03	157.33	57.3
Bank 3	I	89.19	130.51	41.32
Bank 4	J	98.23	143.11	44.88
Bank 5	K	101.23	204.03	102.8

Source: field survey, 2019 (Data from Bank)

The significance of valuation variance presented in Table 4.3 is carried using analysis of variance (ANOVA) the result revealed that the f-statistics at 4.736 is statistically significant at p-value (0.42) is less than 0.05 level precision. In other word, the variances across the valuation figures are statistically significant. Therefore, there is

statistically significant variance in valuations submitted by the valuers to banks on the same property. This finding is in agreement with Ogunba (2003), Aluko (2007) and Adekoge (2008). What factors could have been responsible for this? This is the question which this study intended to address in the subsequent Table 7.

Table 3 Significance of Valuation variance in Mortgage valuation By Nigerian Banks

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6069.626	1	6069.626	4.736	.042
Within Groups	25632.215	20	1281.611		
Total	31701.841	21			

Table 4 revealed the actual market sale and valuation figures provided by selected valuers in Lagos on recent property transaction and valuations between 2015 and 2020. This information was employed to determine valuation inaccuracy among the surveyors and the result revealed that there was large margin of error between actual market sale and valuation figure. Property E

and K maintained a margin lower than 10% and property N also fall within the prescribed range of margin provided by Ogunba and Iroham (2011) between $\pm 11.1\%$ and 13.16% . the significance of mean difference between the actual market sale and valuation figure was tested using T-test presented in table 6.

Table 4 Valuation figures and Actual Sale of Properties by Surveyors in Lagos, Nigeria

Properties	Actual Sale Price (₦:Million)	Valuation Figure(Lagos) (₦:Million)	Difference	% Margin of Error
Property A	95	135.304	-40.304	-42.4
Property B	110	180.23	-70.23	-63.8
Property C	86	70.87	15.13	17.6
Property D	80	95.506	-15.506	-19.4
Property E	100	92.22	7.78	7.78
Property F	150	200.12	-50.12	-33.4
Property G	98	120.51	-22.51	-22.9
Property H	90	77.12	12.88	14.3
Property I	107	91.33	15.67	14.6
Property J	120	170.55	-50.55	-42.1
Property K	90	81.34	8.66	9.62

Properties	Actual Sale Price (₦:Million)	Valuation Figure(Lagos) (₦:Million)	Difference	% Margin of Error
K				
Property L	110	176.23	-66.23	-60.2
Property M	91	149.34	-58.34	64.1
Property N	100	89.54	10.46	10.5
Property O	76	98.33	-22.33	-29.4
Property P	95	73.55	21.45	22.6

Source: Field Survey, 2020

Table 5 revealed the actual market sale and valuation figures provided by selected valuers in Abuja on recent property transaction and valuation figures between 2015 and 2020. This information was employed to determine valuation inaccuracy among the surveyors and the result revealed that there were large margin of error between actual market sale and valuation figure.

Property I and J maintained a margin lower than 10% and property K also fall within the prescribed range of margin provided by Ogunba and Iroham (2011) between $\pm 11.1\%$ and 13.16% . The significance of mean difference between the actual market sale and valuation figure was tested using T-test presented in Table 6.

Table 5 Valuation figures and Actual Sale of Properties by Surveyors in Abuja, Nigeria

Properties	Actual Sale Price (₦:Million)	Valuation figure (Abuja Municipal) (₦:Million)	Difference	% Margin of Error
Property A	88	70.21	17.79	20.2
Property B	65	96.22	-31.22	-48.0
Property C	93	75.43	17.57	18.9
Property D	80	110.21	-30.21	-37.8
Property E	60	100.02	-40.02	-66.7
Property F	120	195.28	-75.28	-62.7
Property G	250	370.23	-80.15	-32.1
Property H	150	250.12	-100.12	-66.7
Property I	100	90.30	9.70	9.7
Property J	130	120.01	9.99	7.7
Property K	100	87.20	12.8	12.8
Property L	125	100.25	24.75	19.8
Property M	69	95.32	-26.32	-38.1
Property N	89	71.50	17.5	19.7
Property	160	200.21	-40.21	-25.1

Properties	Actual Sale Price (N:Million)	Valuation figure (Abuja Municipal) (N:Million)	Difference	% Margin of Error
O				
Property P	150	190.25	-40.25	-26.8
Property Q	89	69.55	19.45	21.9
Property R	99	120.44	-21.44	-21.7

Source: field survey, 2020

The test of inaccuracy was carried out to justify the evidence of findings from previous studies and the result is presented in Table 6. The mean difference between the actual sale and valuation figure is significantly differed at p-value (0.035 and 0.045) less than 0.05 level of precision and the t-test statistics at -19.005 and -2.163 are statistically significant. This therefore connotes that there is high level of valuation inaccuracy as mean difference between

market sale value and valuation figure in Lagos and Abuja is significantly wide, this finding is consistent with that of Aluko (2000). It is therefore apparent that there is a problem of valuation accuracy in Abuja and Lagos. The study further investigated the factors responsible for the problem of valuation accuracy in Nigeria and amount of influence contributed by the group of factors was determined in the subsequent analysis

Table 6 Test of Inaccuracy of Valuation between Market Sale Price and Valuation Figure

Test of Accuracy	Mean difference	T test	P-value	Conclusion	Remarks
Lagos	-19.00537	-19.005	p-value at .035 is less than 0.05	Mean difference between the two values are not equal	Not accurate
Abuja	-21.98611	-2.163	p-value at .045 is less than 0.05	Mean difference between the two values are not equal	Not accurate

The descriptive analysis of factors constraining valuation accuracy in Nigeria is presented in Table 7. The responses from 250 registered estate surveying and valuation firms in Lagos (150 firms) and Abuja (100 firms) were subjected to reliability test called Cronbach alpha test. The result Cronbach alpha reliability test revealed that there is high level of internal consistency among the

factor items at 76.8% and 78.6% respectively in Lagos and Abuja. Therefore, all the identified factors were internally consistent and the responses were highly reliable. All the factors were highly responded to by the respondents thereby indicating high level of agreement to the identified factors constraining valuation accuracy.

Table 7 Descriptive Analysis of Factors Constraining Valuation Accuracy in Nigeria

Factors	Lagos (cronbach alpha @0.768)				Abuja (Cronbach alpha@0.786)			
	N	Sum	Mean	Rk	N	Sum	Mean	Rk
Valuers integrity and Honesty	150	688	4.58	5	100	458	4.58	5
Valuers negligence and misconduct	150	671	4.47	8	100	447	4.47	8
Non-adherence to valuation standards	150	630	4.20	10	100	417	4.17	10
Gazumping	150	691	4.60	4	100	469	4.69	3
procedural errors	150	701	4.67	3	100	476	4.76	2
Measurement error	150	664	4.42	9	100	456	4.56	6
Errors in collection of data	150	673	4.48	7	100	460	4.60	4
Inadequate Practical Experience	150	704	4.69	2	100	513	4.13	11
Poor academic knowledge	150	620	4.13	11	100	438	4.38	9
Inadequate Training	150	688	4.58	5	100	458	4.58	5
Lack of professional qualification	150	671	4.47	8	100	447	4.47	8
Inadequacy in University curriculum	150	630	4.20	10	100	417	4.17	10
different methodologies	150	691	4.60	4	100	469	4.69	3
Unrealistic assumption	150	701	4.67	3	100	476	4.76	2
Different Experience, skills and judgment	150	664	4.42	9	100	456	4.56	6
Inadequate relevant data bank	150	673	4.48	7	100	460	4.60	4
Insufficient property market information	150	704	4.69	2	100	413	4.13	11
Maturity of property market	150	620	4.13	11	100	438	4.38	9
market instability	150	688	4.58	5	100	458	4.58	5
imperfect knowledge of the property market	150	671	4.47	8	100	447	4.47	8
inexplicitness of the law	150	630	4.20	10	100	417	4.17	10
Failure to discipline and prosecute an erring valuer	150	691	4.60	4	100	469	4.69	3
lack of seriousness by regulatory bodies	150	701	4.67	3	100	476	4.76	2
comprehensiveness of the law	150	664	4.42	9	100	456	4.56	6
ineffectiveness of the regulatory framework	150	673	4.48	7	100	460	4.60	4
Insufficient depth of investigation	150	704	4.69	2	100	413	4.13	11
Deficiency in quality control	150	620	4.13	11	100	438	4.38	9
clients' pressure	150	714	4.76	1	100	476	4.76	2
Bribery and corruption in valuation	150	678	4.52	6	100	452	4.52	7
Macroeconomic influence	150	687	4.58	5	100	458	4.58	5
Conflict of interest	150	715	4.76	1	100	477	4.77	1
Valid N (listwise)	150							

Source: field survey, 2020

The analysis of Kaiser-mayer-Olkin (KMO) and Bartlett's Test presented in Table 8 is a necessary condition that must be met before embarking on factor analysis. The result of Bartlett's Test suggests a rejection of the hypothesis that correlation matrix of the variables is insignificant. This is because; the

p-value of 0.000 in both the two cases Lagos and Abuja is less than the assumed level of significance of 0.05. Also, the value of KMO is greater than 0.5 which further suggest that factor analysis can be used for the given set of data in Table 7.

Table 8: KMO and Bartlett's Test

KMO and Bartlett's Test			
Lagos	Kaiser-mayer-Olkin Measure of Sampling Adequacy		0.775
	Bartlett's test of Sphericity		84.001
	d.f		30
	Sig		.000
Abuja	Kaiser-mayer-Olkin Measure of Sampling Adequacy		0.688
	Bartlett's test of Sphericity		79.061
	d.f		30
	Sig		.000

The result of variance analysis of the factors presented in Table 9 showed ten (10) the most correlated factors constraining valuation accuracy in Nigeria. The result revealed initial eigen value and amount of total variance after rotation in the original variable accounted for 92.43% variance by each of the first ten components and while the remaining 7.57% were uncounted for due to loss of information. The total initial eigen values of 1 and above were extracted from the component factors because they maintained high correlation matrix.

The result factor loading analysis presented in Table 10a & 10b) revealed that ten

extracted factors constituted about 92.43% variation in the determining the factors constraining valuation accuracy. The cut-off point for this study is taken 0.5 and above as general rule of thumb applied and factors loading at 0.5 and above in the component were selected and grouped and named. The group of factors constraining valuation accuracy are presented in Table 10a and 10b. Also each of these groups of factors individually almost the variance between 9.864% and 9.637% except for the last group of factors that contributed the least variance at 4.884%.

Table 9 Total Variance Analysis of Factors Explained

Comp.	Initial Eigen values			Extraction Sums of Squared			Rotation Sums of Squared		
				Loadings			Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.947	25.634	25.634	7.947	25.634	25.634	3.058	9.864	9.864
2	5.518	17.800	43.434	5.518	17.800	43.434	3.054	9.850	19.715
3	3.152	10.168	53.602	3.152	10.168	53.602	3.052	9.846	29.561
4	2.851	9.198	62.800	2.851	9.198	62.800	3.049	9.836	39.397
5	1.943	6.268	69.069	1.943	6.268	69.069	3.035	9.790	49.187
6	1.878	6.059	75.128	1.878	6.059	75.128	3.018	9.736	58.923
7	1.656	5.342	80.470	1.656	5.342	80.470	3.005	9.694	68.617
8	1.402	4.523	84.993	1.402	4.523	84.993	3.003	9.688	78.305
9	1.201	3.873	88.866	1.201	3.873	88.866	2.988	9.637	87.942
10	1.105	3.564	92.430	1.105	3.564	92.430	1.391	4.488	92.430
11	.885	2.856	95.286						
12	.769	2.482	97.768						
13	.692	2.232	100.000						
14	2.261E-016	7.294E-016	100.000						
15	1.418E-016	4.574E-016	100.000						
16	1.238E-016	3.994E-016	100.000						
17	9.584E-017	3.091E-016	100.000						
18	5.169E-017	1.667E-016	100.000						
19	3.712E-017	1.197E-016	100.000						
20	3.077E-017	9.927E-017	100.000						
21	1.935E-017	6.240E-017	100.000						
22	-2.304E-018	-7.434E-018	100.000						
23	-6.445E-018	-2.079E-017	100.000						
24	-3.175E-017	-1.024E-016	100.000						
25	-3.770E-017	-1.216E-016	100.000						
26	-5.326E-017	-1.718E-016	100.000						
27	-8.053E-017	-2.598E-016	100.000						
28	-9.520E-017	-3.071E-016	100.000						
29	-1.145E-016	-3.694E-016	100.000						
30	-1.418E-016	-4.574E-016	100.000						
31	-2.398E-016	-7.736E-016	100.000						

Extraction Method: Principal Component Analysis.

Table 10 (a) Factor Loading Analysis of Constraints to Valuation Accuracy in Nigeria

Constraint Factors	Factor loadings	Eigen value	% of variance
Factor 1: Standards, Curriculum and Legal Factor		3.058	9.864
Non-adherence to valuation standards	.926		
Inadequacy in University curriculum	.926		
Inexplicitness of the law	.926		
Factor 2: Inexperience, market data and Knowledge factor		3.054	9.850
Inadequate Practical Experience	.989		
Insufficient property market information	.989		
Insufficient depth of investigation	.989		
Factor 3: Speculative, methodological and indiscipline		3.052	9.846
Gazumping	.936		
different methodologies	.936		
Failure to discipline and prosecute an erring valuer	.936		
Factor 4: Unprofessional and regulatory factor		3.049	9.836
Procedural errors	.972		
Unrealistic assumption	.972		
lack of seriousness by regulatory bodies	.972		
Factor 5: Academic, immaturity and quality factors		3.035	9.790
Poor academic knowledge	.945		
Maturity of property market	.945		
Deficiency in quality control	.945		
Factor 6: Technical factor		3.018	9.736
Measurement error	.923		
Different Experience, skills and judgment	.923		
Comprehensiveness of the law	.923		
Factor 7: data inadequacy and ineffective framework		3.005	9.694
Errors in collection of data	.920		
Inadequate relevant data bank	.920		
ineffectiveness of the regulatory framework	.920		

Also, each of these factors indispensable to valuers during the valuation exercise. This therefore indicates that each of the groups of factors are significantly important in

ensuring valuation accuracy. To this extent, valuer must painstakingly adhere and address strictly all the factors during the valuation process.

Table 10 (b) Factor Loading Analysis of Constraints to Valuation Accuracy in Nigeria (Continue)

Constraint Factors	Factor loadings	Eigen value	% of variance
Factor 8 : integrity, training and market factors		3.003	9.688
Valuers integrity and Honesty	.921		
Inadequate Training	.921		
market instability	.921		
Factor 9: Unethical and market imperfection		2.988	9.637
Valuers negligence and misconduct	.903		
Lack of professional qualification	.903		
Imperfect knowledge of the property market	.903		
Factor 10: Pressure, corruption and Interest clients' pressure		1.391	4.488
Bribery and corruption in valuation	-.624		
Conflict of interest	.704		

IMPLICATION OF FINDING AND

CONCLUSION

The study has therefore further investigated valuation variance and inaccuracy to buttress the findings of the previous studies. It is discovered that there is clear evidence of valuation variance and inaccuracy in valuation, and this finding is in agreement with that of previous studies such as Aluko, 2000; Harvard, 2001; Boyd & Irons, 2002; Ogunba, 2004; Aluko, 2007; Adekoge, 2008; Ayedun *et al.*, 2012; and Effiong, 2015. The factors constraining valuation accuracy were further investigated and these factors were identified from previous studies and there was high level of positive responses towards the identified factors by the valuers in the firms. Most of these factors were rated as highly important constraint to valuation accuracy but the mostly rated

factors are conflict of interest, clients' pressure, Unrealistic assumption, procedural error different methodologies, non-adherence to standards and insufficient market information, this finding is also found in agreement with previous studies informed by Akinjare *et al.*, 2013; Aliyu, Sani, Usman & Muhammad, 2018; Ayedun, Durodola, Oloyede, Akinjare & Oni, 2018; and Atilola *et al.*, 2019. The result of factorial analysis further identified groups of factors alongside with the amount they have contributed determining valuation accuracy. The study therefore identified ten groups of factors having a variance that is almost equal except the tenth factor. This suggests that each group of identified factors is indispensable determining the valuation accuracy. By implication, valuation accuracy cannot be achieved until these groups of factors are addressed and they have

therefore become indispensable which cannot be undermined if the valuation is to be achieved. The study therefore recommends that all the stakeholders in property assessment and valuation exercises should

address all the aforementioned factors by adhering strictly to lay-down provisions of the profession and principles without compromise in order to achieve accuracy.

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APPRAISAL OF THE ROLE OF COMMUNITY PARTICIPATION IN FLOOD RISK MANAGEMENT IN KOGI STATE

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ABSTRACT

In Nigeria, flooding is a major annual disaster that is becoming more severe in recent time due to the effect of climate change and other related factors. This study aimed at identifying the roles of community participation in flood risk management in Kogi state. The study was conducted using eighteen communities from the nine LGAs that annually experience flooding in Kogi state. The LGAs include Lokoja, Ajaokuta, Ibaji, Idah, Ofu, Bassa, Igalamela Odolu and Kogi. Six hundred and ten (610) respondents were selected using Sample Size Table of Research Advisor (2006). The study used questionnaire and FGD in collecting data. The analysis of the study was through the use of tables, percentages, narrative analysis and verbatim quotations. The findings revealed that flood vulnerable communities irrespective of urban or rural settings participates at different levels of participation in flood risk management. The findings also revealed that 71.4% of respondents in rural communities participate through self-mobilization while 30% of respondents in urban communities participate in giving information to authorities. The respondents' level of involvement in flood risk management also differs as 63.3% of urban respondents and 43.2% of rural respondents indicated involvement in flood risk management. The study also discovered that 83.5% communities participate in preparedness, response and recovery, while 40% of urban communities participate in all stages of flood risk management. Majority of urban communities 70.4% and 51.6% of rural communities play the roles of early warning information, organize flood management committee, blockage of flood possible areas, cleaning drainages and waterways, organize for relief materials, evacuating and camping of flood affected victims and psychosocial support to victims. Finally, the study recommends encouragement of community members to participate in all stages, functional medium between the flood vulnerable communities and environmental management agencies to enhance the involvement of communities in flood risk management, train members on the best method for improved responsibilities, because these communities have developed their management strategies using local methodologies, address the issue of early warning, train members on management skills and improve on the livelihood of the flood vulnerable communities. By this, there will be effective flood risk management in Kogi state and Nigeria In general.

Key Words: Community, Participation, Flood Risk, Management, Flood Vulnerable.

INTRODUCTION

Flood event like other natural hazards has become a major environmental challenge across the globe. In many regions flooding has become more intense and frequent as climate change impacts continue to affect precipitation intensity, duration and frequency (Parry *et al.*, 2007). Flooding is

one of the most destructive types of natural disaster that strikes humans and their livelihoods around the world. In 2011 alone, 106 million people were affected by floods all over the world, and most of these victims come from Asian countries whose populations are exposed to recurrent flooding (UNISDR, 2012). There is a general

increase in the trend of climate-related disasters since year 2000 (UNISDR, 2013).

Over the years, the Nigerian Government and International donor agencies like UNICEF, UN and EU as well as non-governmental organizations have committed a lot of resources to flood disaster management in the country. However, much progress has not been made in the areas of flood disaster risk reduction, recovery and community resilience (Jinadu, 2015). Public participation in decision-making concerning flood prevention and protection is needed, both to improve the quality and the implementation of the decisions, and to give the public the opportunity to express its concerns and to enable authorities to take due account of such concerns (EU Water Directors, 2003).

The first responders to disaster in any community are community institutions like Community Based Organizations (CBOs), Faith Based Organizations (FBOs), and Non- Governmental Organizations (NGOs). The effort of this community emergency management structure is complemented by Emergency Management Volunteers (EMV) and if more resources are needed, SEMA and NEMA can bring in additional resources (NDMF, 2010). In the analysis by Few *et al.* (2005), it suggested that improving coping response of the communities is the key to the success of reducing flood risk. In this connection, restoring the natural functions of rivers and floodplains, planning and management practices, involving the local communities in the river basin management, capacity development of the local institutions are found to be effective measures of sustainable flood management. The rationale for community involvement or community-based activities is because community-based activities (and community-based organizations) are deeply rooted in the society and culture of an area, they enable people to express their real needs and priorities, allowing problems to be defined correctly and responsive measures to be designed and implemented (Twigg, 1999). Twigg also argues that existence of community-based organizations allow

people to respond to emergencies rapidly, efficiently and fairly, and therefore available community resources (even it is small in amount) will be used economically.

Several studies have been conducted across Nigeria on flood and flood management. The research conducted includes studies in Anambra (Kingsley *et al.*, 2013), (Jinadu, 2015), (Obeta 2014), (Odedeji *et al.* 2012, research in Kaduna (Augustine *et al.* 2015), and those studies in Kogi state (Liman *et al.* 2015), Aderoju *et al.* (2014) and Anunobi 2014), others are Kelly 2001, ADPC, 2007 and WMO 2008. Best practice places stress on co-operation and community participation. It has become apparent that top-down approaches to disaster risk management, ignoring the local capacities and resources failed to address the specific local needs of vulnerable communities. In response to the limitations of this top-down methodology, the community-based disaster management is seen as an alternative approach (ADPC, 2007). Community participation becomes fundamental and essential for each stage of the management, that is, preparedness for, response to and recovery from flood disasters (World Meteorological Organization (WMO), 2008).

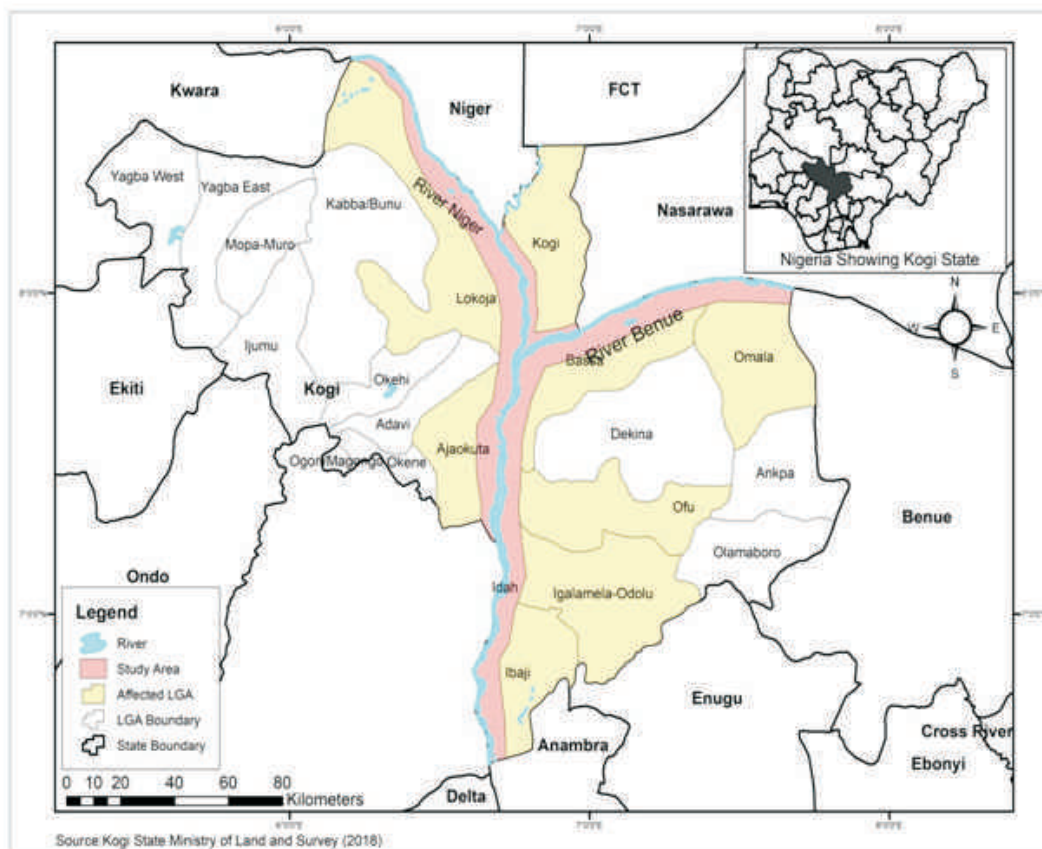
The core objective of this study is to appraise respondents perception of flood risk management, while the specific objectives are to identify the stages of participation of flood vulnerable communities, identify flood vulnerable communities level of participation in flood management, also to identify the major roles flood vulnerable communities play in flood risk management and lastly, to identify the challenges of community participation in flood risk management. The study only focused on the nine LGAs that are usually experience flooding in Kogi state.

THE STUDY AREA

Kogi state is in the central region of Nigeria, located on the latitude 7° 30' N and longitude 6° 42' E with a total land area of 29,833 km². Kogi state share boundary with Federal Capital territory (Nigeria) to the North,

Nassarawa state to the Northeast, Benue state to the South, Enugu state to the Southeast, Anambra state to the south, Edo state to the Southwest, Ondo and Ekiti to the West, Niger state to the North and Kwara to the Northwest. It is popularly called the confluence state because of the confluence of River Niger and River Benue at its capital Lokoja. The land rises from about 300 metres along the Niger-Benue confluence, to the height of between 600 metres above sea level. Agbaja plateau, which ranges from 335 to 336 metres above sea level, and the much higher Okoroagbo hills at Ogidi in Ijumu Local Government Area are some of the predominant of land forms of the state. The state is drained by the Niger and Benue rivers and their tributaries. The two major rivers in Nigeria (Rivers Niger and Benue) flowed through several communities in nine Local Government Areas in Kogi state (Ibaji, Idah, Igalamela-Odolu, Ofu, Ajaokuta,

Bassa, Omala, Lokoja and Kogi) (Figure 1). These rivers annually overflow its banks to flood the communities (SEMA, 2012). Kogi state has a mean temperature range between 24°C to 34°C with a relative humidity of 70% in dry months and 90% in wet months. The general rainfall is undulating. The state has an annual rainfall of between 1,100mm and 1,300mm between April to October. Kogi state has a population of 3,595,789 according to 2006 population census which was the 24th in the ranking of most populous state in Nigeria (NPC, 2006). Agriculture is the main concern of the economy. Mineral resources in the state include; coal, limestone, iron, petroleum and tin. The state is the home of the largest iron and steel industry in Nigeria known as Ajaokuta Steel Company Limited, one of the largest cement factories in Africa, Dangote Cement, Obajana.



Source: Kogi State Ministry of Lands and Survey

Figure1: The Riverine Areas and the Most Flood Prone LGAs in Kogi State

METHODOLOGY

Reconnaissance survey was carried out to help acquire the necessary materials like maps, documented materials as well as information from SEMA, LEMC and communities. Structured questionnaires were administered to purposively sampled respondents from the flood affected communities in the nine Local Government Areas because of their experience in flooding events and Focus Group

Discussions (FGD) was held with major key players in flood risk management in the sampled communities, especially officials of community based organizations that organize flood management activities. The data collected from structured questionnaires was analysed using percentages, while the data from FGD was transcribed, interpreted through narrative analysis.

RESULTS AND DISCUSSIONS

Table 1: Distribution of Respondents according to Stage of Participation in Flood Risk Management.

Community Stage of Participation	Response		Location		
			Urban	Rural	
Preparedness	F		51	35	
	%		21.3	9.5	
Response	F		51	25	
	%		29.2	6.8	
Recovery	F		23	1	
	%		9.6	0.3	
All of the above	F		96	309	
	%		40.0	83.5	
Total	F		240	370	610
	%		100.0	100.0	100.0

Source: Field Survey, 2018

Community Stage of Participation in Flood Risk Management

Table 1 shows the stages at which flood vulnerable communities engage in flood risks management. 83.5% respondents from rural communities like Ajaokuta native Village Shintako, Ichala, Ogbogba, Ejule-Ojebe, Olukudu-Ibaji, Bagana, Otutubatu-Manejo, Banda and Ugwoda indicated participation in all stages of flood risk management in their area, 9.5% indicated involvement in preparedness stage, 6.8% involvement in response stage, while, only

0.3% of the respondents from rural communities reported engagement in recovery stage of flood risk management. The major reason for rural communities' involvement in all the stages is self-commitment to protection from flooding. It also show that majority of the respondents from urban communities (40%) Cantonment, Adankolo, Nataco, Koton-Karfe Onyedega and Itobe reported participation at all stages of flood management. While 29.2% and 21.3% indicated involvement in only response and preparedness stages (table 1).

Table 2: Distribution of Respondents according to Community Levels of Participation in Flood Risk Management

Level of Community Participation	Response		Location	
			Urban	Rural
Passive Participation	F	40	32	
	%	16.7	8.3	
Participation in information giving	F	72	12	
	%	30.0	3.2	
Participation by consultation	F	21	3	
	%	8.8	0.8	
Participation for material incentives	F	49	59	
	%	20.4	15.9	
Self-mobilisation	F	58	264	
	%	24.2	71.4	
Total	F	240	370	610
	%	100.0	100.0	100.0

Source: Field Survey, 2018

Community Level of Participation in Flood Risk Management

Table 2 gives a picture of the respondents level of participation in flood risk management. This shows the different levels of participation between the urban and rural communities. It revealed that majority of the respondents (71.4%) in rural communities such as Ajaokuta native Village Shintako, Ichala, Ogbogba, Ejule-Ojebe, Olukudu-Ibaji, Bagana, Otutubatu-Manejo, Banda and Ugwoda indicated self-mobilisation, 15.9% supports participation for material incentives, 8.6% indicated passive participation and 3.2% participation in giving information. The major reasons for self-mobilisation was lack of the presence of environmental management agencies for intervention in flood disaster management in rural communities. It further revealed that respondents in the urban communities (30%) indicated to participate in information giving, 24.2% participate through self

mobilization, 20.4% indicated for material incentives, 16.7% for passive participation, while, 8.8% participate by consultation. The agencies tend to gather information from members of flood vulnerable communities and also engage some in labor like drainage and waterways cleaning.

Majority of the respondents participate in flood risk management through self-mobilisation as indicated in Ajaokuta native Village, Shintako, Ichala, Ogbogba, Ejule-Ojebe, Olukudu-Ibaji, Bagana, Otutubatu-Manejo, Banda and Ugwoda rural communities and some urban communities. Most of these communities develop different mechanisms in the management of flood disaster because of long period living in the area and experience of flood disaster in their communities. The finding is in line with Pretty, (1995) self mobilization strategy where people participate by taking initiatives independently of any external institutions to solve their problems.

Table 3: Distributions of Respondents according to Community' Role in Flood Risk Management

Community Roles in Flood Risk Management	Response		Location	
			Urban	Rural
	Early warning information to community members	F	2	37
		%	0.8	10.0
	Organizing flood management committees	F	1	28
		%	0.4	7.6
	Blockage of flood possible areas	F	2	37
		%	0.8	10.0
	Cleaning of drainage and waterways	F	29	0
		%	12.1	0.0
	Organizing of relief materials and food	F	3	77
		%	1.3	20.8
	Evacuation and camping of flood affected victims	F	24	0
		%	10.0	0.0
	Psycho-social support to victims	F	10	0
		%	4.2	0.0
	Total	F	240	370
		%	100.0	100.0

Source: Field Survey, 2018

Community Roles in Flood Risk Management

Having effective techniques and tools in flood response measures allows reducing damage to property and repair costs (Ahern, 2011; Liao, 2012). Table 8 shows that both urban and rural communities play numerous activities in ensuring flood risk management in their various communities. It revealed that majority of respondents in urban communities (70.4%) such as Cantonment, Adankolo, Nataco, Koton-KarfeOnyedega and Itoke reported engagement in all the enlisted roles, other 12.1% indicated cleaning of drainage and waterways, while, 10% of the urban respondents involve in evacuation and camping of flood affected victims (table 3). For rural communities, most of the respondents (51.6%) reported engagement in all the enlisted roles, 20.8% reported the community role as organizing of relief materials, but, 10% of the respondents not engagement in clearing of drainage and waterways, evacuation and camping of flood affected victims and psycho-social support to victims of flood in their various communities. The flood vulnerable communities achieved these benefits through community based organizations.

Ajaokuta native Village, Shintako, Ichala, Ogbogba, Ejule-Ojebe, Olukudu-Ibaji,

Bagana, Otutubatu-Manejo, Banda and Ugwoda rural communities mostly engage in early warning information, organize flood management committees, blockage of flood possible areas and organizing of relief materials. While majority of urban respondents engage in cleaning of drainage and waterways, evacuation and camping of flood affected victims.

Quotations of comments from some participants on the role of communities are quoted below:

“Community through CBDs and Committees organizes members for labors such as sand bag fillings of flood entrance areas, clearing of drainages and water ways in preparation for flood.” “The community informs members about flood preparedness through town-criers in the community” “Community generates resource by tasking members of the community for financial and material contributions in preparation for flood” Kaka Ibrahim – Adogo

The findings revealed the flood response activities of communities through CBOs/committees as evacuation of flood affected residents and their properties to a safe harbor in neighbours, provide them with food and clothing within the period of the disaster. While in severe cases the entire community residents move to live with relatives in other communities.

The response activities of communities recognized by participants are quoted below:

“The CFMC organize and evacuate flood affected residents to safer neighbor houses, while those with severe flood cases leave their communities completely on several cases, the committees ensure that the victims are being fed, cloth and given the necessary care from the resources generated during flood preparedness”...
Achemu Yakubu – Ejule-ojebe

It was also revealed that urban communities such as Adankolo, Cantonment, Nataco, Koton-Karfe, Onyedega and Itobe has less work to do at preparedness stage of flood risk management. The access of such communities to media and proximity to environmental management agencies make it possible for early warning messages and

drainage clearing by both the agencies and communities in flood preparedness. It is confirmed that the agencies go around such urban communities with vehicles and speed boats giving early warning information and also get pay labors to clear drainages and water ways. Though, the communities assist the agencies in the clearing of drainage and water ways in their areas. The findings also revealed that some communities such as Ugwoda, Onyedega and Edeha only get early warning information but do all other activities on their own.

The participants further revealed the recovery activities of flood vulnerable communities as organizing of residents for labor, tasking of residents for financial contributions, repairing of affected roads drainages, school structures, town halls and all public properties using the community labor and available resources. The flood vulnerable communities also achieve their recovery activities through committees.

“the community based organizations (CBOs) organize community members, task them to raise fund for repairs of flood damaged facilities such as drainages, roads, schools, hospitals, markets and all other buildings used by the public” ...Achemu Yakubu – Ejule-ojebe

Table 4: Distribution of Respondents According to Challenges of Participation in Flood Risk Management

Challenges of Community Participation In Flood Risk Management	Response		Location		
			Urban	Rural	
Lack of early information	F	15	106		
	%	6.3	28.6		
Lack of management Skill	F	12	0		
	%	5.0	0.0		
Poverty	F	23	98		
	%	9.6	26.5		
All of the above	F	190	166		
	%	79.2	4.9		
Total	F	240	370	610	
	%	100.0	100.0	100.0	

Source: Field Survey, 2018

Challenges of Community Participation in Flood Risk Management

As reflected in Table 4, majority of the respondents in urban communities (79.2%) indicated that communities are faced with all the enlisted challenges of community participation, 9.6% sees poverty as the challenge, 6.3% are of lack of information as lack while 5% is lack of flood management skills. The case is different for respondents in rural communities, 44.9% agree to all the enlisted challenges, 28.6% of them reported lack of early information, while, 26.5% indicated poverty as challenges of flood risk management. In Ajaokuta native Village, Shintako, Ichala, Ogbogba, Ejule-Ojebe, Olukudu-Ibaji, Bagana, Otutubatu-Manejo, Banda and Ugwoda rural communities, lack of early warning information and poverty was identified to be the major challenges. Dukeshire and Thurlow (2002) support the assertion that rural citizen's feel that there is a lack of access to information about government programme.

Kakumba and Nsingo (2008) also noted that the pathetic socio-economic position of the rural people obstructs them from meaningful participation. This is because the rural population is associated with low levels of education, high illiteracy rates, poor infrastructure and communication means obstructing their civic competence.

C O N C L U S I O N A N D RECOMMENDATIONS

Conclusion

The study is about the roles of community participation in flood risk management in Kogi state, Nigeria. The study revealed that flood vulnerable communities have different initiatives in flood management. However, there is variation in flood risk management between the urban and rural communities. 83.5% of rural and 40% of urban respondents indicated participation in all phases of flood

management (preparedness, response and recovery). The management activities of the people include; early warning information through town criers, organizing flood management committees, blockage of flood possible areas, cleaning of drainage and waterways, organize relief materials and camping of victims. The findings also show that 70.4% of urban and 51.6% of rural respondents indicated participation in all flood management activities. The study also revealed that majority of respondents (79.2%) urban and (44.9%) rural flood vulnerable communities identified lack of early warning information, lack of management skill and poverty as the block to community participation in flood risk management in Kogi state. As a result of these factors, the people in the flood vulnerable communities could not adequately participate in flood management.

Recommendations

In line with the findings, the following recommendations are made. FEMA and SEMA should encourage members of flood vulnerable communities to participate in all stages of flood risk management.

There should be functional medium between the flood vulnerable communities and environmental management agencies to enhance the involvement of communities in flood risk management.

The flood vulnerable communities use local available resources in playing the various roles in flood management, they should trained on a method for improved responsibilities.

Government should address the issue of early warning, train members on management skills and improve on the livelihood of the flood vulnerable communities.

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ASSESSING USER SATISFACTION IN OFF-CAMPUS ACCOMMODATIONS AROUND KADUNA STATE UNIVERSITY, KAFANCHAN CAMPUS.

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ABSTRACT

The absence of resident student hostels in Kaduna State University, Kafanchan Campus (KASU KC) has spawned the unregulated development of privately owned off-campus accommodations in the communities surrounding the university. This research adopts the case study survey methodology to determine user satisfaction levels of the occupants from selected accommodations around KASU KC. Purposeful sampling is used to select the off campus accommodations as case studies, while convenience sampling is used to administer structured questionnaires to respondents. The Relative Satisfaction Index (RSI) based on Building Performance Attributes (BPAs) was used to measure user satisfaction. Descriptive statistics was used to analyze the data from questionnaires. The results indicated a mean RSI of 3.4 – designated as Indifferent. This implied that private developer's focus on commercial profitability of the buildings without regard to standards required for user satisfaction. This research will hopefully add to the body of knowledge on user satisfaction in buildings, as well as provide architects/developers of student hostels/accommodations with useful information on the minimum standards for student housing.

Keywords: User Satisfaction, Off-campus Student Accommodations

INTRODUCTION

Housing provides more than just shelter but also a setting for social and psychological development. Nigerian institutions of higher learning have struggled to meet this need for their students, as student housing continues to fall short of the rising student enrolment. Thus creating an avenue for private developers to cash in on the housing demand, (Agava et al., 2018; Ibok et al., 2018).

Research has shown that resident housing for tertiary students has been a challenge of governments in developing countries. In Nigeria, both government and management of the public institutions have not given priority to student housing. Thus leading to a rise in privately owned off-campus accommodations – often developed without adherence to design and construction standards favorable to student learning, (Agava et al., 2018, p. 75; Azeez et al., 2016; Nimako & Bondinuba, 2013).

These privately owned off campus accommodations are typically costly to rent, and also devoid of amenities and services required by students, (Agava et al., 2018). The quality of accommodation provided for

students affects the quality of learning. Ideally, the hostel facilities would include ancillary facilities such as study area, communal lounge, laundry, toilets, and kitchens. This enables students to focus on their education, (Tajudeen et al., 2018, p. 411).

The problem of inadequate student housing is prevalent in the public institutions of the north central region of Nigeria, (Philip, Christopher, & Mukaila., 2018); which is also the case in Kaduna State University Kafanchan Campus (KASU KC). As such it is imperative to assess the preferences and needs of students as a guide to providing efficient hostel accommodations.

This research therefore aims to determine the level of user satisfaction from occupants of the off campus accommodations around KASU KC. The level of satisfaction is measured based on rating scale ranging from 1=Very Dissatisfied (VD), 2= Dissatisfied (D), 3 = Indifferent (ID), 4 = Satisfied (S), 5 = Very Satisfied (VS). This will be achieved by the use of a structured survey, designed to measure the Relative Satisfaction Index (RSI). Hopefully, this research will add to the existing body of knowledge on user

satisfaction in buildings, provide designers, and developers with useful information for efficient hostel design and development based on user preferences.

This paper consists of six sections; following this introduction is the literature review section which explores the theoretical concepts of service quality and user satisfaction. The section on the study area provides information on the environment in which the research is conducted. The case study section highlights the characteristics of the selected buildings to be studied. The research methodology section describes the population sampling technique, instrument of the research, data analysis, and presentation techniques. The paper concludes with the presentation and discussion of findings, and recommendations.

LITERATURE REVIEW

This section explores the associated theoretical concepts and factors associated with user satisfaction, and building performance – by highlighting the definitions of relevant terminologies relevant to the study. These are deduced from review of relevant literature and empirical studies on the subject of user satisfaction.

Service Quality

Service Quality (SQ) is the degree to which a service/product satisfies customer expectations, and is a key component of the student accommodation industry. SQ also involves core service products (facility) and supplementary service (support services) elements, (Nimako & Bondinuba, 2013). In the context of student hostel facilities, SQ is measured by evaluating the collective experiences of various students with facilities over time, (Iroham et al., 2017).

User Satisfaction

Satisfaction is defined as the quality or state of being content, a source or means of gratification, (Merriam-Webster, n.d.). User Satisfaction derived from using a facility varies depending on individual perceptions. Surveys on user satisfaction are significant indicators for determining the level of

improvements required for facilities to meet user expectations, (Olushola, 2018). This implies that the survey may also indicate the condition/quality of a facility.

Housing satisfaction indicates both qualities of housing, and user contentment with the quality. This provides information to professionals on housing design and quality, (Formoso & Jobim, 2006; Mohit et al., 2010). Studies have revealed a correlation between 'satisfaction' and the 'quality' of the hostel environment, (Ifaturoti, 2017). Therefore, it is important that developers provide shelter that meets the needs and expectations of users.

Determining User Satisfaction

Factors indicating user satisfaction with housing include physical characteristics of the dwelling unit and its surroundings; and social/individual characteristics - feelings and perceptions of the users. The physical characteristics involves variables such as security, dwelling design and privacy, unit size, space adequacy, flexibility and adaptability, and satisfaction with surrounding environmental facilities, among others, (Azeez et al., 2016). Therefore in the case of students, the accommodations should provide a serene living and study environment.

User satisfaction can also be assessed based on the dwelling unit features, housing unit support services, public facilities, social environment and neighborhood facilities, (Mohit et al., 2010). A study on government residential buildings in India established a correlation between user satisfaction and building performance. The study also outlined three main components for measuring building performance - the physical, functional, and financial components. Therefore, the condition of the building fabric has a direct effect on user satisfaction, (S. Gopikrishnan & Virendra, 2018).

Empirical evidence based studies on user satisfaction in buildings have generally used as variables the physical attributes of buildings (design, quality and adequacy of

facilities), as well social factors related to user perception, and the immediate environment, (Ajayi et al., 2015; Berkoz et al., 2009; Day, 2000; Fang, 2006; Mohit et al., 2010). The studies have also adopted numerical rating scales to assign value to perceptions of satisfaction from users. Results have also been derived in the form of an index figure which gauges the satisfaction of users.

Building Performance Attributes (BPAs)

Physical and functional factors such as space, physical condition, safety, furniture, fittings, fixtures, lighting, air, noise, water, waste disposal and so on, are referred to as Building Performance Attributes (BPAs), (C. S. Gopikrishnan & Paul, 2017).

This study therefore focuses on the physical and functional components of the building fabric, and its relationship with its

occupants/users as previously outlined. The Functional components of BPAs therefore provide a basis for developing subcategories, which will be used for measuring user satisfaction in this study.

STUDY AREA

Kaduna State University, Kafanchan Campus and Binzom Village

Located in Binzom village, Kafanchan, the Kaduna State University Kafanchan Campus (KASU KC) lies on Latitude 9.5848982 North, and Longitude 8.2924213 East (see figure 1). Boundaries of KASU KC and Binzom are highlighted in red and yellow. Two faculties – Environmental Sciences, and Agriculture, and the College of Basic Studies (CBS) comprise the academic units of the campus. While the student population just over 1600, as of the 2019/2020 academic session.

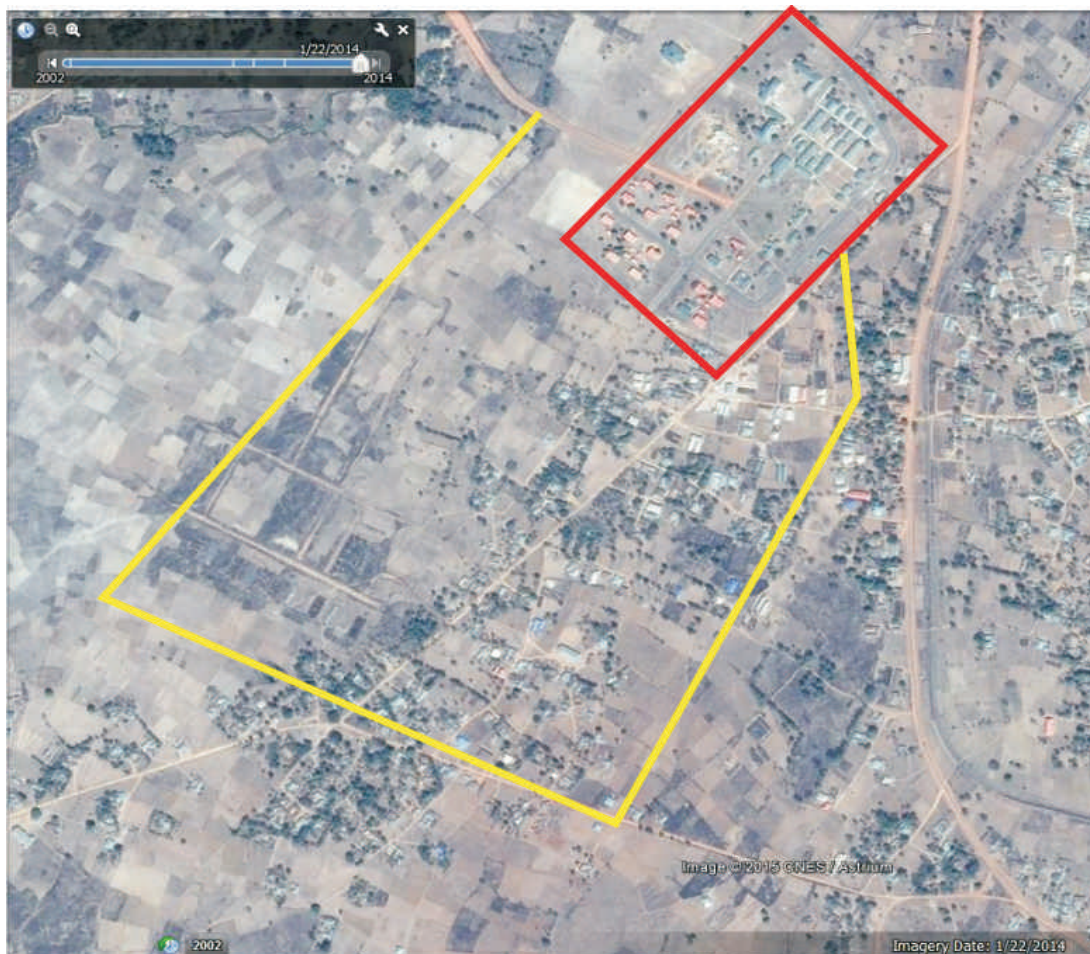


Figure 1: Location of KASU KC and Binzom. (Source: Adopted from Google Earth)

Binzom community is characterized by small residential compounds (mostly mud buildings roofed with zinc sheets) enclosing a yards/courtyard. Parcels of farmlands surround the compounds. The establishment of KASU KC in 2013 has spawned the transformation of Binzom. Even as rural houses and parcels of farmlands are remodeled, and developed respectively into student lodges. These developments are usually carried out without due diligence to/from the Kaduna State Urban Development Authority. Access to the off campus accommodations is characterized

foot paths, with limited vehicular access. There is also inadequate electricity supply, and no pipe borne water in the community, (Musa & Shamang, 2016).

CASE STUDIES

Case studies of privately owned off campus accommodations were chosen using purposeful sampling techniques. The characteristics of the buildings are outlined in Tables 1 and 2. Outlined in the tables are observations/remarks corresponding to the Building Performance Attributes (BPAs).

Table 1: Case studies of some select off campus accommodations in Binzom.

BUILDING SURVEY 1		
	BPA	Remarks
1	Type of development	New development
2	Number of rooms	11
3	Facilities	Single room, kitchen, and bath
4	Size of plot	900 m2



Plate 1: A new development of 11 fully en-suite rooms. (Source: Authors Field Work)

BUILDING SURVEY 2		
	BPA	Remarks
1	Type of development	New development
2	Number of rooms	8
3	Facilities	Single room, kitchen, and bath
4	Size of plot	600 m2



Plate 2: A new development of 8 fully en-suite apartments on a farmland. (Source: Authors Field Work)

BUILDING SURVEY 3		
	BPA	Remarks
1	Type of development	New development
2	Number of rooms	6
3	Facilities	Single room, kitchen, and bath
4	Size of plot	450 m2



Plate 3: A new development of 6 fully en-suite apartments on a farmland. (Source: Authors Field Work)

BUILDING SURVEY 4		
	BPA	Remarks
1	Type of development	New development
2	Number of rooms	10
3	Facilities	Single room, kitchen, and bath
4	Size of plot	450 m ²



Plate 4: A compound of 10 fully en-suite rooms, in a residential area. (Source: Authors Field Work)

BUILDING SURVEY 5		
	BPA	Remarks
1	Type of development	New development
2	Number of rooms	16
3	Facilities	Single rooms
4	Size of plot	450 m ²



Plate 5: A compound of 16 single rooms (Source: Authors Field Work)

Source: Author's Field Work

Table 2: Case studies of some select off campus accommodations in Binzom.

BUILDING SURVEY 6		
	BPA	Remarks
1	Type of development	New development
2	Number of rooms	10
3	Facilities	Single room, kitchen, and bath
4	Size of plot	450 m ²



Plate 6: A compound of 10 fully en-suite rooms. (Source: Authors Field Work)

BUILDING SURVEY 7		
	BPA	Remarks
1	Type of development	Adaptive re-use
2	Number of rooms	14
3	Facilities	Single rooms
4	Size of plot	750 m ²



Plate 7: A compound of 14 single rooms. (Source: Authors Field Work)

BUILDING SURVEY 8		
	BPA	Remarks
1	Type of development	Adaptive re-use
2	Number of rooms	6
3	Facilities	Single room, kitchen, and bath
4	Size of plot	400 m ²



Plate 8: A compound of 8 single rooms, redevelopment, (Source: Authors Field Work)

BUILDING SURVEY 9		
	BPA	Remarks
1	Type of development	Adaptive re-use and Extension
2	Number of rooms	8
3	Facilities	Single rooms
4	Size of plot	450 m ²

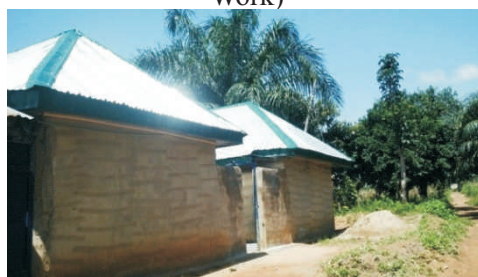


Plate 9: Case study 9, a compound of 8 single rooms, (Source: Authors Field Work)

BUILDING SURVEY 10		
	BPA	Remarks
1	Type of development	Adaptive re-use
2	Number of rooms	10
3	Facilities	Single room, kitchen, and bath rooms
4	Size of plot	750 m ²



Plate 10: A compound of 10 fully en-suite rooms, (Source: Authors Field Work)

Source: Author's Field Work

RESEARCH METHOD

Study Population

The study population consists of the selected facilities and their users – which are categorized and targeted as follows:

- Users: The students of KASU KC. The target population are students who are tenants in the privately owned off campus accommodations in Binzom community.
- Facilities: The facilities mostly consisted of blocks of single units/rooms with provision of en-suite or separate bathroom and kitchen facilities.

Sampling Technique

Purposeful sampling, is the intentional selection of individuals and sites based on their potential for providing rich information aimed towards the understanding a central phenomenon, (Creswell, 2012).

This research therefore adopts the purposeful sampling technique to select specific sites/case studies of privately owned off campus accommodations. In order to eliminate bias in the selection of case studies, the criteria used for selection are as follows:

- Close proximity to the university, based on a short walking distance

- from the campus.
- b. Occupancy consisting mainly of students.
- c. Permission/access to the author from the owner.

Convenience sampling was used to administer questionnaires to the respondents. According to Creswell (2012), this technique allows the researcher to select participants that are willing and available to be studied.

Research Instrument

A self-administered, structured questionnaire based on Building Performance Attributes (BPAs) was developed for the study. The questionnaire consisted of three sections, which involve attributes of number of years lived in the unit; the characteristics of the unit; and rated responses to measure the respondent's satisfaction level based on the BPAs.

The numeric rating scale is a close ended response used to measure respondent feedback, it provides a means of conducting qualitative evaluation of a facilities performance, ("Rating Scale," 2018). A five point numeric rating scale was used to gauge the responses of each variable/BPAs, thus determining user satisfaction levels, and the level of importance which respondent's associate to the BPAs.

Therefore, the responses for level of satisfaction are coded as 1=Very Dissatisfied (VD), 2= Dissatisfied (D), 3 = Indifferent (ID), 4 = Satisfied (S), 5 = Very Satisfied (VS).

Data Analysis and Presentation

Descriptive statistics is used for data analysis and presentation showing the percentage frequencies of responses, and RSI. The computation was carried out using Microsoft Excel 2016. The following procedure was used to determine the RSI for each variable (RSI_v):

- a. Multiply each coded response value (according to the 5 point NRS) by the number of responses to obtain the Weighted Value (WV)

- b. Sum up the Weighted Values ($\sum WV$).
- c. Sum up the responses (n)
- d. Divided the sum of the WV by n.
- e. Thus $RSI_v = \sum WV/n$

Consequently the overall user satisfaction index .i.e. Average RSI (RSI_a) was by obtained by the following procedure:

- a. Sum up the RSI_v of each variable.
- b. Divide by the total number of RSI_v (RSI_n)
- c. Thus $RSI_a = \sum RSI_v / RSI_n$

The above procedure has been successfully used in previous studies to measure user satisfaction based on a relative satisfaction index in accordance to specific building performance attributes, (Amole, 2009; Azeez et al., 2016; Djebarni & Al-Abed, 2000).

RESULTS

Survey Profile

A total of 77 questionnaires were issued and returned; from which 58 questionnaires representing 75% were valid, while 19 questionnaires representing 25% were invalid. Creswell (2012) suggests that a high response rate of 75% - as obtained is adequate for further analysis. Empirical studies have previously used a high/significant rate of return to further analysis. Examples include - Kasimu, (2016), in a study on cost management of Nigerian infrastructure successfully conducted statistical analysis using 107 (71%) out of 150 survey questionnaire responses. Umar & Ibrahim, (2016), in a study on financial risk associated with housing estate development, successfully used 20 (50%) out of 40 survey questionnaires responses for statistical analysis. Other examples are Olubajo et al., (2016), with 68.15% response rate; Bajere et al., (2016), with 71% response rate; and (Hamma-Adama et al., (2018), to mention a few. The questionnaires were invalidated due to errors and incomplete entries.

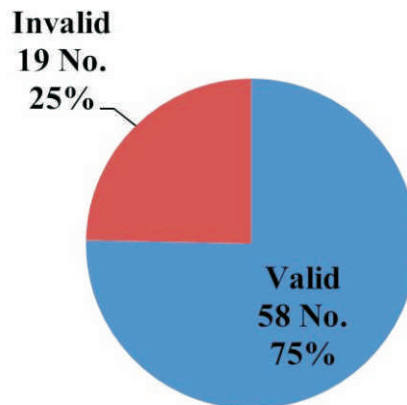


Figure12: Statistics of administered questionnaires.
(Source: Author)

Facilities and Category of the Buildings

The off campus accommodations studied consisted of two categories, those consisting of single rooms with bathroom and kitchen facilities attached (3 in number), and those with separate bathroom and/or kitchen facilities (7 in number) as shown in Figure 13. As shown in Figure 14, the study categorized the buildings studied as 'New'

developments .i.e. purpose made for student accommodation, and 'Redeveloped' .i.e. buildings converted from their original purpose to student hostels. Six of the buildings are new developments representing 60%, while 4 are redeveloped representing 40%.

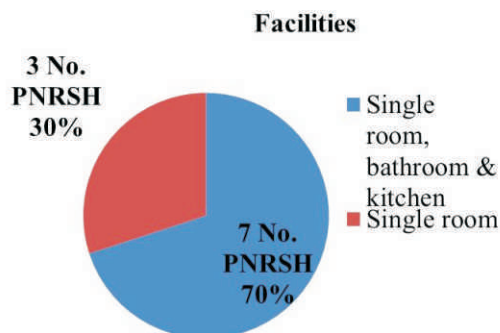


Figure 13: Types of buildings studied.
(Source: Author)

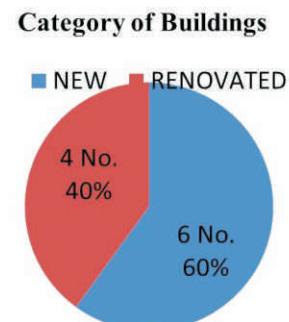


Figure 14: Category of buildings.
(Source: Author's field work)

User Satisfaction Index

The results of this study (as shown in table 3) reveals that the average RSI of the off campus accommodations studied is 3.4 - which falls between the numerical rating

ranges of 'Indifferent' to 'Satisfied'. This implies that the users are not quite satisfied with their living conditions.

Table 2: User Satisfaction Index. (Source: Author's Field work)

	Building Performance Attributes	Rating & Weighted Variables - Satisfaction					Σ Variable s n	Σ W V	RS Iv
		VD	D	ID	S	VS			
		1	2	3	4	5			
1	Room size	0	2	15	16	25	58	238	4.1
2	Kitchen space	6	10	14	12	16	58	196	3.4
3	Bathroom space	2	10	14	18	14	58	206	3.6
4	Internal arrangement of room	3	2	14	15	24	58	229	3.9
5	Size of door/s and windows	1	3	7	17	30	58	246	4.2
6	Visual privacy in the room	4	6	9	15	24	58	223	3.8
7	Parking space	15	12	11	10	10	58	162	2.8
8	Open spaces in the compound	8	6	13	13	18	58	201	3.5
9	Wardrobe and kitchen cabinets	18	4	6	14	16	58	180	3.1
10	Plumbing: Water supply, toilet, taps, bath etc.	11	9	7	8	23	58	197	3.4
11	Electricity: Power supply, light fittings, fan, sockets etc.	10	7	15	12	14	58	187	3.2
12	Security of the premises	17	9	17	12	3	58	149	2.6
13	Fire safety equipment/provisions	32	8	8	4	6	58	118	2.0
14	Adequacy of natural light in the room	5	9	6	23	15	58	208	3.6
15	Adequacy of windows/cross ventilation	4	7	7	19	21	58	220	3.8
16	Adequacy of ventilation/natural fresh air	2	9	10	19	18	58	216	3.7
17	Air purity	5	9	13	18	13	58	199	3.4
18	Room temperature in the day time	4	10	13	18	13	58	200	3.4
19	Room temperature at night	6	10	9	16	17	58	202	3.5
20	Noise level in the building	10	13	12	10	13	58	177	3.1
21	Waste disposal	14	12	13	12	7	58	160	2.8
22	Cleanliness of the surroundings	6	3	17	18	14	58	205	3.5
23	Drainage system	10	9	14	13	12	58	182	3.1
24	Location of the building	3	6	9	15	25	58	227	3.9
25	Nearness to school	3	1	2	14	38	58	257	4.4
26	Nearness to shops or market	8	10	12	17	11	58	187	3.2
27	Accessibility to vehicles	10	13	17	12	6	58	165	2.8
							TOTAL		
							ΣRSIv		92.0
							MEAN RSIa		3.4

Ranking of Building Performance Attributes (BPA)

The ranking of the BPAs by RSI index revealed that students most valued proximity to the school (RSI of 4), and openings (RSI of 4.2). Also, electricity supply, cross ventilation, water supply and security ranked among the top five BPAs. While they least valued kitchen space, night temperature, open space in the compound, noise level in the building, and parking space. These ranked among the bottom five (see Table 5 and 6). This implies that students prefer

hostels to be inside the university campus, with functional design, and efficient ergonomics. Also, accommodations should have sufficient natural ventilation and lighting, with clean environment among others.

The ranking of the RSI revealed that students were most satisfied with the nearness of the accommodations to the school, size of openings, and room size; while students were least satisfied with waste disposal, security, and fire safety.

Table 3: Ranking BPAs by Relative Satisfaction Index (Source: Author)

	Building Performance Attributes	RSI _v	RANK
1	Nearness to school	4.4	1
2	Size of door/s and windows	4.2	2
3	Room size	4.1	3
4	Internal arrangement of room	3.9	4
5	Location of the building	3.9	5
6	Visual privacy in the room	3.8	6
7	Adequacy of windows/cross ventilation	3.8	7
8	Adequacy of ventilation/natural fresh air	3.7	8
9	Adequacy of natural light in the room	3.6	9
10	Bathroom space	3.6	10
11	Cleanliness of the surroundings	3.5	11
12	Room temperature at night	3.5	12
13	Open spaces in the compound	3.5	13
14	Room temperature in the day time	3.4	14
15	Air purity	3.4	15
16	Plumbing: Water supply, toilet, taps, bath etc.	3.4	16
17	Kitchen space	3.4	17
18	Electricity: Power supply, light fittings, fan, sockets etc.	3.2	18
19	Nearness to shops or market	3.2	18
20	Drainage system	3.1	20
21	Wardrobe and kitchen cabinets	3.1	21
22	Noise level in the building	3.1	22
23	Accessibility to vehicles	2.8	23
24	Parking space	2.8	24
25	Waste disposal	2.8	25
26	Security of the premises	2.6	26
27	Fire safety equipment/provisions	2.0	27

CONCLUSION AND RECOMMENDATIONS

This study has revealed a low level of satisfaction of users with the privately owned off campus accommodations. This reflects the quality of the facilities, provided by private developers. The results also revealed that the service quality of the facilities falls short of the user expectations for satisfaction. An indication of profit-oriented focus of developers as against quality and comfort of users.

The results of this study have established that building performance attributes can be used to gauge user satisfaction, and also measure

the service quality of facilities. Also, the ranking of the building performance attributes based on the relative satisfaction index indicates areas of needed attention. Therefore, it is recommended that designers and developers make use of this as a guide to determine the quality, and quantity of facilities to provide in future developments.

A limitation of the study is the absence of a correlation study of the RSI based on facilities provided, and category of the buildings (between new and old/redeveloped buildings). This limitation presents an opportunity for further research on the subject.

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ANALYSIS OF GROUND AND SURFACE WATER OF IGBOTAKO AND ODE-AYE COMMUNITIES IN OKITIPUPA LOCAL GOVERNMENT AREA OF ONDO STATE, NIGERIA

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ABSTRACT

After air, water has been known to be the most precious natural resource available to man. It is however limited as only a part of it is good for use. The inhabitants of Igbotako and Ode – Aye communities in Okitipupa Local government Area of Ondo State rely solely on water harvested from the rain, few wells and the four streams that criss-cross the communities. This study therefore is aimed at analysing the quality of these water bodies and to form a baseline for future references. Water samples from the four streams and four wells were taken and analysed using standard protocols. The results were compared to the Federal Ministry of Environment Standards for drinking water as highlighted in the National Guidelines and Standards for Water Quality in Nigeria, 1999. Results show that the ground water in Igbotako is acidic (pH; 4.44 – 5.12) with high turbidity levels especially in Ode-Aye ranging from 0.79 – 6.9 NTU. The surface water contains coliform and heterotrophic bacteria. Ammonium and manganese ion levels are higher (0.71 – 2.1 mg/L and 0.29 – 0.77 mg/L, respectively) than the limits set by the Federal Ministry of Environment. The study recommends the necessary treatments for the different water bodies before use.

Keywords: Water quality, microbial load, Physico-chemical analysis, groundwater, streams

INTRODUCTION

Water is a life resource that is very essential to sustenance of life as we know it. As a result, adequate safe and accessible supply must be ensured all year round irrespective of area of habitation (WHO, 2004). The public/environmental health significance of water quality cannot be over emphasized. Many infectious diseases are transmitted by water through the fecal-oral route. Diseases contracted through drinking water kill about 5 million children annually and make a 1/6th of the world population sick (WHO, 2004). Water is vital to our existence in life and its importance in our daily life makes it imperative that thorough biological and physiochemical examinations be conducted on water. Potable water is the water that is free from disease producing microorganisms and chemical substances that are dangerous to health (Lamikanra, 1999).

Naturally occurring water is never pure; it constantly contains some amount of dissolved substances, gases and dissolved solids. Some of these substances cause hardness of water especially with the presence of dissolved calcium and magnesium salts. Water Quality is the chemical, physical and biological characteristics of water, usually in respect to its suitability for a designated use. Water can be used for recreation, drinking, fisheries, agriculture or industry. Each of these designated uses has different defined chemical, physical and biological standards necessary to support that use (Roy, 2018).

Subsistence agriculture is the main stay of the Nigerian and African economy. Agricultural practices usually result in the application of both organic and chemical fertilizers, pesticides and many other farm inputs. The intensive use of farm slots for subsistence farming may lead to the

pollution of water bodies both surface and underground with these agricultural inputs. These water sources also serve the communities bathing, washing and sundry sanitation needs. Agricultural activities also introduce chemicals and dirt into the water bodies hence exposing residents who depend on these waters to microbes and chemicals some of which might be toxic with deleterious consequences. The position of these surface streams are naturally such that during the wet season, the run-offs pick up a lot of materials and substances including both human and livestock faecal matter and drains them into these streams. This also applies to ground water especially hand – dug wells that not only are they usually open but are shallow thus allowing chemicals and organic substances to gain access to them. Deeper wells and boreholes are usually not open but are deep enough to filter the rain water and not allow faecal materials to gain access.

Usually in Africa and the rest of the global south, these waters are consumed both directly and indirectly domestically without any further forms of treatment. The aquatic life and the rest of the ecosystem are also endangered. These cascades of cause and effect end up having some negative economic implications for the population who depend on these water sources for their day to day needs as well as fishermen and other aqua culturists who depend on these water sources for survival.

The major reason for the elucidation of important parameters in water quality assessment may be attributed to the fact that in the overall utility of water, such parameters should not be ignored (Osuinde and Enuezie, 1999). Though according to Wegelin – Schuringa, (1999), provisions of quality drinking water is vested in Federal, State and Local Government Authorities. In spite of their efforts, a large number of people still lack access to adequate quality

potable water for personal and agricultural uses. And it is particularly critical in rural communities all over Nigeria, since both past and present governments adduce paucity of funds as reason militating against the provision this fundamental human right.

The main aim of this study therefore is to analyse the water quality for the different uses they are put to especially in the rural communities of Igbotako and Ode-Aye and comparing the results with the Nigerian water standard which is a domestication of (WHO, 2004) and other similar international regulatory bodies' standards. Prior studies in other parts of Nigeria found out that pipe borne water and other natural water supplies in Nigeria have been reported to be unsatisfactory, with coliform counts far exceeding the level recommendation by W.H.O or the local standard for drinking water. (Dada *et al.* 1990a, 1990b, Edema *et al.* 2001).

METHODOLOGY

Study Area

This study was carried out at Igbotako – 6°34'0" N and 4°39'0" E and Ode-Aye – 6°35'0" N and 4°45'0" E communities in Okitipupa local government area of Ondo State, South-west Nigeria (Figure 1). It considered only the physical and chemical properties of their water. The climatic condition of the study area is of the Low Land Tropical Rain Forest type with distinct wet and dry seasons. Temperatures are generally high throughout the year with the maximum and minimum temperatures of 32°C and 31°C respectively. The mean annual rainfall within this area exceeds 2000mm with rains coming scantily in February till October. The heaviest downpour is usually recorded in August and September. The prevailing wind is the South – Westerlies accounting for about 60% of total wind in the area. (NIMET, 2010)

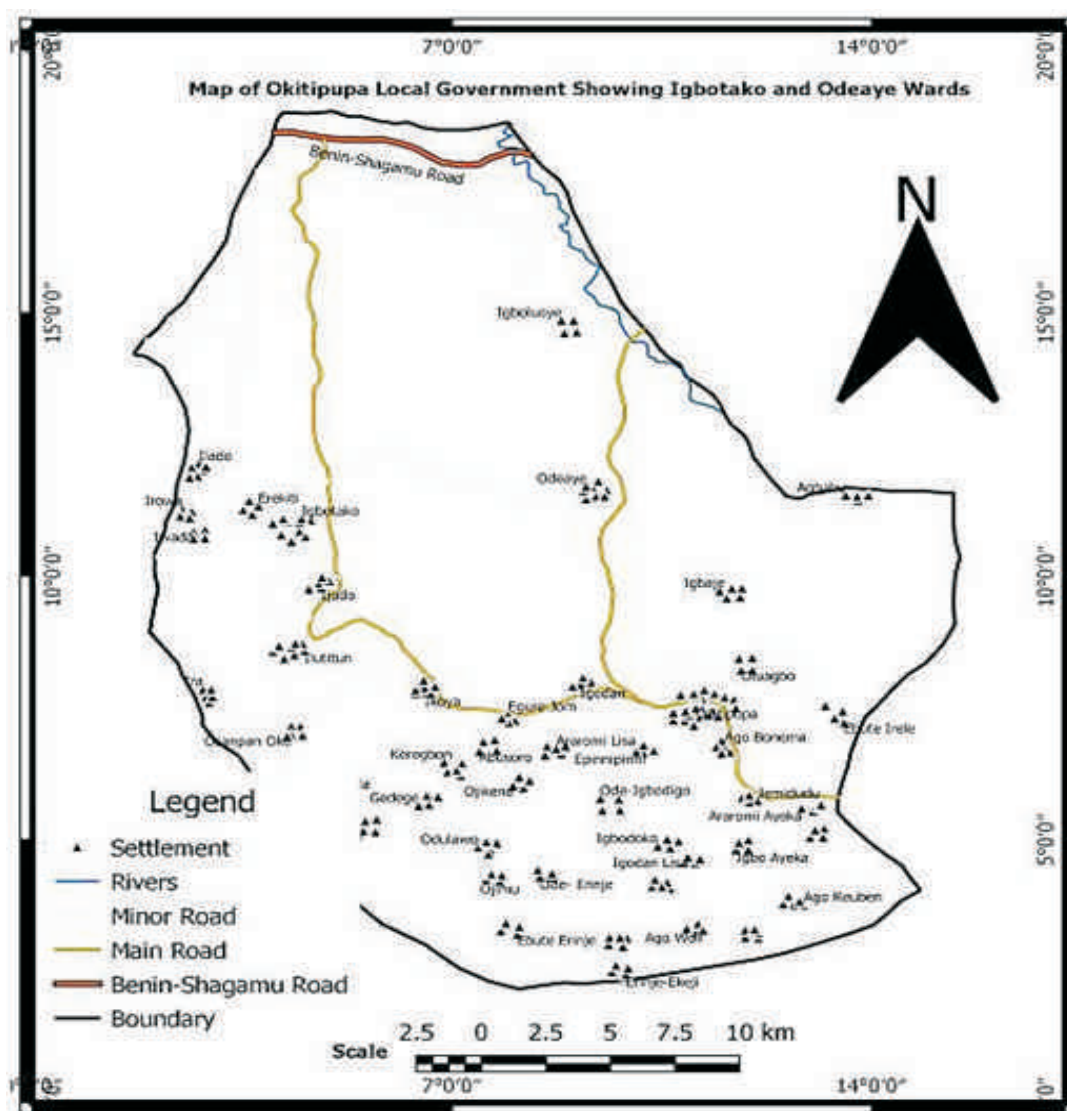


Figure 1: Okitipupa Local Government Area showing Ode-Aye and Igbotako Towns
Source: Field Survey,(2019)

The natives are predominantly farmers. The major cash crops being cultivated in the area are oil palm, rubber, cassava and yam. They also farm okro, beans, pepper, vegetables and melon. Their staple food are but not limited to “Pupuru” (baked cassava), yam, cassava, beans, yam flour and garri.

The indigenes rely solely on water harvested during rainfall; this is only possible during the wet season. During the dry season, the residents rely solely and extensively on the few surface water bodies that are found in the communities. The streams that usually serve the study area are the *Gbeguren*, *Oketiti*, *Gbagba* and *Akinu – Aye* streams. A few well

to do indigenes of these communities, who do not reside permanently within the communities and are financially stable come home only during festive periods and key occasions. Some of these few have hand-dug wells that serve their homes whenever they are back in the community.

Sample Collection and Analyses

Collection of water samples

Water samples from boreholes were randomly collected from both communities with the location of delineated boreholes marked with the aid of satellite-based GPS (Timbrell 3000 series). Same went for the sampling of surface water sample. Water

samples were collected directly from the sources utilizing new amber 1.5L sample containers, thoroughly washed with deionized water, then nitric acid, and finally rinse twice with the water source before taking the sample with care to avoid contamination (Pacheco *et al*, 2006). The surface water samples were taken at downstream so as account for all manner of pollutions at the up and mid-stream levels. All water samples so collected were transported to our laboratory on ice. Samples were stored in the freezer at -20°C till analyses.

Determination of physico-chemical parameters of water samples

Some of the physico-chemical parameters of the water samples were determined *in situ* with the aid of standard multi-parameter measuring equipment. Temperature, pH, Electric conductivity, Total dissolved solids (TDS), and Total suspended solids (TSS) were all measured with Labforce PC200, a standard multi-parameter equipment. Turbidity and viscosity were determined in the laboratory with the aid of a nephelometer and viscometer (Visco 39, India) respectively.

To further assess the quality of the water samples from both communities, sulphate (SO_4) concentration of the samples was determined using a simple turbidometric method as described by (Mengdi, 2003); nitrate and nitrite (NO_3 and NO_2) concentrations were determined colorimetrically using the method annotated by the United States Environmental Protection Agency (USEPA), 1993. Ammonia (NH_4) content was determined by the method of Le and Boyd, 2012, whereas salinity was determined via a method developed by FEW and APHA, (2005), Bartram and Ballance, (1996).

Determination of heavy metals in water samples

Water sample metal load was determined using the method of American Public Health Association, APHA (1998) as adapted by

Okonkwo *et al.*, (2018) described briefly below. Five milliliters of 1:1 HNO_3 was added to a test-tube containing 1 ml of water sample and the mixture covered in a wash glass. The sample was heated at 95°C on a hot plate and refluxed for 15 minutes in a fume cupboard without the mixture boiling over. The sample was allowed to cool down after which 2.5 mL concentrated HNO_3 was added. The wash glass was replaced and the mixture refluxed for 30 minutes repeatedly until complete oxidation. The mixture was cooled and 2 ml of distilled water and 3 ml of 35 – 40% H_2O_2 were added. The beaker was covered once more with a wash glass and was boiled again on a hot plate without the mixture boiling over. To the mixture was added 35 – 40% H_2O_2 in 1 ml aliquots but not exceeding 10 ml. This was continued until effervescence became minimal and the sample appeared unchanged. The beaker was removed from the hotplate and 5 ml of concentrated HCl and 10 ml of de-ionized water were added. The mixture was refluxed for another 15 minutes with boiling until sample became clear. The sample was made up to 100 ml with de-ionized water and transferred to acid-cleaned bottle. The sample was read off on Atomic Absorption Spectrophotometer (AAS) at 241 and 283 nm respectively.

All due laboratory protocols were observed and every chemical used was of analytical grade and purchased from reputable stockists. All the results gathered were compared with the Federal Ministry of Environment (FMEnv) prescribed limits for drinking water as highlighted in the National Guidelines and Standards for Water Quality in Nigeria, (FMEnv., 1999).

RESULTS

Table 1 shows the sampling point delineation for the surface and ground water samples that was carried out in the two communities of Igbotako and Ode-Aye under study. The delineated water sources took into consideration the accessibility of the sources to large number of users in the community.

Table 1: Geo- reference points delineated for water sample collection.

SURFACE WATER			
Points	Description	Northings	Eastings
SW1	Gbeguren Stream	6°35'38.4"	004°39'17.9"
SW2	Oketiti River	6°36'03.7"	004°40'08.2"
SW3	Gbagba Aye River	6°35'14.3"	004°42'51.6"
SW4	Akinu Aye	6°35'12.4"	004°43'01.6"
GROUND WATER			
GW1	Ode Aye	6°35'26.1"	004°44'35.5"
GW2	Ode Aye	6°35'58.3"	004°44'44.1"
GW3	Igbotako	6°35'05.4"	004°38'20.7"
GW4	Igbotako	6°34'24.5"	004°38'06.1"

Source: Field survey, 2019

Table 2: Physico-Chemical Parameters of Groundwater in the study area

Parameters and units	Sample code (GW 1-4)→ Methodology ↓	Ode-Aye GW1	Ode-Aye GW2	Igbotako GW1	Igbotako GW2	FMEnv standard for drinking water
Colour		Colorless	Colorless	Colorless	Colorless	Clear
Taste		Tasteless	Tasteless	Tasteless	Tasteless	Unobjectionable
Odour		Odourless	Odourless	Odourless	Odourless	Unobjectionable
Temperature	Thermoelectric	27.9	27.9	28.0	28.0	<40
pH@25°C	Electrometric	4.4	6.4	4.44	5.12	6.5 – 8.5
Turbidity NTU	Nephelometric	1.5	6.9	0.79	2.3	1
E.C μS/cm	Electrometric	24.1	69	28.9	11.1	1000
TDS mg/l	Electrometric	13.2	35	15.2	6.6	100
TSS mg/l	Gravimetric	2.5	5.9	2.2	4.9	100
V mg/l	Colorimetric	ND	ND	ND	ND	NS
T. Hardness	Titrimetric	51.7	61.1	52.2	43.0	100
SO ₄ ⁻² mg/l	Colorimetric	21.9	14.8	40.3	34.3	250
NO ₃ - mg/l	Colorimetric	1.76	0.71	2.23	1.01	10
NO ₂ - mg/l	Colorimetric	0.16	0.10	0.13	0.20	1.0
NH ₄ - mg/l	Colorimetric	0.86	1.11	2.00	1.01	< 1.0
Salinity	Electrometric	0.00	0.00	0.00	0.00	0.00
HCO ₃ - mg/l	Titrimetric	40.7	50.1	40.5	35.5	NS
Ni mg/l	Colorimetric	0.007	ND	0.001	ND	0.05
Fe ²⁺ mg/l	Colorimetric	1.2	2.2	0.41	0.31	1.00

Parameters and units	Sample code (GW 1-4)→ Methodology ↓	Ode-Aye GW1	Ode-Aye GW2	Igbotako GW1	Igbotako GW2	FMEnv standard for drinking water
Pb ²⁺ mg/l	Colorimetric	ND	ND	ND	0.001	0.05
Zn ²⁺ mg/l	Colorimetric	0.1	1.2	1.01	1.02	5.0
Cu ²⁺ mg/l	Colorimetric	0.001	0.012	0.004	0.014	0.5
Cl ⁻ mg/l	Colorimetric	16.7	20.1	17.9	19.0	200
Mg ²⁺ mg/l	Colorimetric	5.07	4.91	5.02	4.10	20
Mn ²⁺ mg/l	Colorimetric	0.97	0.10	0.39	0.42	0.001

Source: Field survey, 2019

Table 3: Physico – chemical and microbial analysis of surface water in the study area

Parameters and units	Sample code (SW 1-4)→ Methodology ↓	Gbeguren Stream SW1	Oketiti River SW2	Gbagba Aye River SW3	Akinu Aye River SW4	FMEnv standard for IRRIGATION
RESULTS OF PHYSICAL AND CHEMICAL ANALYSIS OF SURFACE WATER SAMPLES						
Colour		Clear	Clear	Clear	Amber	NS
Taste		Tasteless	Tasteless	Tasteless	Tasteless	NS
Odour		Odourless	Odourless	Odourless	Odourless	NS
Temperature	Thermoelectric	27.9	27.7	28.0	27.9	NS
pH@25°C	Electrometric	4.49	5.70	5.4	6.05	NS
Turbidity NTU	Nephelometric	2.0	2.1	4.5	2.5	NS
E.C μS/cm	Electrometric	21.5	14.7	17.5	35.8	NS
TDS mg/l	Electrometric	11.5	7.3	12.0	18.9	NS
TSS mg/l	Gravimetric	4.0	8.7	3.5	5.0	NS
V mg/l	Colorimetric	ND	ND	ND	ND	NS
T. Hardness	Titrimetric	75.2	50.7	51.0	50.1	NS
SO ₄ ⁻² mg/l	Colorimetric	41.3	45.5	35.0	38.2	NS
NO ₃ ⁻ mg/l	Colorimetric	1.77	0.71	0.69	0.99	NS
NO ₂ ⁻ mg/l	Colorimetric	0.12	0.09	0.09	0.04	NS
NH ₄ ⁻ mg/l	Colorimetric	2.10	1.22	0.97	0.71	1.0
Salinity	Electrometric	0.00	0.00	0.00	0.00	0.00
HCO ₃ ⁻ mg/l	Titrimetric	65.1	41.7	41.1	41.5	NS
Ni mg/l	Colorimetric	0.01	0.007	ND	0.01	0.2
Fe ²⁺ mg/l	Colorimetric	1.20	0.51	0.71	0.40	5.0
Pb ²⁺ mg/l	Colorimetric	ND	ND	ND	ND	0.2
Zn ²⁺ mg/l	Colorimetric	1.0	0.76	1.21	1.33	5.0
Cu ²⁺ mg/l	Colorimetric	0.001	0.003	0.001	0.002	1.0

Parameters and units	Sample code (SW 1-4)→ Methodology ↓	Gbeguren Stream SW1	Oketiti River SW2	Gbagba Aye River SW3	Akinu Aye River SW4	FMEnv standard for IRRIGATION
Cl ⁻ mg/l	Colorimetric	27.1	21.1	21.1	21.1	100
Mg ²⁺ mg/l	Colorimetric	7.5	3.71	6.0	5.01	NS
Mn ²⁺ mg/l	Colorimetric	0.77	0.32	0.66	0.29	0.2
Ca ²⁺ mg/l	Colorimetric	30.01	21.1	20.6	20.1	NS
As mg/l	Colorimetric	0.002	0.003	ND	0.001	0.1
K ²⁺ mg/l	Flametric	35.3	1.9	4.6	5.7	NS
Na ²⁺ mg/l	Flametric	11.1	2.4	3.0	2.6	NS
Cadmium mg/l	Colorimetric	ND	0.003	ND	0.002	0.01
Ba mg/l	Colorimetric	0.010	0.007	0.01	0.01	NS
BOD ⁵ mg/l	Reflux	5.5	4.0	6.0	7.0	7.0
DO mg/l	Electrometric	6.0	5.0	6.0	5.6	7.5
COD mg/l	Reflux	13.8	12.2	14.9	16.0	NS
PO ₄ mg/l	Colorimetric	1.2	0.76	0.61	0.09	NS
Cr mg/l	Colorimetric	ND	ND	ND	ND	NS
Cobalt mg/l	Colorimetric	ND	ND	ND	ND	NS
Hg mg/l	Spectrometric	ND	ND	ND	ND	NS

Source: Field survey, 2019

NS – No Standard, ND – Not detected

Table 2 shows the results of the physico-chemical analysis of groundwater from the delineated points from Table 1. Being small communities without plenty hand dug wells, we randomly picked and sampled from four (4) wells spread around the two communities with two (2) wells sampled from each community. The wells are the ones that service more members of the community owing to their location and accessibility. Table 3 shows the results of the physico-chemical analysis of the four (4) major streams serving the water needs of the two communities were also sampled. The streams are utilized by the indigenes for drinking, to wash, clean, irrigation, fishing, and sundry other uses, serving the communities well into the dry months when the wells may have dried up.

DISCUSSION

The recorded conductivity which is an index of the Total Dissolved Solids in water ranged from 11.1 – 69µS/cm. The TDS

concentrations ranged between 6.6 – 35mg/l. The concentrations of chloride, nitrate and sulphate ranged from 16.7 – 20.1 mg/l, 0.001 – 0.007 mg/l and 14.8 – 40.3 mg/l respectively. The concentrations of magnesium, copper, zinc and lead levels ranged from 4.10 – 5.07 mg/l, 0.001 – 0.014 mg/l, 0.1 – 1.2 mg/l and 0.0 – 0.001 mg/l respectively. All these values were within permissible/ recommended limits prescribed by the Federal Ministry of Environment and World Health Organisation. Chromium, Vanadium, Cobalt and Mercury were however, not detected in the groundwater.

However, the water is acidic for GW1 Ode-Aye and GW1 and 2 Igbotako; turbidity is higher than the standard in GW1 and 2 Ode-Aye and GW2 Igbotako; NH₄⁻ is high in GW2 Ode-Aye and GW1 and 2 Igbotako; Fe²⁺ is high in the two water bodies of Ode-Aye while Mn²⁺ is high in all the water bodies.

Physico-chemical properties of surface water

The results of the analysis of the surface water show that most of the parameters measured in samples taken from the rivers were within the FMEnv regulatory permissible limits for irrigation except for manganese as well as ammonium in Gbeguren and Oketiti Rivers.

The pH water samples from the study area ranged from 4.49 – 6.05 indicating the water is acidic. This level of acidity may be due to the geology of the area. The water samples across all samples are colourless, tasteless and odourless with turbidity of the water ranging from 2.0 – 4.5.

The recorded conductivity which is an index of the total dissolved solids in water ranged 14.7 – 21.5 $\mu\text{S}/\text{cm}$. The TDS concentrations ranged from 7.3 and 18.9mg/l indicating that the water is polluted. The Gbeguren Stream which has high conductivity of 21.5 $\mu\text{S}/\text{cm}$ with corresponding high TDS of 11.5 mg/l indicating the water is polluted. The concentration of chloride, nitrate and sulphate ranged from 21.1 – 27.1mg/l, 0.04 – 1.77mg/l and 35.0 – 45.5mg/l respectively. The BOD values ranged from 4.0 – 7.0mg/l, DO ranged 5.0 – 6.0mg/l while COD ranged from 12.2 – 16.0mg/l.

The concentration of magnesium, copper, zinc and iron levels ranged from 3.71 –

7.5mg/l, 0.001 – 0.003mg/l, 0.76 – 1.33mg/l and 0.40 – 1.20mg/l respectively. All these values were within the permissible/recommended limits prescribed by FMEnv and WHO. Manganese concentration levels were slightly high and ranged from 0.29 – 0.77mg/l. lead, chromium, vanadium, cobalt and mercury were not detected in all rivers within the study area.

CONCLUSION

Assessment of water quality is essential to check the suitability of a water source for the designated use. Several water quality parameters were assessed and compared with their standard values to determine the acceptability of the source of water. From the results, the ground water in the study communities could be good for drinking with a little treatment to correct the acid, turbidity, ammonia, iron and manganese levels. The surface water in the area is good for irrigation especially for non-vegetable plants. However, the presence of coliform and heterotrophic bacteria makes the water unfit for vegetable irrigation because of the health implications. It is the recommendation of the authors that government agencies and aid organizations should institute policies that will make safe drinking water accessible to the populations in the rural areas. This will promote healthy living and the overall attainment of the Sustainable Development Goals (SDGs).

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ASSESSMENT OF HOUSEHOLDS LIVELIHOODS IN PERI-URBAN COMMUNITIES OF KADUNA METROPOLIS, KADUNA STATE, NIGERIA

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ABSTRACT

The study aimed at assessing the livelihood of peri-urban communities in Kaduna Metropolis Nigeria. The study sampled four peri-urban communities in Kaduna metropolis. The selected communities include Nassarawa, Hayin na Iya/Malalin Gabas, Hayin Dan Bushiya and Down Quarters. The study employed interview and focus group discussion in obtaining the data. The study used 25 respondents from each of the four study areas making a total of 100 respondents (representing 30.3%) as the sample size. Purposive and simple random sampling were used in selecting for both interview and FGD. The respondents were contacted at different times for both interview and focus group discussion. The data was analyzed by the use of descriptive statistics, frequencies, percentages for interview method while narrative analysis and verbatim quotations were used for FGD and Kruskal Wallis test was used for interview method. This is because in the interview method numbers of respondents were used during the interview with the respondent. The findings revealed that the peri-urban communities engaged in different economic activities such as tailoring, driving, mechanic work, KekeNapep riding, land speculation, building, civil service, trading, vulcanization among others for their livelihood. The study also discovered the duration of the peri urban communities which differ from one another, but those that spent above thirty years have the highest number in the four study areas constituting 52%. However, the peri-urban communities have different sources of water, but water from the well is the main source of water in the four peri-urban communities. However, using KruskalWallis test it is revealed that there is no significant difference in the sources of water in the four peri-urban communities in Kaduna metropolis. Most of our Peri – urban communities suffer from inadequate and quality water supply, hence adequate sources and good quality water supply should be provided to such areas. Recommendably Authorities like ministry of environment, Kaduna State Urban Development Authority (KASUPDA) and Kaduna State Geographical Information Service (KADGIS) should provide an avenue for boosting micro – economic activities in our Peri – urban areas. Where Peri – urban settlements stay for along time, social and infrastructural facilities should be provided to them.

Key words: community, livelihood, metropolis, peri-urban, respondents.

INTRODUCTION

Land is one of the resources in any city that need to be effectively managed for better urban management outcomes (Ayman & Kamel, 2004). The world today faces complex challenges, many of which have a clear land dimension. These challenges which are repeatedly mentioned in the literature include rapid urbanization and growing food, water and energy shortages (Palmer, 2009). Land possesses a central position in social, political and economic terms. It gives support to life and it is central to human culture and institutional

development (Ahmad, 2012). Urbanization and urban growth are considered as modern way of life which manifests economic growth and development in many countries. That means the level of urbanization and socio-economic status of the inhabitants is correlated in many countries (Tamira, 2016). Urbanization grows at such unprecedented rate that cities are spilling over their boundaries into nearby rural villages. Large metropolises spreads out on the surrounding fringe areas, often termed as peri-urban regions where economic transfer takes place at a massive scale (Pillabi & Veronica, 2016).

However, the high rate of urbanization has become a worldwide phenomenon and Nigeria is not left out on the prevailing global demographic and spatial flux. It has been observed that urban settlements attract people as they offer better economic opportunities and provide access to basic social needs like water and sanitation, better health care and wellbeing (Oluwale, 2011). Collectively constituting the pull factor as a result of the outward urban population thrust, many peri-urban land use changes from being dominated by agriculture to multiple land use patterns (Gallant *et al*, 2004).

Economic necessity, scarce urban land and resources and the large urban market associated with increasing urbanization, have among others encouraged micro-economic activities in the peri-urban areas. Livelihood is the way you make your living and pay for the basic things you need in life (Yeken, 2014)

Diversification is norm in every economy, particularly in rural and peri-urban areas of Africa, where farming alone rarely provides sufficient income. There are different forms and determinants of nonfarm livelihood in rural households in Ogun State Nigeria. Livelihood can be defined as the job or work one undertakes to earn income that will support himself and his family (Fabusoro *et al*, 2010).

Coping with the pressure and dynamics of population and land use changes, peri-urban zones are areas capable of promoting rural and peri-urban livelihoods. Livelihood is also defined as the work that provides the money that one need to earn a living (Ayo, 2016).

However, the peri-urbanities have to engage themselves in different economic activities to sustain their livelihood because their farms are lost to urban development. There are resources that individuals and households draw upon to build their livelihoods. These include natural capital or natural resources like land, forestry, water and mineral resources, physical capital like

road, electricity, market, building and machinery, financial capital, personal savings, loans from relatives, friends or money lender as well as credit and financial services received from formal financial institutions, human capital like wage employment, business venture, education, vocational and managerial skills as well as health status and social capital which refers to the rules, norms, obligation or trust that help individuals and households to devise livelihood strategies (Charles *et al*, 2015).

The word peri-urban is interchangeably used as suburb areas, extended places or areas, outskirts areas, sprawl areas, peripheral land, transition zone, rural hinter land, urban fringe, middle band areas, commuting zone, urban edge, urban frontier among others (Inhoff, 2000; Berry, 1990; Daniel, 1999; Bureau of Census, 2000; John, 2008; Ravetz *et al* 2013; Mandere, 2010). The term peri-urban has been defined differently by many scholars. For instance, Pallabi and Veronica (2016) defined peri-urban as a home to migrant population who are unable to afford the city life, and also is a place where people shift from agricultural activities to non agricultural activities. Appiah *et al* (2014) sees peri-urban land as a prime agricultural land outside the cities bought by urban residents for residential or commercial purposes.

The term peri-urban is also defined as a rural agricultural areas located in urban built-up areas in cities and predominantly rural agricultural areas (Achamyeleh, 2015).

Several studies have been conducted both locally and internationally by different researchers on the livelihood of peri-urban dwellers. For instance Pallabi & Veronica (2016) in India observed that peri-urban dweller enhanced their livelihood through non agricultural activities, technological innovations and tertiary activities such as service based activities thereby creating huge pool of human capital in their peri-urban areas.

However, in peri-urban communities in Accra, Ghana peri-urban household engage in various means of enhancing their wellbeing through different ways. These

means of livelihoods included land speculation, sand mining, stone quarrying, fishing, poultry farming, trading, traditional restaurants, saw mills, hairdressing salons, artisan shops, private health centers, private schools, telecommunication and internet cafes among other (Charles *et al*, 2015). Frederic *et al* (2018) in their research findings observed that in WaMunicipality of Ghana the source of the livelihood of the peri-urban dwellers comprised sand mining, stone mining, farming, sheanut trading, fuelwood selling, charcoal production and quarrying.

The core aim of this study is to assess the livelihood of the peri-urban communities in Kaduna metropolis, Nigeria. The study have the following objectives; to examine the type of micro-economic activities of the peri urban communities in the study area, to examine the duration of the peri-urban communities in the study area and to analyze the sources of water in the peri-urban communities. The study focused on peri-urban communities in north, south, east and western parts of Kaduna metropolis which are all within the four local governments of Kaduna metropolis. These local governments comprise Kaduna North Local Government, Kaduna South Local Government, Igabi Local Government and Chikun Local Government. The study areas selected comprises peri-urban communities in Nasarawa in Rigasa in the west in Igabi Local Government, Hayin Na Iya/MalaliGabas in the North, in Kaduna North Local Government, Hayin Dan Bushiya in the east in Chikun Local Government and Dawn Quarters in Makera (Kakuri) in the South in Kaduna South Local Government. This communities were selected to serve as sample.

THE STUDY AREA

Kaduna metropolis is located between latitudes 10° 25'27" to latitudes 10° 35'29" N and longitude 7° 22'20" E to longitude 7° 30'27" E. Kaduna metropolis comprises of Kaduna North, Kaduna South, parts of Chikun and Igabi LGAs of Kaduna State.

Its climate is tropical wet and dry. The wet season is between May and early October

and the dry season is between end of October to early May. The rainfall is variable with its highest peak in August and sometimes September. The rainfall decrease from the south to North ward. The rainfall is heavier in the south. It has about 1500mm of precipitation annually. The humidity follows the pattern of rainfall in the wet season with 60% and in the dry season with 20 – 30%. The temperature ranges between 15° C – 36°C with the highest temperature between April and May while the lowest is between December and February. The elevation of Kaduna ranges between 500 -700m above sea level. It is among the Hausa plain. The geology of the study area is essentially basement complex rocks. Most of the role out crops are made up of granite. The rocks have been exposed to weathering for long period of time where some of them have produced a kind of regolith which is rich in clay content (Abdullahi, 2010). The basement complex rocks comprise of migmatites, gneisses, schists, granites, pegmatites, quartzites, phyllites, metamorphic rock and metasediments (Eze *et al*, 2011) reported by (Mallo, 2019). In terms of vegetation, Kaduna has Sudan Savanna vegetation characterized by numerous grasses. Some grasses are tall while others are short. It has some deciduous trees which are scattered. The vegetation is also characterized by some trees which wither in the dry season in adaptation to water shortage. The soil of Kaduna is tropical Ferruginous soil or nitrosols which are usually reddish in colour due to the presence of Iron. The soil is lso heavily leached due to rainfall. They are also sticky when wet and hard when dry. The soils support the growth of cocoyam, cassava, maize, rice, Guinea corn, Ground nut, Soya beans, Millet among others. Kaduna circumscribes different ethnic groups like Hausa, Yoruba, Igbo, Fulani, Kadara, Gwari, Jaba, Bajju, Kaje, Igbira, Igala, Kamanton, Kamuku, Nupe, Gwandara, Kagoma, Kataf, Marwa, Kahugu, Sanga, Surubu among others. Kaduna metropolis has a population of 1,570,331 million as betokened by the National population commission (NPC census, 2006).

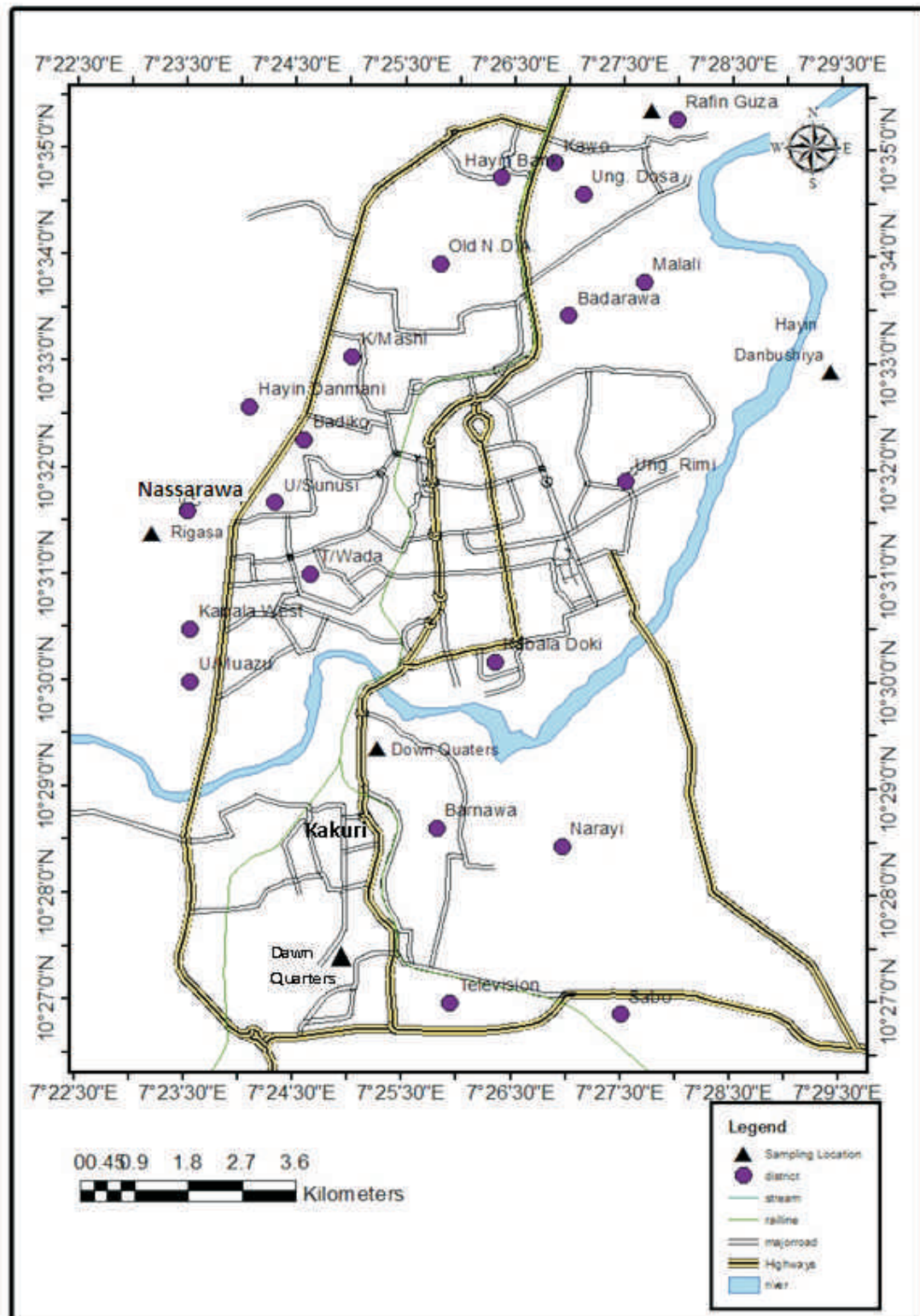


Figure 1: Administrative Map of Kaduna Metropolis.

Source: Geography Department Bayero University Kano, 2018

METHODOLOGY

The study used both primary and secondary sources of data. The secondary sources of data include Map, Journal, Books among others. Purposive and simple random sampling were the methods applied in selecting the respondents. The study selected the respondents that can give information purposely for this study, while for the simple random sampling respondents were selected in such a way that adult, old age, religious leaders and district heads were selected randomly. Thus, 25 people were chosen from each of the four study areas making 100 respondents (representing 74%) as the sample size from the population of 135. Sample size based on the Krejcie and Morgan (1970) was applied in selecting the respondents, because the research used focus group discussion and interview methods in collecting the data, and in focus group discussion the sample size is expected to range between four and twelve's respondents, but where there is diversity in either the respondents or the range of topics to be covered then there will be increase in the number of respondents in order to achieve saturation (Morgan, 1992 and Gamson 1992). For instance Gamson (1992) in his focus group discussion wanted each of his group to give their opinions on four different political issues, 37 groups were conducted in order to produce enough discussion on each topic therefore this is what inspired this study to choose 25 respondents from the four study areas. For the FGD 8 discussants were selected each from the four communities which comprise youth, adult, old age, religious leaders and

district heads. The four communities were visited twice for the FGD session.

The study area was visited twice for interview were 17 respondents were interviewed and anybody within the age of 18 years and above was qualified to be among the respondents community leaders, religious leader, youths, adults and old age were part of the respondents. The number of respondents were considered when conducting the interview by the study. For both the interview and the focus group discussions session, the questions used by the study were in line with the objectives of the research. All the relevant data were gathered through the interview and the focus group discussion on the livelihoods of peri-urban communities of the study areas. This has been achieved through the maximum cooperation given by the respondents in the study area. When gathering the data especially in the focus group discussion the moderator was assisted by the assistant moderator using relevant materials like field notebook, checklist and smart phone. For the data analysis descriptive statistics, frequencies, narrative analysis, verbatim quotations and Kruskal Wallis test were applied in order to have meaningful and significant result. KruskalWalli'stest is applied in order to established whether there is significant difference in the sources of water of the peri-urban communities in the four study areas using the level of significance at 0.05. The formula for KruskalWalli'stest is expressed mathematically as

$$H = \frac{12}{N(N+1)} \sum_{i=1}^K \left(\frac{R_i^2}{n_i} \right) - 3(N+1) \dots\dots\dots(1)$$

where:

N = total sample size.

R1 = total of the ranks for the height sampled or the sum of rank for each sample.

n1 = sample size of each group

k= the number of sample

RESULTS AND DISCUSSIONS

Types of Micro-economic Activities

Discussions and interviews with the respondents pointed out different means of livelihoods in the peri-urban communities in the four study areas.

- i *Trading*: some of the respondents participate in trading activities to earn their living. Thus, some items are bought from the city centre and brought to the peri-urban areas. Most of these items are provisions and some food items. Business transactions in these items is among the economic activities of the respondents in the four study areas.
- ii *Farming*: some respondents earn their living through farming. They use farming as their major source of income to take care of their families. Thus they engage in both rainfed agriculture and irrigation agriculture. This allows them to produce different series of crop on their farm.
- iii *Tailoring*: it was revealed that from the study areas some of the respondents participate in tailoring as a means of living. Their major economic activity is tailoring in different designs. Some of them due to their competency engage in some contracts with some government agencies, boards or commissions.
- iv *Driving*: response in the study areas indicates that driving is among the economic activities they engage in. It is of different forms, some are mainly for town services while some are for long journeys. But most of the respondents using driving as their sources of livelihood engage in town service driving.
- v *Mechanic work*: discussion among the respondents revealed that some of the respondents are involved in mechanic work. Some of them are for motor cycle and some are for taxi or buses, their family livelihood is dependent upon the

mechanic work. Even though sometimes their services can be needed outside these peri-urban areas. This was confirmed by some of the respondents in the course of this research.

- vi *Land speculation*: due to increase in peri-urban expansion land speculation is one of the economic activities of some of the respondents in these study areas. It is through this that many of the respondents have access to own some plots of land apart from their residential house in which they occupy together with their families.
- vii *Construction /Building*: it is another economic activity to some respondents, because it is their source of income to take care of their families. It is revealed that in all the four study areas builders are found in all the four study areas. Building is their major economic activities. They can be taken to other places to work but their major areas of work or construction activities are within the study areas. Their livelihood is solely dependent upon building work.
- viii *Tricycle Riders (KekeNapep)*: from the focus group discussion with the respondents it is revealed that some of them engage in KekeNapep riding. Their source of livelihood is from the movement of people. From one locality to another using KekeNapep.
- ix *Vulcanization*: it is another form of economic activities of the respondents in the four study areas. Some of them combine vulcanization with farming especially in the rainy season. However, in all the economic activities of the respondents in the study areas, farming is the major economic activities of the respondents, because most of the Peri-urbanities when the dry season is over they go to the farmer and engage a farming activities to support their regular economic activities. For instance, among the respondents

some land speculators, builders, retirees, tailors stated that in the rainy season they give more emphasis to farming, in order to boost their income for their family livelihood. Again, one elderly man Ibrahim Musa aged 65 years explained how he that he benefited immensely through land speculation, “When I came here in 2000 there were only three to four houses in Hayin Dan Bushiya I decided to be a land speculator, and through this I have built about three houses apart from the one I

am living with my family”. Another respondent named Idris Abbas in Nasarawa Rigasa also stated that “I was the first vulcanizer here, and this gave me the opportunity to build my house and even went to the extent of buying a private car”. (FGD)

However, a similar study was conducted by (Charles *et al*, 2015) in Accra, Ghana where the livelihood of the Peri-urbanities included farming, trading, traditional restaurants, land speculation, sand mining among others.

Duration of stay in the peri-urban areas

Table 1: Duration of stay in the Peri-Urban Areas

Duration	Nasarawa Rigasa		Hayin na Iya/ Malalin Gabas		Hayin Dan Bushiya No.		Dawn Quarters		Total
Year	%		%		%		%		%
1 – 5 Years	12	48	10	40	9	36	1	4	32
6 – 10 years	8	32	9	36	8	32	1	4	26
11 – 15 years	3	12	5	20	5	20	2	8	15
16 – 20 years	2	8	1	4	3	12	4	16	10
21 – 25 years	0	0	0	0	0	0	2	8	2
26 – 30 years	0	0	0	0	0	0	2	8	2
Above 30 years	0	0	0	0	0	0	13	52	13
Total	25	100	25	100	25	100	25	100	100

Source: Author's field work 2018

Discussion with the respondents revealed that their duration differ from one another. Some have stayed for a long time, some have stayed for a short time while some are in between. For instance, one of the respondents named Musa Garba explained that “I built my house in 2003 in Malalin Gabas but I was afraid of attack by thieves therefore I waited until in 2006 I relocated to the house when most of my neighbors relocated to their houses.

It is revealed from the interview that in the four peri-urban areas respondents that spent

1 – 5 years in Nassarawa Rigasa constituted 48%. Their movement to the area could be attributed to low price of land for house construction. Respondents in Hayin Na Iya/Malalin Gabas formed 36% in the four study areas whose duration is form 6 – 10 years. Their movement to the area could be attributed to accessibility to farmland. Both Hayin Na Iya/ Malalin Gabas formed 20% for the respondents who spends 11 – 15 years. For the respondents whose duration is between 16 – 20 years constituted 16% Dawn Quarters in the four study areas. Those who spent 21 – 25 eras and 26 – 30 years

formed 8% in Dawn Quarters is not far way from some textile industries, therefore, the duration of the respondents in this area could attributed to job opportunities in the industries. However, those respondents whose duration is above 30 years constituted 52% in Dawn Quarters. In the four study areas the highest number of respondents are those that spent over 40 years. This could be attributed to location of other industries apart from textile industries.

Sources of water

Water is very essential in our daily life.

People always like to stay where there is availability of water. Interviews with the respondents revealed various means of getting water from the peri-urban communities in the four study areas. For instance, one of the respondents stated that “when we first settled here there was difficulty in getting water, we had to dig well but after sometimes we were provided with boreholes but still we are using our wells to support the boreholes”.

Table 2: Source of Water by the Respondent

Sources of water	NassarawaRigas a No. of respondent 25		HayinnalYa/Mal alinGabas No. of respondent 25		HayindanBushiy a No. of respondent 25		Dawn Quarters No. of respondent 25		Total 100
			%			%		%	100
River	2	8	2	8	0	0	0	0	4
Well	16	64	18	72	14	56	20	80	68
Borehole	6	24	4	16	9	36	3	12	22
Rain Harvesting	1	4	1	4	1	4	0	0	3
Pipe borne water	0	0	0	0	1	4	2	8	3
Total	25	100	25	100	25	100	25	100	100

Source: Author's Field work 2018

The interview with respondents indicated that most of their sources of water is from the well. About 80% of the respondents their water from the well. Another major source of water is the borehole. The usage of water from the well by the respondents is attributed to the inadequacy of social amenities. Therefore the respondents paid much attention to source their water from the well. However, respondents who depends on the water from the river or rain encounter shortage of water especially during the dry season, and for those who source their water from the pipe-borne water in most cases the water is not reliable. Therefore the common source of water by the respondents is water

from the well. Sources of water from pipe borne water and rain constitute only (36%) of the respondents. Water from the rain have the least respondent with three respondent (4%). However, Thokozani *et al* (2018) conducted a similar study in Peri-urban areas of Malawi, Tanzania where they discovered that the major sources of water include tap water, boreholes and water from the well. The findings of this study revealed that well water is the major source of water followed by borehole and river in the study area. This shows that there is little variation in the sources of water between the finding of Thokozani in Tanzania and the present study.

Table 3: Test of hypothesis using walli's test for the sources of water of the respondents in the peri-urban communities.

Sources of water	NasarawaRigasa No of respondent 25		Hayin Na IyaMalalinGabas No of Respondents 25		Hayin Dan Bushiya No. of Respondent 25		Dawn Quarters No of Respondents 25	
	R1		R2		R3		R4	
River	2	10	2	10	0	1	0	1
WELL	16	18	18	19	14	17	20	20
BOREHOLE	6	15	4	14	9	16	3	13
RAIN	1	6	1	6	2	6	0	1
Pipeborne water	0	1	0	1	1	6	2	10
	R1=50		R2=50		R3=46		R4=45	

HO: there is no significant difference in the sources of water by the respondents in the four communities of the peri-urban areas. The level of significance used is 0.05. The degree of freedom is $K = 4 - 1 = 3$

$$H = \frac{12}{N(N+3)} \sum \frac{R^2}{n} - 3(N+1) \dots\dots\dots(2)$$

$$H = \frac{12}{20(20-1)} \times \left(\frac{50^2}{5} + \frac{50^2}{5} + \frac{46^2}{5} + \frac{45^2}{5} \right) - 3(20+1)$$

$$= \frac{12}{140} \times (500 + 500 + 423.2 + 405) - 63$$

$$= (0.03 \times 1,828.2 - 63)$$

$$= (54.846 - 63 = -8.154)$$

The critical value is 5.780, therefore, the hypothesis is accepted, that is, there is no significant difference in the sources of water in the four peri-urban communities, because the value calculated is less than the critical value, this means -8.154 is less than 5.780.

CONCLUSION AND RECOMMENDATIONS

As agricultural and forest land uses in our peri-urban areas are gradually missing their prominence with time, and the demand for other land uses are rising substantially, households move from subsistence agriculture to other means of livelihood. From the foregoing findings, the study has shown that the peri-urban communities resort to different livelihood activities such as tailoring, driving, mechanic work, kekenapep riding, land speculation, building, civil service, trading,

vulcanization among others. However the discussions with the peri-urban communities as stated by the respondents revealed that these livelihood strategies are the ways used in enhancing their well being. The study discovered that the residents of the peri-urban area engaged in different economic activities namely farming, trading, tailoring, mechanic work, land speculation, vulacanization among others. It was also found that most of the peri-urban communities have stayed for over 30 years followed by 24 years. Additionally their major sources of water is from the well.

The utilization and management of water is an essential aspect of man's daily life. Peri-urban communities also need water just like their counter part in the urban cities. As such, the maintenance of several access points to water sources is a practice through which the peri – urban communities generate water security (Megan and Morin Ville, 2014)

Drawing from the findings of the study the following recommendations are suggested;

- I. State government and local government should provide an avenue for boosting micro – economic activities in our peri – urban areas through the provision of soft loan to the poor masses especially residents of peri-urban areas to support their micro economic activities.
- ii. Where Peri – urban settlements stay for along time, social and infrastructural

facilities should be provided to them. This infrastructural facilities will encourage the peri-urban communities in engaging in different economic activities.

- iii. Most of our Peri – urban communities suffer from inadequate and quality water supply, hence adequate sources and good quality water supply should be provided to such areas. Therefore ministry of water resources can play a vital role in developing peri-urban communities through the provision of adequate sources of water.

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A SYSTEMATIC REVIEW OF SPATIAL CONFIGURATION AND COMMUNICATION RELATED STUDIES IN HOSPITAL SETTINGS

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ABSTRACT

Hospitals are designed to provide efficient healthcare delivery. This has facilitated a lot of research on the spatial configuration of hospitals and the subsequent effect on the delivery of healthcare. Also, research has shown the relationship between the spatial configuration of hospitals and some physical and social outcomes in the hospital environment which contribute in one way or the other to healthcare delivery. Recently, research has pointed out that most errors in healthcare delivery in Nigeria have been attributed to errors in communication. Thus, this study sought to conduct a systematic review of relevant literature on spatial configuration and communication-related concepts in Hospital settings. The systematic review was guided by the following protocols namely: the theoretical framework (approach and focus), the methodology and the findings. Results, divided into two major categories research in spatial configuration and communication. This included a focus on the relationship between space and communication-related concepts and the influence of space on communication-related concepts. Also, this paper found that communication as a concept in Hospital settings can be interpreted into three subcategories namely social (Culture and social interactions), psychological (User Groups) and Technical (work processes and Healthcare outcomes). This paper concluded that most of the studies reviewed had focus on the technical aspects of communication and or its relationship and influence on the spatial configuration of Hospitals with a more comparative approach to gathering, analysing and interpreting data. This paper recommends that the focus of spatial configuration and communication-related studies should shift to the social and psychological categories in the Hospital environment to build and develop more robust and evidence-based theory.

Keywords: Spatial configuration, Communication, Space syntax, social network.

INTRODUCTION

Research on the design of Hospitals has generated a lot of interest in the last two decades. This is partly because of the focus studies have placed on the spatial configuration of hospitals and their relationship to healthcare delivery. Many studies on the spatial configuration of hospitals have focused on the effect of spatial configuration on health care delivery (Pachilova & Sailer, 2020; Ogunola, 2015). A lot of work has highlighted the relationship of spatial configuration to many outcomes that contribute to efficient healthcare delivery (Fay *et al.*, 2019). For example, research has been carried out on how the spatial configuration in hospitals are related

to patient falls, medication errors, patient confidentiality and privacy, stress, depression, organisation commitment, organisation performance, job satisfaction and social interaction (Cai and Zimring, 2017). Also, the social interaction within and among professionals in the healthcare institution especially with regards to the efficient delivery of healthcare has come under intense investigation. Both fields in design and medicine have highlighted the contribution of efficient social interaction or otherwise known as communications in delivering healthcare. In the last decade, researchers have pointed out the immense influence of the hospitals' spatial configuration on communications within the hospitals. (Scott, 2017).

In the hospital environment, communication is multi-faceted. One good explanation for that is the different players in the Hospital institution all saddled with the responsibility of delivering efficient healthcare. For example, the hospital houses several professionals like doctors, nurses, pharmacists, technical staff and specialists who have to work harmoniously to deliver healthcare within the same spatial configuration (Spatial layout). This presents a communication complex and many questions have been tailored towards how the spatial configuration has contributed to enhancing or easing this communication complex.

The design of hospital spaces promotes easy accessibility, easy movement and easy communication between health workers and between health workers and patients. From an architecture point of view, the design of a hospital can either enhance or limit the level of communication between health workers and between health workers and patients. When communication is impeded or distorted as a result of the design it could lead to poor healthcare service delivery which translates to increased mortality (Tahir, Haming and Bijaang, 2018; Ogunola, 2015). Barasa, Molyneux, English, and Cleary (2017) noted that communication in a hospital environment is complex because of the different categories of professionals which create communication problems (Sari 2017; Scott, 2017).

Recently a survey in the Ahmadu Bello University teaching hospital showed that 36% of the errors committed in the delivery of Healthcare were traced to poor communication (Jamoh, Abubakar, & Isa, 2018). Besides, a follow-up survey of the Ahmadu Bello University teaching hospital design revealed that it has contributed negatively to the daily communication patterns among medical personnel and between medical personnel and patients. This has resulted in poor service delivery which accounts for over 20% of the mortality rate recorded in the hospital in the last year

(Okonofua, Ntoimo, Ogu, Galadanci, Abdus-Salam, Gana, & Randawa, 2018).

With this background, this paper sought to review, systematically, the spatial configuration and communication-related studies in hospital settings and assess what extant research has conducted and documented about the relationship between spatial configuration and communication in Hospitals. The following section proceeds to conceptualize the major concepts in this paper namely, spatial configuration and communication in the Hospital environment.

CONCEPTUALIZATION

There is a strong link between spatial configuration and communication patterns in spaces and this is linked to how these concepts are interpreted. Like many other institutional buildings, the hospital has its unique building typology that has been developed over many centuries as a result of many factors (Wagenaar and Mens, 2019). Some of these factors include technological development, an increase in demand, scientific innovation to mention a few. This has led to the development of its (hospital) spatial configuration to cater for the dynamic changes throughout these years. These developments in the hospital's spatial configuration have occurred to enhance the operations of hospitals and provide better environments for the delivery of efficient healthcare. Thus, as a result of various research, the spatial configuration in Hospitals provides a range of benefits that are captured in Suvanajata's (2001) positions. Spatial configurations cover four basic dimensions namely, its function, structure, aesthetic and experience. Using a hospital setting as an example, the spatial configuration of space in a hospital has a function, like Treatment and Diagnostics areas, these spaces have a particular structure that guides the sequence healthcare is delivered and this is with unique aesthetics specific to the hospital environment. More importantly, there is an experience that is offered as a result of the function, its

structure, and the Aesthetics of the configured space. Put differently, there is a unique experience offered by a configured space due to its unique function, structure and aesthetics.

On the other hand, the concept of communication in hospitals is often interpreted from its organizational structure. The organizational structure elucidates the way and manner players in an organization should communicate. However, according to Poole, 2014, this does not adequately cater to the way, manner and most importantly, the patterns of communication. Other researchers have preferred to interpret an organization's communication as a subset of the organizational culture (Schiavo, 2013). In other words, the communication among the different players in the hospital environment can be interpreted as social interaction and can be observed by the attitudes, behaviour and values in the hospital environment. This, is a more accurate interpretation of interpersonal communication in the hospital environment as it caters to the dynamic changes over time when people communicate.

METHODOLOGY

With the interpretation of the concepts in the preceding section, the paper used online databases to search for relevant studies in spatial configuration and communication with a focus on hospital settings. The selection of the databases was based on proven records of research in these areas which were based on Architecture and the social sciences. Three databases were used namely, Google Scholar, Medline and SAGE journals. Keywords words used in the search included spatial configuration, communication, behaviour, and healthcare settings.

A preliminary review of the search results highlighted 102related articles which

focused on socially related concepts in healthcare settings. A thorough review of the Abstract highlighted 25 studies that have targeted the investigation of spatial configuration and communication-related concepts in healthcare environments.

RESULT AND DISCUSSION

Table 1 Summary of Review of Spatial configuration and communication-related Studies. outlines research that has focused on spatial configuration and 1 communication-related studies especially in healthcare delivery buildings. To analyse the written data in the reviewed literature a summative content analysis was used. This was important to be able to trace the similarities and differences in the studies under review. To do this, this study examined language intensely to classify texts in categories and most importantly interpret the context of text data through systematic classification.

The criteria used to examine the content were based on;

- i. The Theoretical framework
- ii. The methodology of the Study and
- iii. The major findings

The first criteria, which was a review of the theoretical framework was to highlight the background and interpretation of the major concepts used in the study. In this case, the focus was on how each research interpreted and related the concepts of spatial configuration and communication. Secondly, this study looked critically at the methodology adopted in each of the research reviewed. This was done to build data on the methods, instruments and variables used in spatial configuration and communication-related studies. Finally, the major findings were reviewed critically to assess the focus of these studies in healthcare delivery and possibly highlight the recommendations and proposals for further study.

Table 1: Summary of Review of Spatial configuration and communication -related Studies.

Name	Methodology/Techniques	Findings	Approach/Focus
1 Pachilova&Sailer (2020)	i. Explorative and comparative study of 6 nursing unit wards ii. In-depth study of movement and communication of Healthcare workers iii. 31 selected based on the quality of care iv. Test of these spaces was based on a spatial communication index v. Statistical analysis	i. large viewsheds in visibility and awareness produced more communication ii. the higher Spatial communication index the better the quality of care	Relationship between hospital design and the quality of care and communication among healthcare professionals The influence of nursing unit design on the quality of care
2 Cai H, Zimring C.,(2017).	i. Comparative study of Chinese and US nursing unit typologies ii. Comparative analysis of unit designs iii. Unempirical Interpretation of National cultures and relationships with unit designs	i. Impact of national culture on the nursing unit design ii. Developed a methodology combining abstract culture, organisational construct and complex spatial relationships into spatial metrics	i. Relationship between culture and nursing unit design ii. Spatial configuration a product of culture iii. How nursing unit design reflect the different work styles and organisational communication which is driven by culture
3 Real, K., Bardach, S. H., &Bardach, D. R. (2017)	i. Comparative study between centralized and decentralized nursing unit design ii. Focus group discussions iii. Systematic qualitative analysis iv. Quantitative modelling v. Space syntax	i. Highlighted care processes in the frequency of walks and the 2 designs ii. Nursing unit design shapes the communication, processes and outcomes in the nursing wards.	i. The relationship between the spatial layout of hospitals and communication in this case; patient care processes and patient outcomes/quality of care.
4 Gharaveis, A., Hamilton, D. K., &Pati, D. (2018)	i. A systematic review of the literature with a focus on the impact of hospital design on teamwork and communication (19 studies)	i. Spatial layout is a critical factor that promotes the efficiency of teamwork and collaborative communication ii. Layout design, visibility and accessibility are the most cited aspect of design which affect Teamwork and Communication in healthcare facilities.	i. An investigative impact of the hospital design layout on teamwork and communication

Name	Methodology/Techniques	Findings	Approach/Focus
5 Pachilova et al. (2017)	i. An empirical study of 4 hospital wards in 2 UK hospitals. ii. Comparative study iii. Space syntax analysis iv. Social comparative network analysis	1. The distance in the spatial layout influence the frequency and duration of conversation in the wards	i. Relationships between spatial layout and social behaviour especially on patient ward and work processes)
6 Rippin, A. S., Zimring, C., Samuels, O., & Denham, M. E. (2015)	i. Comparative study of Neuro-Critical Ward design ii. Structured observation	i. The unit layout did not contribute to easy interactions in the spatial layout ii. Spatial layout recorded influences in communication patterns	i. Impact of design on caregiver interactions ii. Relationship between spatial design and care (focus on bedside nursing categories)
7 Rashid, M. (2015).	i. Integrative Review of studies form ii. Review based on a framework consisting of a Technical, Psychological and social orientations.	i. 21 Technical oriented Studies ii. 16 psychological oriented Studies iii. 3 Social oriented Studies iv. 13 Technical, Psychological and Social oriented studies.	i. Review of Nursing unit layouts ii. A look at Technical, Psychological and social issues ranging from Behaviour and Perception, Health Outcomes and social and psychological factors. Communication key to quality care How nursing unit layout affect communication patterns and medical and organisational outcomes The focus was on the relationship between spatial layout on communication patterns, nurse satisfaction, distance walked, organisation outcomes, patient safety and satisfaction. Evidence-Based Design research in hospital Focus on how hospital layout can affect communication between categories of people especially in the Outpatient clinics
8 Hua, Becker, Wurmser, Bliss, Haltz and Hedges (2015).	i. A comparative study using Pre/post research design where comparison was between centralised and decentralised units.	i. Patient satisfaction increased substantially ii. Few significant changes in communication patterns iii. No significant changes in nurse satisfaction, patient falls and organisation outcomes	i. quality care ii. How nursing unit layout affect communication patterns and medical and organisational outcomes iii. The focus was on the relationship between spatial layout on communication patterns, nurse satisfaction, distance walked, organisation outcomes, patient safety and satisfaction. Evidence-Based Design research in hospital Focus on how hospital layout can affect communication between categories of people especially in the Outpatient clinics
9 Pachilova&Sailer (2014)	Comparative study of 2 distinctly organised Hospitals, Using Space Syntax methodology for spatial analysis Staff survey highlighting communication networks	Hospital organisation with shared facilities increases the frequency of communication Besides space, the workflow and culture affect interaction patterns between users Spatial separation of user areas	Evidence-Based Design research in hospital Focus on how hospital layout can affect communication between categories of people especially in the Outpatient clinics

Name	Methodology/Techniques	Findings	Approach/Focus
10 Liu, Mainas and Gertz (2014)	An Explorative study using space syntax methods to analyse spatial layout and observation using movement and behavioural patterns	Highlighted impact on spatial interruption on communication processes Communication difficulty was associated with spatial layout assessed	Hospital design plays a critical role in Health communication processes The research focused on the relationship between hospital design and communication process in acute care hospital settings (Treatment and Diagnostics)
11 Bayramzadeh, S., & Alkazemi, M. F. (2014).	Explorative Study Comparative cross-sectional study, assessing a total of 70 registered nurses in 2 weeks.	No significant difference between centralised and Decentralised nursing unit layout in relation to the frequency of communication and technology used A significant difference in perception the 2 spatial layouts considered	Relationship between nursing unit design and use of communication technologies/methods How the design of nursing unit can impact on the use of communication technology and methods Strength and weakness in nursing unit design with regard to communication technology
12 Pachilova, R., & Sailer, K. (2013)	A comparative study analysing 2 hospitals (with 5 clinics each) which differ in the spatial layout Space syntax analysis of spatial layout. Staff survey and direct observation, communication networks and activities of caregivers	Strong differences between the 2 spatial settings.	Evidence-based design for credible design decisions. Communication important for good health provision The relationship between the spatial layout and the way people interact in Wards.
13 Cai, H., & Zimring, C. (2012)	Comparative study of Neurology intensive care unit A multi-layered approach with spatial analysis, behavioural mapping and co-awareness network analysis	The difference in spatial differentiation between the 2 wings A strong correlation between the spatial metrics and the observed behaviours and co-awareness	Based on the hypothesis that Nursing unit layouts impact the way which nurses interact and maintain co-awareness

Name	Methodology/Techniques	Findings	Approach/Focus
14 Sailer& Penn, 2009	A comparative study, questionnaires, social network analysis	Some influence of spatial layout on organisational behaviour was found to be generic Spatial layout influences organisational behaviour is subject to the context, culture and character. Aspects of social networks and spatial layout combine to provide a good indicator for successful collaboration Spatial layouts with higher integration promoted communication Spatial layout plays a strong supportive role in the formation and maintenance of social relations Spatial layout shapes organisation culture and achievement	The relationship between spatial layout, social interaction and social structure in an organisation
15 Wineman et al., 2009	Explorative study investigating the social dimensions of innovation and its spatial metrics.	Movement in workplaces may be reflected best by a metric distance, Distance is a key indicator of movement patterns in workplaces Spatial configurations are best used to explain movement flows	Relationship between Spatial layout, social networks and innovation.
16 Sailer, 2007	An exploratory study, observations (movement patterns), axial and segment analysis of strong and weak programme aspects of office movement patterns	Spatial layout influences the formation of social structure and organisational behaviour Spatial layout have consistent effects on movement but inconsistent on visible copresence	The spatial layout can explain movement flows with the focus of complex buildings
17 Sailer et al., 2007	An exploratory study with an interpretative and phenomenological approach using correlation and syntax analysis		How spatial layout influence social interaction and organisation behaviour.
18 Sailer& Penn, 2007	Explorative study with Statistical analyses with observation behavioural data		The effect of spatial layout on face interaction through movement and visible co-

Name	Methodology/Techniques	Findings	Approach/Focus
20 Rashid & Zimring, 2003	A comparative study of 5 office layout	Highlighted generic spatial properties of these constructs using space syntax analysis.	Relationship between spatial layout and organisational constructs like, communication control, territoriality, privacy and status
21 Penn et al., 1999	A comparative assessment of 2 research-led design projects with space syntax techniques survey.	A spatial layout which dictates movement and patterns of space use has a direct impact on the frequency of contact between workers in the office-based organisation Patterns of communication were a direct result of spatial configuration Spatial integration and differentiation of important spatial metrics to support flexible working and a range of different work activity.	How spatial layout can generate new organisation structure and facilitate individual communication Relationship between spatial layout and pattern of communication
22 Serrato & Wineman, 1999	Exploratory study which investigates the relationship between layout and communication patterns Using 2 case studies	The frequencies and location of communication were related to the spatial layout Spatial layout enhanced local networks	Relationship between spatial layout and communication patterns in research facilities
23 Peatross, 1997		Spatial layout influences the spatial patterns of movement and by extension interaction.	Exploring the relationship between spatial layout and control in a restrictive environment Spatial properties of building the effect patterns of space use.
24 Wineman & Serrato, 1997	A comparative study with observations (face to face interaction) spatial analyses.	Integrated spatial layout correlated the significantly higher number of face to face communication	Examining interrelationship between spatial layout with face to face communication outcomes

As highlighted previously, this paper focused on spatial configuration and communication-related research. A summary of the systematic review is seen in Table 2. This study critically reviewed past research based on the focus of these studies, the methodological approach and techniques used and the variables and findings of these studies. Thus, this study discusses the findings from the systematic review as follows.

Focus of the Study.

Considering the focus, this study found that all the researches reviewed were based on the relationship and influence of space on many socially related concepts, in this case, communication-related. Table 2 summarises the many communication-related concepts that were associated with the spatial configuration in hospitals. A look at these concepts gave a range of interpretations to the multifaceted concept of communication, especially in Hospitals.

Table 2: Main Communication-Related concepts in Hospital Settings

Space		Communication-related Concepts
Spatial Configuration Spatial layout Nursing Unit Design, Ward design	Relationship	Caregiver Interactions, Communication (Outpatient Clinics) of different categories of People Communication (Teamwork), Communication patterns, Communication Processes (in Treatment and Diagnostics Areas) Culture, Different Work Styles, Face to Face Interaction Interaction and Coawareness Interaction in Wards
	Influence on	Medical and Organisational Outcomes Movement Flows Nurse Satisfaction Observed behaviours and Environmental Perception Organisation communication, Communication (Patient Care processes, Organisational Behaviours Organisational Constructs (Communication, Control, Privacy, Status, Territoriality) Patient Outcome/Quality of Care) Patient Safety and Satisfaction Productivity (Healthcare Outcome) Quality of Care, Social Interaction and Social Structure Social behaviour (Work processes), Social Network and Innovation Technical, Psychological and Social orientation

Source: Author, 2020.

It is important to note the various interpretations of space itemised in the studies under review. Space was interpreted as the designed layout of the hospital. Thus, in the reviewed literature space was defined as spatial layout, spatial configuration and in specific cases, nursing unit design and other specialised spaces in the hospital setting as the case implied. Also, the research reviewed in this paper focused on two major concepts and the focus was on the relationship or influence as the case was presented. In other words, the studies reviewed focused on the relationship between spatial configuration and communication, the influence of spatial

configuration on communication and the influence of communication on the spatial layout in the Hospital settings. More importantly, each study reviewed conceptualised communication in a unique way that set the pace for this systematic review. From Table 2, the concept of communication can be divided into 3 categories namely Communication defined by Culture and social interactions (Social), communication defined by category of users (Psychological) and Communication-related to work processes and healthcare outcomes (Technical). Contents of these communication definitions are seen in Table 3.

Table 3: Conceptualising Communication in Spatial and communication - Related Studies

Communication categories		
1	Communication: Culture and Social Interaction	Interactions, Patterns, Face -to-face Interaction, Coawareness, Movement Flows, Behaviour, social structure
2	Communication: User Groups	Nurse Satisfaction, Perception, patient Outcome, Safety and Satisfaction
3	Communication: Work processes and Healthcare Outcomes	Teamwork, work processes, Different Work Styles, Medical organisational Outcomes, organisational communication, Organisational Constructs; Control, Privacy, Status, Territoriality

Source: Author, 2020.

From Table 3 it is clear that the concept of communication with spatial configuration studies covers a wide range of concepts as seen above. However, most of the studies reviewed in this paper mostly fell in the Technical category. This category accounted for 60% (about 19 of the studies reviewed). The Social and Psychological category accounted for 30% and 10% of the studies reviewed respectively. It should be noted that the studies reviewed was a cross-section of spatial configuration and communication-related studies from over four decades. It is safe to conclude that a majority of the studies in spatial configuration and communication especially in Hospital settings were focused on the technical aspects of communication as related to the Social and psychological interpretations of communication as opined by Rashid (2015).

A closer look at the technically oriented category of communication, this research found out that communication was conceptualised as focusing on areas that had to do with work processes and health care outcomes. In this category, communication was seen to influence the work processes that contribute to healthcare delivery or outcomes (Pachilova & Sailaer, 2020, Cai & Zimring, 2017, Real et al., 2017, Gharaveis & Hamilton, 2018, Pachilova et al., 2017, Hua *et al.*, 2015, Liu et al., 2014, Bayramzadeh, 2014, Peponis et al, 2007, Hanson & Zako, 2005, Rashid and Zimring, 2003). Terms like teamwork, work styles, organisational communication and constructs like control, privacy, status, and territoriality were all concepts that were focused on in this category. In other words, the concepts of communication as seen in the Technical category of this review

focused on healthcare outcomes. Put differently, the relationships investigated in these studies pointed to how communication contributed to efficient healthcare delivery in Hospital Settings. Thus, the concept of communication was used as a variable to understand work processes, teamwork, Control and many other constructs in research. Also, the concept of communication was seen to be an integral part of healthcare delivery.

When considering the social and psychological category of research under review, communication as a concept is seen as a construct on its own. For the Social category of research, communication was interpreted by the organisational culture and the interactions within the spaces. The focus of this category was on the social interactions in the spaces in the hospital environment. Keywords in this category were social interactions, patterns, culture, face to face interactions coawareness, movement flows, behaviours and social structure. In line with these, this study found that this category focused on the behaviour and movement patterns of the users of the spaces being studied. Here, the research pointed to the relationship between the spatial layout and the behaviour and movement patterns of the users of the spaces being investigated. For the Psychological category, the studies focused on specific User-groups and how the spatial configuration in hospital affect these groups, their movement, behaviour, job satisfaction, commitment, and their perception.

In summary, the approach and focus of spatial configuration and communication-related studies provided clear distinctions concerning the interpretation of the concept of communication and providing an insight into the various aspects in the hospital settings that communication can be related to. In short, communication can be socially interpreted focusing on the social interactions and patterns within the spatial layout. It can also be psychologically interpreted with a focus on the User groups in the Hospital especially the relationships between the spatial layout and the perceptions of these groups.

Review of Methodologies

As part of this review, this paper also studied the methodology and techniques used to investigate the relationships and influence between spatial layout and communication in the hospital setting. Three distinct methodologies were identified in the review. First, a majority of the research reviewed were comparative studies while a few others were Explorative and Interpretative in their methodological approach. The comparative studies focused on comparing distinct spatial layouts based on established typologies. For example, Pachilova and Sailer's study in 2013, compared the spatial layout of five clinics each in two hospitals other studies focused on comparing the spatial layout across varying cultures as exemplified in Cai and Zimring's (2017) study.

For the exploratory studies, most of the research reviewed focused on case studies which provided a platform for in-depth investigation of the relationships between the spatial layout in hospitals and specific ways the spatial configuration influenced communication. Methods employed in these studies were tailored towards the spatial layout and communication. The space syntax theory and methodology was used for assessing the spatial layout in all the studies reviewed. First, the theory of Space Syntax provides an interpretation of spatial layout that highlights its social milieu (Hillier and Hanson, 1984). This interpretation provided these studies with the opportunity of highlighting specific properties in the spatial layout that were socially related. Second, the space syntax methodology helped to quantify the spatial properties of the layout related to socially related concepts, in this case, Communication.

This study recorded quite a number of methods to assess communication in the Hospital settings investigated. This paper identified some methods that were used to gather data on communication (Technical, Psychological and Social). For the communication defined by social interaction and culture methods included, non-participant observation of social and communication network within the spaces being investigated, direct observation of

activities in the spaces, and questionnaire survey. The Communication interpreted as Psychological had its data mostly gathered by surveys (Questionnaires) and focused group discussions because of the focus on the perception of unique categories of people. The data gathered for the technically defined communication category were done using both observations (social and communication networks) and survey techniques to accurately assess work processes and organisational outcomes in hospital settings.

Most of the studies (90%) reviewed, used statistical analysis to conclude on the relationship between the spatial layout and communication in Hospitals. A good number using correlation to investigate whether a relationship exists between space and communication while a few used regression models to predict significant influences of variables between space and communication in Hospital environments. It should be noted that the Space Syntax methodology provides a platform for these studies to harmonise the data collected by quantifying space. Other studies in this review used interpretative phenomenology to link the concepts of spatial layout and communication. (Peatross and Peponis, 1995, Allen, 1977)

CONCLUSION This study set out to review systematically studies that focused on spatial configuration and communication-related studies for the past four decades. Using content analysis, this study first highlighted relevant studies in this category from key online databases as stated above. Using the approach/focus of research, methodology and findings of the studies, this study proceeded to perform a systematic analysis using the above as content criteria for the assessment. Following the findings, the conclusion of this study are as follows;

i. Studies that have focused on spatial configuration and communication in hospitals can interpret Communication into three categories namely; communication as social interaction and culture, communication as it refers to a specific user

group (Psychological), and communication referring to work processes and organisational outcomes (Technical category)

ii. Studies that focused on communication as social interaction and culture are better positioned to develop a theory on behaviour, movement and space usage patterns in the Hospital environment.

iii. Studies that pointed to communication as it refers to specific user groups target the relationship of spatial configuration and perception of these user groups which border on a range of psychological concepts.

iv. Studies that focused on the organisational Outcomes address the processes that lead to the efficient delivery of healthcare.

v. Most of the methodologies in the review are Comparative studies that research on existing typologies with a limitation to building theory in spatial layout and communication-related studies.

vi. Exploratory and Phenomenological Studies provide a solid platform for developing theory in spatial configuration and communication-related studies

vii. Statistical analysis remains a highly patronized method for harmonizing data and investigating the relationship between spatial configuration and communication-related studies

viii. Considering the many theoretical assumptions in spatial configuration and communication-related studies and the bias in comparative studies in healthcare environments, there is a need to focus on in-depth study to better understand the relationship between the two (2) concepts (spatial configuration and communication-related studies)

The study recommends that further studies in this area should be focused on the in-depth study (case studies) to better understand and shed light on new relationships between the concepts under review.

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ASSESSING THE INFLUENCE OF LEADERSHIP STYLES ON EMPLOYEE PERFORMANCE IN NIGERIAN CONSTRUCTION FIRMS

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ABSTRACT

Leadership plays a vital role in the success or failure of any organization. Lack of effective leadership style leads to poor innovation, low productivity and inability to meet performance targets. Effective leadership enhance employee performance. This study assessed the impact of leadership style on employee performance in Nigerian construction firms. This was achieved by establishing the relationship between leadership styles and employee performance. Five leadership styles and six employee performance measures were adopted for the study. A structured questionnaire was administered to employees of construction firms to identify the leadership style adopted in Nigerian Construction firms and to establish the level of adherence to performance standards. The questionnaire was administered to 328 construction firms in Nigeria, 179 (54.7%) were completed and analyzed. SPSS 22 was adopted for the descriptive statistics while Smartpls3 was used for the inferential Statistics. The result of the descriptive statistics shows that, team leadership style ranked the highest with a grand mean of 4.28. Commitment of employee ranked the highest performance measure with a grand mean of 4.30. The result of the inferential statistics shows that team leadership has the highest number of significant relationships with employee performance thus making it the preferred leadership style for employee performance improvement in Nigerian Construction firms. The study recommended the training and adoption of team leadership style for employee performance improvement.

Keywords: Construction Firms, Leadership, Leadership Styles, Employee and Performance

INTRODUCTION

Leadership is an influential activity that determines the success or failure of firms' endeavors (Javaid, 2012). The effect of leadership cuts across all kinds of social situations especially where the situations demands that people work to achieve common goals. Globally, society generally depends on effective leadership, this cut across several spheres of life such as National development, organizations developments community survival, work function and effective performance (Bushra *et al.*, 2011; Thamrin, 2012). Organizations are established primarily to solve social needs of societies. Currently, the global economy is constantly driven by innovation, performance and productivity. Globalization is making organizations change their structure to compete in the bigger global

arena. Institutions either public or private require leaders to drive the objectives for which they were established. A competent leader can achieve organizational goals by overcoming impediments and solving existing problems (Rasool *et al.*, 2015; Otieno *et al.*, 2015). Leadership in organizations is a managerial activity whose purpose is to direct employees in a chain of command towards the achievement of organizational goals (Murray, 2013). It is believed that an effective organization is rooted on the propellers or on the business leaders. Leadership epitomizes a combination of behaviors exhibited by a person who occupies an elected, appointed or designated position of influence in a social system (Jeung, 2012). Leadership can be formally or informally sanctioned. It has been described as a persuasive process where leaders act as an example to motivate

and induce employees to pursue the organizational goals. Leaders are integral parts of systems (Lub et al, 2012).

Employee performance involves the execution of defined duties, ability to meet deadlines, competency and work efficiency that can be driven by suitable leadership style (Nkoidila, 2015). Performance of employees depends to a large extent on the leadership style operational in the setting of their organization (Kendra, 2013). Leaders are accountable for the performance of their organizations or the success of their government, these largely depends on the productivity of their employees (Quick & Nelson, 2013). Performance of employees is dependent on effective leadership that can lead employees towards changes and performance improvement. Organizations are in need of strong leadership style that can stimulate the performance of employees (Nkoidila, 2015). Employees perceive the need for effective leaders that gears firms towards changes and performance improvement (Murray, 2013). Lack of effective leadership style usually leads to poor innovation, low productivity and inability to meet performance targets. The need to identify the leadership styles that will suite the performance of employees has been severally highlighted in literatures as observed by Rasool *et al*, (2015) and Tsigu & Rao, (2015). Previous studies have generically examined the relationship between leadership style and performance. Umer et al, (2017) and Adejumo & Ogundipe, (2018) highlighted the need to examine the relationship between individual leadership style and performance measures in construction firms this study intends to fill the gap. This will be achieved by establishing the relationship between leadership styles and employee performance in Nigerian construction firms.

LITERATURE REVIEW

Leadership

Leadership can be viewed as an influential process which distinguish a leader and also gear a group of people to move towards achieving a common or shared goal (Robbin,

2014). A leader is an individual, while leadership is the function that the individual performs. Besides, an individual within organizations who have been ascribed authority are often referred to as a leader, irrespective of their performance while executing their jobs (Shirazad et al, 2011). The term leadership therefore can be defined as the exercise of influence in a social situation in which the followers' (influences) attribute leadership qualities to the leader (influencer) (Melvyn et al, 2011). Leaders are made based on the fact that other people view them as such. It must be noted that not all leaders are effective managers and not all managers are effective leaders (Muhammad & Usman, 2012). In other words, leadership has been described as a process of persuasion where the leader (or team of leaders) act as an example for a group in order to motivate and induce the group to pursue the objectives of the leader and the organization (Menz, 2012; Bushara et al, 2011). In this regard, it is important to outline the culture of their working environment. They are integral parts of the system in which they arise yet dependent upon two-way communication with constituent and the forces that create the circumstances in which they emerge (Tims *et al*, 2011).

Leadership styles

This refers to the manner in which a person uses power to lead others. Several leadership styles have been identified in literature and they include Autocratic, Democratic, Strategic, Transformational, Team, Cross-Cultural, Facilitative, Laissez-Faire, Transactional, Coaching, Charismatic and Visionary (Muhammad & Usman, 2012; Nkoidila, 2015; Otieno et al, 2015). Shafie *et al* (2013) Identified the leadership styles that exists in construction industry as Coaching Leadership, Visionary Leadership, Facilitative Leadership, Team Leadership and Laissez-Faire leadership. These will be adopted for this study.

Coaching Leadership: This style involves the teaching and supervision of followers. A coaching leader operates in settings where improvement is required for results to be achieved. This leadership style encourages

followers to improve their skills (Serfontein & Hough, 2011). They motivate, inspire and encourage their followers. Coaching leaders encourage followers to try something new on their own. They take personal interest in helping followers maximize their success. Coaching leaders derive fulfilment from the success of their team. Specifically, they motivate members to rise to challenge, uncover hidden talents of team members, build trust and engage team members and understand the true potentials of their team members (Thamrin, 2012).

Visionary Leadership: It is recognized that successful leaders have visionary aspects in them. Visionary leaders accept that the recognition of methods, steps and process of leadership are obtained with and through people. They strive to see their vision transformed to reality (Northhouse, 2014). Unlike ordinary leaders, visionary leaders have eyes focused on the big picture. Visionary leaders strive to build optimistic and inspirational vision and pass it on in an enticing manner to gain followers. Visionary leaders ignite passion in members, are aware of followers' emotions, arrive at creative solutions to problems, encourage followers to 'dream big', see setbacks as stopping points in realizing their visions and create trust among team members (Nusair *et al*, 2012)

Facilitative leadership: This style is dependent on measurements and outcomes and it requires skills to master (Serfontein & Hough, 2011). The effectiveness of the firm largely depends on the efficacy of its processes. The extent of directives issued by a facilitative leader depends on the functionality of the group (Joo, Yoon & Juma, 2014). A highly functional group will require less directive from leadership and vice versa. The leadership style involves the monitoring of group dynamics, offers suggestions and intervention to keep the organization on the right track. Specifically, facilitative leaders encourage critique and improvement, understand how group interaction impacts on productivity, seek appropriate involvement in decision making

and keep discussions focused, clear and productive (Obiwuru *et al*, 2011).

Team leadership: This involves the creation of a vivid picture for the future of the organization and what it stands for. A team leader inspires and provides a strong sense of purpose and direction. Firms become more effective when they have a common goal and possess ability to resolve conflicts that can disrupt the proper running of the firms (Kendra, 2013). Team leaders choose right employees, delegates effectively, gets employees excited about their goals and ensure employees are given audience when necessary and motivated. Team leaders expand the capabilities of employees, enable and empower groups to accomplish their work efficiently, encourage team members to eliminate low value work, anticipate and influence changes and also inspire towards higher level of performance (Ngethe *et al* , 2012).

Lessez-Feire leadership: This is hinged on the fact that effective leaders depend on the ability to allow a degree of freedom to employees. They trust employees to do the jobs themselves and concentrates on the rational aspects of his assignment (Machuki *et al*, 2012). The leaders observe how subordinates perform their duties on their own. This leadership style is characterized by indecision, uncertainty and indifference. Leaders seldom have a clear vision of organizational goal and have no policies. Leaders allow complete freedom to employees to work freely without interference though readily available when help is needed. Lessez-Feire leaders abdicate responsibilities, avoid decision making, mostly delegative, are hands off and comfortable with mistakes (Kamarudeen *et al*, 2011).

Employee performance

This refers to the job-related activities expected of a worker and how well employees execute their activities in accordance with the required standards of their organizations (Ngethe *et al*, 2012). It is normal for a worker's performance to be evaluated based on standards set by the

organization they represent. This is done basically to identify areas of improvement for employees. Employees performance can be evaluated based on competency, productivity, communication skills, commitment, cooperation and professionalism (Eze, 2010, Jeung, 2012; Lub et al, 2012; Nkoidila, 2015).

Competency: This refers to how well an employee carry out assigned duties, ability to complete assignments with minimal errors and work largely unsupervised. Areas of struggle are identified and solutions sought mostly via training (Shafie et al, 2013).

Productivity: one major function of an employee is productivity. Productivity measures how employees use time effectively, prioritize projects, multi task when necessary, strive to improve skills and ask for suggestions and produce reliable results (Thamrin, 2012).

Communication skills: effective communication is vital for success in any organization. It is necessary for employees to demonstrate the necessary verbal and written skills required for delegated assignments. Assistance should be offered and accepted when necessary, constructive criticism are welcomed, high listening skills are demonstrated, good communication skill is displayed (Eze, 2010).

Commitment: this portrays the actions and intents of employees. Commitment refers to the level of input by employees. This generally refers to the ability of employees to resume on time and put in a full day's work, adheres to specified dress code when available, accepts errors when they occur, take advantage of further trainings and educational opportunities and make suggestions for improvement (Ghafoor *et al*, 2011).

Cooperation: this refers to the ability of employees to work together with others as a team. Cooperation involves the ability to share and accept responsibilities, treat others with respect, work to resolve conflicts before it degenerates, prevent third party

interference in disputes and ability to work with others (Aboshaiqua et al, 2014).

Professionalism: This refers to the competence or skills expected of professional in the execution of their duties. It is required that employees avoid using company time and resources for personal use, strictly adhere to employee handbook on code of conduct, avoid forming opinion quickly based on single incident and formal evaluation should be adopted as an opportunity for professional growth (Cheung, 2013).

Leadership style and performance

Performance of an employee is dependent on the operative leader. A definite status is established based on the relationship that exist between a leader and the employee (Iheirohanma, Wokoma & Nwakorie, 2014). The central role of a leader and the credibility becomes more prominent in the existing relationship with employees (Achua & Lussier, 2013). Coaching and Visionary leaders augment the level of performance of the employee (Ejere & Abasilim, 2013). According to Rasool et al (2015) There is a direct relationship between the performance of employees and facilitative leaders. Comprehension and motivation by leaders increase the output of employees. Coaching Leaders perform certain functions for the smooth operation and improvements in their firms with the involvement of employees (Ali et al, 2011). Team leaders and visionary leaders influence the performance of employees. Leaders have control or command over their employees and must do all they can to ensure maximum support from employees (Hintea *et al*, 2011). Ultimately, decision making powers lies with leaders. Leaders guide employees on what to perform and how to perform, while the employees communicate to the leader their experience and their suggestion if any (Chaudhry & Husnain, 2012). Leaders can entice subordinates to perform and thereby achieve desired outcomes by promising rewards and benefits for the accomplishments of task and administering punishments when task are not well executed. Several relationships exist between leaders and employees and the

relationship ultimately determine the output by employees (Alan, 2013).

METHODOLOGY

The study considered theories and collect data hence the deductive approach was suitable. The data collection process points towards the deductive approach therefore the survey was appropriate for the research process. The survey design allows collection of quantitative data which can be analyzed using descriptive and inferential statistics. The survey method has been applied in research examining aspects of Leadership style (Menz, 2012), Employee performance (Nkoidila, 2015) and relationship between Leadership style and employee performance (Obiwere et al, 2011). In order to utilize the statistical power of the quantitative method the data was analyzed using statistical (quantitative) analysis procedure. This study seeks to establish relationship between different variables (Leadership style and Employee Performance) and this will be achieved by a quantitative approach that will enable the research to formulate the relationship and infer meaning, direction and establish relationship between KM and performance. This study focused on construction organizations registered with the Bureau of public procurement (BPP) of Nigeria.

A total number of 88,424 construction companies are registered with the BPP in Nigeria. Saunders A sample of 383 was drawn from the population at 95% level of confidence. A sample size of 383 is needed to arrive at a sample with a sampling error of at least 5%. This number (383) is further collaborated by the tables presented by (Saunders et al, 2009, Cohen et al, 2007) the choice of 383 is consistent with the two tables for a population size of less than 100,000 with 95% confidence level and 5% margin of error.

Thus, a total number of 358 questionnaires were administered and 179 (54.7%) were retrieved and analyzed. The survey instrument (questionnaire) was developed based on the identified concepts, the identified variables were used to construct appropriate measures.

Likert scale was used for each item measured 5 Points representing Strongly Agree and 1 point Strongly Disagree. The descriptive analysis of the data collected were analyzed using SPSS version 22 and the partial least square structural equation modelling (SmartPls 3) for the inferential statistics. SEM will establish the AVE (Average Variance Extracted), R², Q² results, Path Coefficient, T Statistics Results and the Significance of the of each path.

Table 1: Leadership Styles

CODE	LEADERSHIP STYLES	MEAN
Coaching Leadership		
L1A	Motivating members to 'rise to the challenge'	4.22
L1B	Uncovering the hidden talents of team members	4.37
L1C	Building trust and engaging team members	3.90
L1D	Understanding the true potential of team members	3.62
	GRAND MEAN	4.03
Visionary Leadership		
L2A	Igniting passion in members	3.88
L2B	Arriving at creative solutions to problems	4.17
L2C	Seeing setbacks as stopping points in realizing the visions of the organization	3.79
L2D	Encouraging followers to 'dream big'	4.10
	GRAND MEAN	3.99

CODE	LEADERSHIP STYLES	MEAN
Facilitative Leadership		
L3A	Encouraging self-critique and improvement	4.10
L3B	Understanding how group interactions impact on productivity	4.16
L3C	Seeking appropriate involvement in decision making	4.12
L3D	Keeping discussions focused, clear and productive	3.16
	GRAND MEAN	3.88
Team Leadership		
L4A	Expanding the team's capabilities	4.16
L4B	Enable and empower groups to accomplish their work efficiently	4.44
L4C	Encouraging team members to eliminate low-value work	4.32
L4D	Anticipating and influencing change	4.27
L4E	Inspiring towards higher level of performance	4.22
	GRAND MEAN	4.28
Leiszez-faire leadership		
L5A	abdicates responsibilities	3.72
L5B	avoids making decisions	3.91
L5C	a delegative leader	3.85
L5D	leaders are hands off	3.88
L5E	comfortable with mistakes	3.17
	GRAND MEAN	3.71

Source: Field Study (2019)

Table 1 shows the results of the descriptive statistics of leadership styles adopted in Nigerian Construction Industry. The findings show that Team leadership is the most adopted leadership style in Nigerian

construction Industry with a grand mean of 4.28, followed by Coaching Leadership with a grand mean of 4.03 while Lessez-Faire leadership style ranked the lowest with a grand mean of 3.71.

Table2: Employees Performance Measures

CODE	EMPLOYEES PERFORMANCE MEASURES	MEAN
Competency		
P1A	Ability to handle assigned workload	4.05
P1B	Completion of assignments with minimal errors	4.22
P1C	Ability to work unsupervised	4.23
P1D	Openness to more training	3.48
	GRAND MEAN	3.99
Productivity		
P2A	Effective use of time	2.81
P2B	Ability to prioritize project	2.65
P2C	Multi-tasking when necessary	4.30
P2D	Continuous strive to improve skills and ask for suggestions	4.20
P2E	Ability to produce reliable results	4.09
	GRAND MEAN	3.61
Communication skills		
P3A	Demonstration of verbal and written skills required for tasks	4.00
P3B	Ability to offer and ask for assistance when necessary	3.94
P3C	Ability to accept and provide constructive criticism	4.03
P3D	Demonstration of listening skills	4.37
P3E	Display of good communication skills	4.36

CODE	EMPLOYEES PERFORMANCE MEASUREs	MEAN
GRAND MEAN		4.14
Commitment		
P4A	Timely resumption and input of full day's work	4.31
P4B	Adherence to dress code when available	4.36
P4C	Accept error when they occur	4.53
P4D	Take advantage of further trainings and educational opportunities	4.54
P4E	Make suggestions for improvement	3.76
GRAND MEAN		4.30
Cooperation		
P5A	Ability to share and accept responsibilities	3.92
P5B	Treat others with respect	3.06
P5C	Work to resolve conflicts before it degenerates	2.86
P5D	Don't air grievances to outsiders	4.65
P5E	ability to work with others	4.14
GRAND MEAN		3.73
Professionalism		
P6A	Avoid using company time and resources for personal use	4.37
P6B	Strict adherence to employee handbook and code of conduct	4.29
P6C	Quick forming of option based on single incident is avoided	4.22
P6D	Formal evaluation should be adopted as opportunity for professional growth	3.15
GRAND MEAN		4.01

Source: Field Survey (2019)

Table 2 shows the result of the descriptive statistics of employees' performance measures. The result shows that commitment of employees ranked the highest with a grand

mean of 4.30 followed by communication skills with a grand mean of 4.14 while productivity ranked the lowest with a mean of 3.61

Table 3: AVE, Composite Reliability, Cronbach Alpha, R^2 and Q^2 results

Construct	AVE	Composite Reliability	Cronbachs Alpha	R Square	Q Square
Coaching Leadership	0.596	0.848	0.797		
Facilitative Leadership	0.579	0.844	0.774		
Leissez-faire leadership	0.508	0.829	0.757		
Team Leadership	0.655	0.892	0.851		
Visionary Leadership	0.538	0.820	0.709		
Productivity	0.587	0.875	0.825	0.429	0.226
Commitment	0.629	0.866	0.793	0.430	0.052
Cooperation	0.550	0.763	0.722	0.496	0.342
Professionalism	0.526	0.740	0.757	0.504	0.008
Competency	0.727	0.914	0.874	0.621	0.018
Communication Skills	0.575	0.810	0.735	0.131	0.059

Source: Field Study (2019)

Internal consistency: The results of the internal consistency also referred to as composite reliability for the firms is presented in Table 3. The scores as presented in Table 3 are as follows: Coaching Leadership 0.848, Facilitative Leadership 0.844, Laissez-faire leadership 0.829, Team Leadership 0.892, Visionary Leadership 0.820, Productivity 0.875, Commitment 0.866, Cooperation 0.763, Professionalism 0.740, Competency 0.914 and Communication Skills 0.810.

Convergent validity: Table 3 shows the AVE of the model. The findings show that the 11 constructs meet the minimum 0.50 threshold. Coaching Leadership 0.596, Facilitative Leadership 0.579, Laissez-faire

leadership 0.508, Team Leadership 0.655, Visionary Leadership 0.538, Productivity 0.587, Commitment 0.629, Cooperation 0.550, Professionalism 0.526, Competency 0.727 and Communication Skills 0.575.

Coefficient of determination (R^2): The findings indicate that the 5-leadership styles explain 42.9% of the variance in Productivity (moderate), 43% of the variance in Commitment (moderate) 49.6% of the variance in Cooperation (moderate) 50.4% of the variance in Professionalism (moderate) 62.1% of the variance in Competency (moderate) and 13.1% of the variance in Communication skills (weak)

Table 4: Path Coefficients

	Commitment	Communication Skills	Competency	Cooperation	Productivity	Professionalism
Coaching Leadership	0.351	0.312	0.296	0.084	0.156	0.001
Facilitative Leadership	0.420	0.288	0.119	0.464	0.073	0.456
Laissez-faire leadership	0.111	0.343	0.100	0.005	-0.093	0.184
Team Leadership	0.550	0.316	0.261	0.368	0.246	0.330
Visionary Leadership	0.297	0.429	0.584	0.464	0.007	0.071

Source: Field Study (2019)

Table 4 shows the results of the path coefficients. The result shows the path coefficient of the relationship between leadership style and Employee Performance. It indicates that positive relationships exist between the endogenous and exogenous constructs except between laissez-faire leadership and productivity with a negative relationship. The strongest relationship

exists between visionary leadership and competency with a path coefficient of 0.584 followed by the relationship between Team leadership and commitment with a path coefficient of 0.550 while the weakest relationship exists between laissez-faire leadership and productivity with a negative path coefficient of -0.093.

Table 5: Mean STDEV, T-Values and SIG Level

	Original Sample (O)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (O/STERR)	SIG
Coaching Leadership -> Commitment	0.351	0.161	0.161	2.183	**
Coaching Leadership -> Communication Skills	0.312	0.169	0.169	1.852	*
Coaching Leadership -> Competency	0.296	0.163	0.163	1.817	*
Coaching Leadership -> Cooperation	0.084	0.198	0.198	0.427	NS
Coaching Leadership -> Productivity	0.156	0.172	0.172	0.909	NS
Coaching Leadership -> Professionalism	0.001	0.180	0.180	0.003	NS
Facilitative Leadership -> Commitment	0.420	0.166	0.166	2.531	**
Facilitative Leadership -> Communication Skills	0.288	0.246	0.246	1.174	NS
Facilitative Leadership -> Competency	0.119	0.148	0.148	0.806	NS
Facilitative Leadership -> Cooperation	0.464	0.241	0.241	1.929	*
Facilitative Leadership -> Productivity	0.073	0.170	0.170	0.427	NS
Facilitative Leadership -> Professionalism	0.456	0.231	0.231	1.974	*
Leiszez-faire leadership -> Commitment	0.111	0.167	0.167	0.662	NS
Leiszez-faire leadership -> Communication Skills	0.343	0.163	0.163	2.099	**
Leiszez-faire leadership -> Competency	0.100	0.129	0.129	0.778	NS
Leiszez-faire leadership -> Productivity	-0.093	0.187	0.187	-0.500	NS
Leiszez-faire leadership -> Professionalism	0.184	0.230	0.230	0.800	NS
Team Leadership -> Commitment	0.550	0.144	0.144	3.809	***
Team Leadership -> Communication Skills	0.316	0.146	0.146	2.167	**
Team Leadership -> Competency	0.261	0.132	0.132	1.979	**
Team Leadership -> Cooperation	0.368	0.154	0.154	2.380	**
Team Leadership -> Productivity	0.246	0.147	0.147	1.668	*
Team Leadership -> Professionalism	0.330	0.154	0.154	2.135	**
Visionary Leadership -> Commitment	0.297	0.170	0.170	1.749	*
Visionary Leadership -> Communication Skills	0.429	0.253	0.253	1.696	*
Visionary Leadership -> Competency	0.584	0.179	0.179	3.264	***
Visionary Leadership -> Cooperation	0.464	0.271	0.271	1.714	*
Visionary Leadership -> Productivity	0.007	0.219	0.219	0.030	NS
Visionary Leadership -> Professionalism	0.071	0.262	0.262	0.271	NS

Source: Field Study (2019) Note: NS = not significant. a. Bootstrap confidence intervals for 10% probability of error ($\alpha = 0.10$). * $p < .10$. ** $p < .05$. *** $p < .01$.

Table 5 shows the t statistics and Sig level results associated with each paths result for the firms. A total number 30 path relationships exist between the five leadership styles and six employee performance measures. Eighteen significant and twelve non-significant relationships exists between the exogenous and the endogenous variables. The Coaching Leadership style has three significant relationships with commitment,

communication skills and competency, facilitative leadership has three significant relationships with commitment, cooperation and professionalism, leissez-Faire leadership has one significant relationship with communication skills, team leadership has six significant relationships with commitment, communication skills, competency, cooperation, productivity and professionalism. Visionary leadership has four significant relationships with

commitment communication skills, competency and cooperation. The empirical results of the paths significance show that the five leadership styles are significantly related to the six employee performance measures however, team leadership is significantly related to the six employee performance measures followed by the visionary leadership style with four significant relationships. This finding confirms the importance of team leadership and visionary leadership for successful employee performance improvement.

Discussion of findings

This study explored the relationship between leadership style and employee performance in the Nigerian construction industry. Leadership styles have influence on performance of employees (Adejoumo et al, 2018). Specifically, the leadership styles that have significant impact on the performance of employees were established. The findings established that the team leadership style ranked the highest in Nigerian construction firms. The findings are in line with the findings of (Ushie et al, 2010; Joo et al, 2014) whose findings highlighted the importance of team leadership style in employee motivation which ultimately results in improved employee performance. The results also indicate that commitment ranked the highest performance measure in Nigerian Construction firms. This finding is in line with the finding of (Rasool et al, 2015). The study established that team and visionary leadership styles as the most suitable for employee performance improvement in Nigerian construction firms. These findings corroborate the findings of (Otieno et al, 2015) that also identified team leadership style as ideal for employee performance. Team leadership style does not mean that the leaders do not follow the rules and regulations. On the other hand, if the leader

adapted visionary leadership style then it not means that they do not motivate and inspire their employees. So, there is need of shared leadership styles which contains the mixture of attributes of both the styles. The leadership with theses shared attributes will strengthen the institutions and thus the quality will be the only result. Lastly, the study found that laissez-faire leadership style does not significantly affect employee performance this corroborates the findings of Maguchi et al (2012).

CONCLUSION

This study contributes to the expansion of knowledge on how specific leadership style influence employee performance in Nigerian construction firms. Commitment and competency of employees were identified as the key employee performance measure in Nigerian construction firms, it further shows that team leadership style influence employee performance in the firms studied as it has the highest number of significant relationships with employee performance measures. To improve employee performance, team leadership style should be adopted in Nigerian construction firms. While the laissez-faire leadership style has the highest number of non-significant relationships with employee performance and a negative path coefficient.

Recommendations

From the study, the research recommends the following

1. Construction firms are encouraged to adopt the team leadership style as it has the highest number of significant relationships with in the study to influence employee performance.
2. Employee should be given a free hand to contribute or suggest ideas for improvement in their performance

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AN APPRAISAL OF VEHICULAR PARKING SITUATION IN ORE, NIGERIA

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ABSTRACT

The study examines vehicular parking situation in Ore town with a view to identifying prevailing parking problems and their mitigation measures in the town. Research design was used in the study and a set of structured questionnaires; interview and field observations were used for data collection sourced from primary and secondary sources respectively. Primary sources of data were collected from residents, motorists and commuters along major roads in the study area. Adopting a Stratified random sampling technique to administer the questionnaire given that the sample elements were at different zones in the town, a total of three hundred and fifteen (315) respondents were sampled. The questionnaires were analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0 and Microsoft Excel in the analysis of parking survey and computation of parking statistics in the study area. The study revealed that parking problems in Ore were brought about by so many factors namely; poor condition of major roads, proliferation of illegal On-Street parking areas, poor traffic and parking control, temporary and permanent structures constructed on the right of way of the sampled roads among others. This practice not only reduced the right of way but it also reduced existing off-street parking spaces in the sampled roads as submitted by the commuters and officers of the Ministry of Physical Planning and Urban Development (MPPUD), Ondo State and Federal Road Safety Corps (FRSC). The field survey revealed further that all the major roads in the study area were encroached and parking regulatory signs were not provided in these major roads to prevent indiscriminate on-street parking of vehicles. The study recommends rehabilitation of roads and removal of structures on the roads' shoulder; enforcement of minimum building setback bye-laws, and provision of off-street parking areas at strategic locations in the study area.

INTRODUCTION

Transportation is significant to modern and rapidly developing urbanizing societies, for without it, no society can function well. The transport system in an urban area can be likened to a blood's circulating system without which the body cannot be nourished and made to function properly (Adefolu, 1993). However, as useful as the role of transport may be in our daily activities, it has been noted to possess myriads of negative effects. In this regards, Ogunsanya (2002) reports that, transport has built cities over the years in some urban areas in Nigeria and it has gradually destroyed them. Yue (2004)

observed that the usage of cars has definitely improved the efficiency of travel and flexibility. On the other hand, this has also created widespread problems, particularly in respect to the issue of poor land use and transportation planning in urban areas spaces for road traffic and parking requirement, both of which are often difficult and costly to be compromised. In most cities in sub-Saharan Africa, particularly within Central Business District (CBD), parking and parking related problems have been deteriorating with the increase in city traffic and parking demand (Okoko, 2006). More vehicles and more time are spent in looking

for parking, leading to increased travel time and traffic congestion.

Parking lots are areas designated and fixed by authority of city's management or its agents to ease inter or intra-transport systems for long or short journey of passengers. Parking lot is an essential part of the road transport system; it plays crucial role in the management of traffic and congestion. But where these lots are not authorized, they become illegal parking (Ahmend, 2013). Parking facilities are essential elements of the road transport system. Parking is one of the comprehensive components in land use appearing in residential, shopping and industrial areas, and is related to all kinds of trips (Mniach, 2006). Rodrigue (2011) observed that in a motorized city, on the average, 30% of the surface is devoted to roads while another 20% is required for off-street parking. In North American cities, roads and parking lots account for between 30% to 60% of the total surface. Parking emerged to be a serious problem in Western Europe in the 1950s; Japan from the mid-1960; Hong Kong and Singapore in the early 1970s; and the Republic of South Korea, Malaysia and Thailand in the late 1970s and 1980s (Msigwa and Bwana, 2013). With efficient management and the involvement of various stakeholders in the strategies to avoid underpricing and oversupply, however, many European cities have transformed their parking situation into an economic opportunity and valuable asset for local communities (de Wit, 2006). On the contrary, however, developing countries including Nigeria are still facing variant degrees of parking menace in their cities. According to Yue (2004), in Saudi Arabia, particularly in Damman Areas, control of parking in the central areas has been a major transport drawback. Poorly regulated parking makes government and road users pay a high cost in terms of travel time and efficiency, and cities in the country face challenge in managing parking within their CBDs and even residential areas. It was explained further that traffic congestions, parking and other negative sides induced by the use of motor vehicles are putting pressures on transport systems and the

principles of town planning in the country.

The CBD of all the capital towns in Nigeria lack enough parking facilities. These inadequate parking spaces therefore make the city centres to be congested as vehicles are parked in any available space even along the roads (Ogunbodede et al, 2008). In Lagos metropolis, on-street parking, lack of parking space and poor traffic management at the road intersections were among major factors responsible for traffic congestion (Bashiru & Waziri, 2008). However, literature records that in most Southwestern Nigeria cities, illegal roadside parking and lack of geospatial information were other causes of traffic congestion (Ogunbodede & Aribigbola, 2003, Okoko 2006). Inadequate or improper management of parking spaces was among leading cause of road congestion in Lokoja (Olorunfemi, et al, 2014). In view of the foregoing background, this study aim to examine the vehicular parking situation in Ore, a nodal town and an emerging commercial hub in Ondo State, Nigeria with a view to identifying parking related problems and proffering mitigation measures to them. The objectives are to conduct inventories of roads and on-street parking spaces (physical characteristics) in the study area; conduct parking volumetric survey on selected distribution of on-street/road parking spaces; and investigate the parking provision in Ore as well as suggested parking control measures.

LITERATURE REVIEW

Parking is the act of stopping a vehicle and leaving it unoccupied for more than a brief time. Parking on one side of a road is commonly permitted, but on both sides of a road is often with restrictions. Parking facilities are constructed on most highways, to facilitate the free flow of traffic (Tim & Cherie, 2007). Parking facilities are either permanent or temporary. Permanent parking facilities are an integral part of installation on traffic and building plans. They may be either on-street or off-street parking. Temporary parking areas are established by the Military or Police to service a particular event or occasion (GlobalSecurity.org, 2015). As observed in the literature, parking

can be categorized broadly in two groups: On-street parking and Off-street parking (Okoko, 2006). On-street parking can be generally described as that vehicular parking which is located alongside the edge of the road, and where maneuvering into and out of a parking space may interact with traffic flow. It is often discouraged in congested areas, sharp bends and other areas that constitute hazards to other road users. Some definite areas are however marked and designed by the road shoulder to serve as emergency vehicle checking points and similar uses (Dukiya *et al*, 2014). Off-road parking is where the parking facility does not directly interact with the through traffic flow along a road other than at the access point between the road and the car park. This type of facility is required when demand for parking far outweighs the supply of on-road facilities and alternative parking areas are required, (Australian Standard/New Zealand Standard 2890.1, 2004).

Parking studies are performed to determine the location, use and adequacy of existing parking facilities. They can also be used to gather information for planning parking facilities. Normally, parking studies are concerned with specific problem areas and are made in an effort to improve efficiency and safety. They may be performed with origin-destination and vehicle registration studies (GlobalSecurity.org, 2015). According to Bhatti (2014), parking studies must be conducted to collect the required information about the capacity and use of existing parking facilities. Parking studies may be restricted to a particular traffic producer or attractor, such as a store, or they may encompass an entire region, such as a central business district.

In literature there are various parking studies relevant to this research work. Bhatti (2014) observed that parking studies include: inventory of parking facilities, accumulation counts, duration and turnover surveys, user information surveys and land use method of determining demand. Tom, 2014 employed parking load (average) duration as applied in this research. These studies are also known as parking statistics and they are of immense

importance and relevance to this research work. As observed in the literature, there are various causes of parking problems in Nigerian cities. According to Ogunbodede & Olurankinse (2006), the central business district (CBD) of all the capital towns in Nigeria lacks enough parking facilities. By design, the CBD has a higher tendency to attract vehicles more than any other known land use in urban centers. Inadequate parking spaces, therefore, make the city centers to be congested as vehicles are parked on any available space, including the road. Similarly, Okoko (2006) reports that, there is a limited amount of land space within the CBD and there are several and varied demands for the use of this limited land area. Aderamo & Salau (2013) observed that parking problem arises due to absence of clearly designated areas for parking in many of the cities. It has led to traffic congestion and delay problems. They further observed that, illegal parking is a major problem in Nigerian urban environment and roadside parking is a common phenomenon which reduces the traffic corridors meant for the efficient movement of automobiles. The resultant effect of such illegal parking is traffic congestion which also leads to delay in travelling time and increases the cost of travelling. Parking problems become even worse in Nigerian cities as a result of ineffective regulation. It must be noted that in spite of the enormous studies that have been carried out on transport problems in many cities in Nigeria, less attention has been given to smaller towns like Ore without regards to its status as a transit and commercial town.

Parking studies and statistics

Parking and road inventories: Parking inventory is a physical count of existing parking spaces. It includes on-and off-street parking. For marked spaces, a numerical count is made. Parking inventory is similar to road inventory. According to Okoko (2006), road inventory is necessary to serve as a guide in the provision of roads in the town. Road inventory provides information on the mileage, physical characteristics and conditions of all roads in the town. It provides the transport planner with

information on such issues as the type, dimension and conditions of urban roads, classification of road by type of pavement, physical designs features such as pavement widths, grades, curvature, sight distances, location of road furniture etc. Parking usage survey was conducted in this study.

Parking Usage Survey: It is based on the number of vehicles in a specific area and the length of time vehicles are parked in the area. The survey is conducted during normal duty hours. Each parking space in an area can be checked per person, once during a 15-minute period for on-street parking, and once during a 30-minute period for off-street parking. On the other hand, the observer will walk a predetermined course and record on a field sheet the license plate or decal numbers of vehicles. The same route is used at intervals of 15 to 30 minutes. Parking usage surveys are useful in determining areas with the greatest parking demand and where parking problems are critical due to inadequate capacity. They are helpful in identifying areas where time limits are not consistent with usage. This will further aid in determining whether enforcement efforts should be lessened or increased. They evaluate efficiency of parking areas. An efficiency of 85 percent is considered maximum in short-time parking areas and 95 percent is the maximum in long-time parking areas (GlobalSecurity.org, 2015). Parking usage survey was employed in this study to achieve the stated goal of the study.

Transportation and Land Use Models: Transportation and land-use interactions mostly consider the retroactive relationships between activities which are, land use-related and accessibility which is transportation related. These relationships have often been described as a classic 'chicken-and-egg' problem since it is difficult to identify the triggering cause of change. Do transportation changes precede land-use changes or vice-versa. The

relationship between transportation and land-use is rich in theoretical representations that have contributed much to regional sciences. Several descriptive and analytical models of urban land-use have been developed over time with increased levels of complexity (Rodrigue, 2013). According to Torrens (2014), Land use models are used to simulate demographic and economic transition in land-based activities. These models describe the population (usually in terms of income and employment) and built-space environment. They use economics theories to explain and estimate the layout of urban land uses. Land use model is the quantitative method to predict the future changes in land use, socio-economic and demographic data base on economics theories and social behaviors (Zeng-Peng, 2014). The concentric urban land use model is of immense importance to this research work.

Concentric Urban Land Use Model: The Burgess (1925) concentric model (Figure 1) was among the first attempts to investigate spatial patterns at the urban level. Although the purpose of the model was to analyze social classes, it recognized that transportation and mobility were important factors behind the spatial organization of urban areas. The formal land use representation of this model is derived from commuting distance from the central business district, creating concentric circles. Each circle represents a specific socioeconomic urban landscape. Even close to one century after the concentric urban model was designed, spatial changes in Chicago are still reflective of such a process. The model suggests that, the city as a complex entity, often exhibits concentric pattern of growth of six notable zones, each with a distinct structure of development.

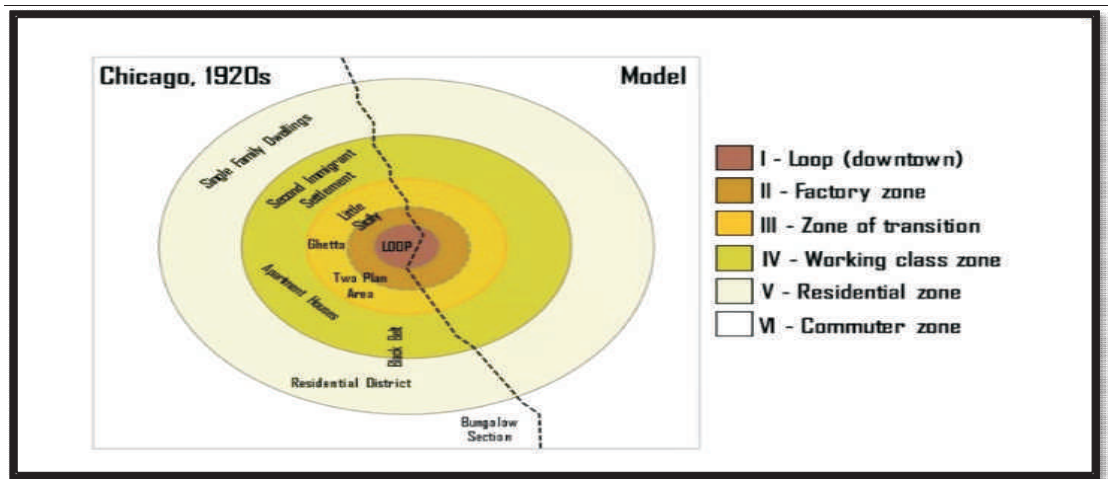


Figure 1: Burgess Concentric Land Use Model.
Source: Carter (1995).

The six distinctive zones are the inner zone, light manufacturing activities zone, transition zone, medium class residential zone, the commuter's zone and outer ring roads. The theory was therefore concerned that, there is an order of behaviour of people in response to certain circumstances as the city continues to grow. On account of daily increase in city's population at the center, people in the inner zone gradually succeed to the next outer zone.

RESEARCH METHODOLOGY

This is an in-depth explanation of the systematic approach and scientific methods employed to carry out this study. The social survey research design was adopted for this study. It is perhaps the most widely used by social scientists in the built environment (Ogunsanya, 2002, Olorunfemi et al, 2014). The research design was in three phases. These are pre-survey, survey and post survey phases. Two sources of data were explored; (i) primary and (ii) secondary sources. Basically, this study adopted both questionnaire and field observation methods to collect the required primary data. Field observation method was employed to conduct inventory of roads and on-street parking spaces in Ore town. It was also used to conduct parking volumetric survey in the study area. Data on the physical characteristics of existing roads and

distribution of On-street parking spaces in the study area were collected concurrently. In addition, oral interview of some selected respondents particularly officers of the Federal Road Safety Corps (FRSC) and the motor traffic department (MTD) of the Nigerian Police Force were carried out. Secondary data in the study include existing information about the study area such as location, population, occupation among others. They also include information about the conceptual and theoretical framework and other relevant information about parking and its associated menace sourced from existing literature including published textbooks, articles, reports, Journals, Newspapers, Magazines, other published and unpublished materials, and the internet resource. In addition, secondary data were also sourced from Ministry of Physical Planning and Urban development (MPPUD), Ondo State and National Population Commission (NPC) among others. Table 1 showed the questionnaire' administration schedule for the study. The sample size adopted for the study was 50 percent of the sampling frame (630 motorists). This was considered reasonable judging from the number and statistically representative size of the target population to be sampled. From the Table, it could be observed that the sample size was 315

motorists being 50% of the sampling frame. This meant that, a total of 315 copies of structured questionnaire were administered in Ore. Stratified random sampling technique was employed to administer the questionnaire given that the sample elements were at different zones in the town. As shown in Table 1, there were 7 on-street parking areas in the study area. These parking areas were: Lagos Motor Park area, Benin Motor Park area, NNPC-Broad Street area, First Bank Area, Mobil Junction Area, Zenith

Bank and Akure Motor Park area. The sampled elements in each of these parking areas were approximately 52, 35, 55, 48, 40, 43 and 42 respectively (the observed variation in number of questionnaire administered in the parking areas was as a result of differences in their size and concentration of commercial activities) being 50% of total population of motorists involving in on-street parking in each of the parking areas.

Table 1: Questionnaire Administration Schedule

S/N	On-Street Parking Spaces	Zone/Location	Population (Motorists)	Sample Size (50%)
1	Lagos Motor Park	Benin-Shagamu Express	104	52
2	Benin Motor Park		70	35
3	NNPC-Broad St. Area	Broad Street	110	55
4	Mobil Junction Area	“	96	48
5	First Bank Area	Sabo Market Road	80	40
6	Zenith Bank Area	Ore-Okitipupa Rd.	86	43
7	Akure Motor Park	Ore-Ondo Road	84	42
		Total	630	315

Source: Author's Preliminary Survey, 2018

The questionnaires were administered in situ at the different parking areas. The observed variation in number of questionnaire administered in the parking areas was as a result of differences in their size and concentration of commercial activities. Information concerning parking control measures was sourced from selected motorists in Ore and agencies of government, which includes Ministry of Physical Planning and Urban development (MPPUD), Ondo State. Further relevant information was collected with the aid of field note, check-list, measuring tape, camera, oral interviews and discussions with the respondents among others. The processing of data was analysed using Statistical Package for Social Sciences (SPSS) version 20.0 and Excel in the analysis of parking survey and computation of parking statistics in the study area. The

analysis of data was discussed using frequency count; distribution and such information were presented through the use of tables, figures, percentages and charts.

RESULTS AND DISCUSSION

The findings of the road and parking space inventory conducted to identity physical features and influences on vehicular parking, their distribution, and extent of usage (parking volume) in Ore are presented below.

Physical characteristics of roads and on-street parking spaces in Ore, Nigeria

This study identified there were six (6) major roads namely: Benin-Shagamu express way, Ore-Ondo road, Broad Street, Ore-Okitipupa road, Old Lagos-Benin road and Sabo Market businesses and trading activities. Due to this reason there were high traffic

attraction and parking demand which promoted indiscriminate on-street parking at different locations on these major roads. All the major roads were used as on-street parking spaces by motorists thereby constituting parking menace in the town. The spatial distribution of these roads is shown in Figure 2. On the basis of functionality, all the roads in the town fell under different road (Table 2). These roads formed the core area where there was high accumulation. As depicted in Table 2, three of out of the six selected roads namely: Benin-Shagamu express way, Ore-Ondo road and Ore

Okitipupa road were under arterial road category. They carried thorough traffic especially the expressway and they linked the town with other major settlements and states. The remaining three roads, that is, Broad Street, Old Lagos-Benin and Sabo Market road were distributor/collector road category. These roads distributed to and collected traffic from the arterial and access roads in the town. In addition, they also provided linkages between the different residential zones in the study area such as Ajegunle, Idi-Mango, Beaulah Secondary school area, reserve market.

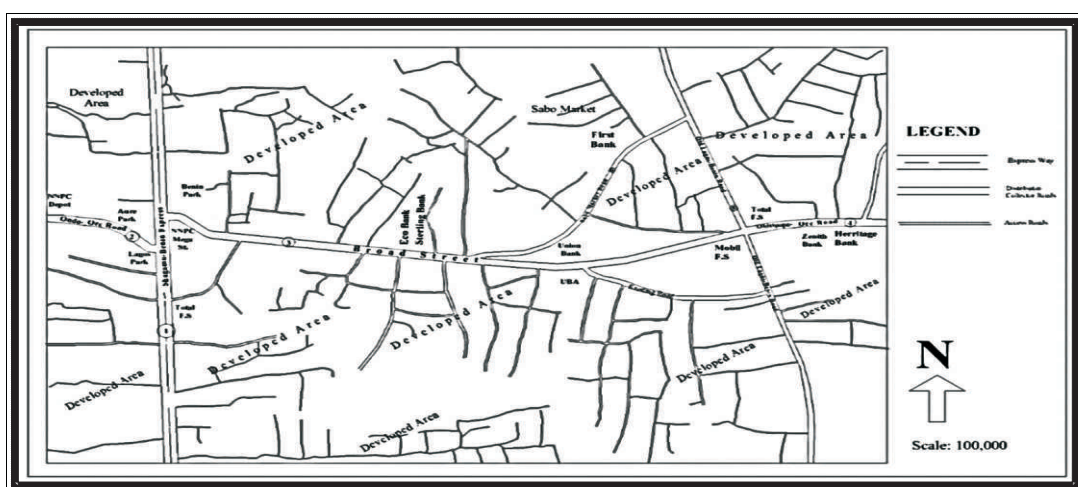


Figure 2: Road map of Ore, Nigeria.

Source: Google Earth (2018).

Finding as depicted in Table 2 showed that among the six sampled roads, only the Benin-Shagamu express way had a dual carriage way. The remaining ones were single carriage ways. It was only the Benin-Shagamu express way had 4 lanes while the rest of the roads had 2 lanes each. All the roads had two-way traffic direction except the Benin-Shagamu express that has one-way traffic. The right of way of Benin-Shagamu express was 90metres while Ore-Ondo road, Ore-Okitipupa road and Broad street were 45-50metres. The remaining two roads, that is, Old-Lagos road and Sabo market road had right of way of 18-25metres. As indicated in the Table, temporary and permanent structures were constructed on the right of way of the sampled roads. This practice not only reduced the right of way but it also reduced existing off-street parking

spaces in the sampled roads. This situation disposed motorists in the study area to indiscriminate on-street parking. The study further established that, the sampled roads had Asphalt pavement but with different structural conditions. As shown in Table 2, only one of the roads, that is, the Benin-Shagamu express way was in a very good structural condition. This was as a result of the fact that the road was being newly reconstructed. Specifically, the Old Lagos-Benin road was in a bad structural condition as its surface had numerous potholes. Ore-Ondo road, Broad Street, Ore-Okitipupa road and Sabo market road were in fair structural condition as the roads had fairly smooth pavement. However, none of the sampled roads had sidewalk. From Table 2 it can be concluded that all the roads examined had their provisional shoulders encroached.

It was observed that commercial activity and business owners erected temporary or permanent structures on them. For instance, in Old Lagos-Benin road, the road shoulders were occupied by traders and street hawkers for the sales of their commodities. This practice is worrisome; it has a bad implication on the parking situation in the study area. This is because the road shoulders could have been used for off-street parking if they had not been encroached. This situation indeed created parking problem in form of parking supply deficit in the study area. In fact, parking space supply and demand in Ore could better be described as paradoxical. This was because, there was a situation where business owners completely occupied the road shoulders that were to serve among other uses as off-street parking spaces for customers, yet they displayed no parking sign post at the frontage of their buildings but were expecting customers' patronage. They

forgot that their business activities attracted customers and vehicles which require parking spaces. Furthermore, there was no parking regulatory sign along the sampled roads. Conventionally, traffic and parking are regulated through the use of various regulatory signs put on specific sections and surfaces of the road way. They are popularly known as Highway Code. Observation showed that none of the roads in the study area was provided with any of the highway codes. As observed, none of the roads' surface was marked with yellow or red paint/mark in order to control parking. This condition gave room for indiscriminate on-street parking which is a serious parking problem in Ore. Finding reveals that there is a clear indication of lack of concern for traffic and parking management by relevant government agencies in Ore.

Table 2: Physical Characteristics of Major Roads in Ore

S/N	Road Name	Type	CW	Lane's Width(m)	NTL SO	RoW (m)	Pavement Type	SC	NIL	Side Walk	Sewer	Shoulder	SL	TS
1	Shagamu-Benin Exp.	Arterial	Dual	3.7	4	1	90	Asphalt	V. Good	4	Nil	Yes	Nil	Nil
2	Ore-Ondo Road	Arterial	Single	3.7	2	2	45-50	Asphalt	Fair	3	Nil	Nil	Partly	Nil
3	Broad Street	Distributor	Single	3.7	2	2	45-50	Asphalt	Fair	4	Nil	Yes	Nil	Yes
4	Ore-Okitiupupa Road	Arterial	Single	3.7	2	2	45-50	Asphalt	Fair	4	Nil	Yes	Nil	Yes
5	Old Lagos-Benin Road	Distributor	Single	3.7	2	2	18-25	Asphalt	Bad	4	Nil	Partly	Nil	Nil
6	Sabo Market Road	Distributor	Single	3.7	2	2	18-25	Asphalt	Fair	3	Nil	Partly	Nil	Nil

CW=Carriage Way, NTL=No. of Travel Lanes, SO=Street Operation: 1=One -way traffic, 2=Two-way traffic, RoW=Right of Way, SC=Structural Condition, NIL=No. of Intersection Legs, SL=Street Lighting, TS=Traffic Signs.

Source: Authors Fieldwork, 2018

Distribution of on-road parking spaces in Ore, Nigeria

The study established that there were seven (7) on-road parking areas namely; Akure Motor Park area, Lagos Motor Park area, Benin Motor Park area, NNPC-Broad Street area, First Bank area, Mobil Junction area and Zenith Bank area in Ore (Table 3). The parking areas were illegal

and were located along the roads depicted on the Table 2. However, from Table 3, it can be established that the dominant land uses around majority of the on-street parking areas were transport and commercial activities which promoted illegal on-street parking in the study area.

Table 3: Distribution of On-Street Parking Spaces in Ore town

S/N	Name of Area	Zone/Location	Dominant Land Use	Road Sides Used	Sited on Road Intersection	Parking Sign
1	Akure Motor Park	Ore-Ondo Road	Transport/Comm.	2	✓	-
2	Lagos Motor Park	Benin-Shagamu Exp.	"	"	-	-
3	Benin Motor Park	"	"	"	-	-
4	NNPC-Broad Street	Broad Street	"	"	✓	-
5	Mobil Junction Area	Broad St./Okiti pupa Road.	"	"	✓	-
6	First Bank Area	Sabo Market Road	"	"	-	-
7	Zenith Bank Area	Ore-Okiti pupa Road	"	"	✓	-

Source: Author's Fieldwork, 2018.

From table 3, it was also observed that all the on-street parking spaces were on-street motor parks or loading points due to deficit of off-street parking spaces in the study area. In addition, the dense cluster of commercial activities abutting the on-street parking spaces enormously attracted traffic that equally increased demand for parking spaces which resulted to indiscriminate on-street parking mostly during the peak period in the town. This situation reduced the width of roads and caused traffic congestion and accidents. Moreover, the situation eroded the town of its aesthetic

values. As shown in Table 3, both sides of the roads were used in all the illegal on-street parking areas. This practice further led to a drastic reduction of the width of the roads where the parking spaces were located. Four out of the seven parking areas, that is, Akure Motor Area, NNPC-Broad Street, Mobil Junction area and Zenith Bank area were sited on road intersections. This posed serious challenge for smooth intra urban travel around those locations. The four parking areas constituted serious traffic flash points that require urgent attention. Furthermore, parking signs were not

available in all the on-street parking areas, a situation that promoted proliferation of on-street parking in study area.

The extent of usage of on-road parking spaces in Ore, Nigeria

This section showed the findings of the parking volumetric survey conducted in the study area in order to assess the extent of usage of selected on-road areas as presented below.

Parking volume

Presented in Figure 3 is the daily average vehicular parking volume of selected on-street parking spaces namely in Ore (Figure 4). The study revealed that a total of 611 vehicles parked daily in all the sampled on-street parking spaces. As

shown in the graph, parking volume was high in all the parking area but the peak volume occurred at Lagos Motor Park area (16.69%) and NNPC-Broad street parking areas (16.53%). This meant that the two parking spaces had the largest volume of vehicles. This was as a result of high concentration of transportation and commercial activities; the dominant land uses in the two parking areas. It implied that parking problems such as traffic congestion and accidents might equally be higher in these parking areas. The least parking volume (11.28%) occurred at Benin Motor Park area. Commercial activities were at low concentration and there were reduction in parking volume, hence was minimum in this location.

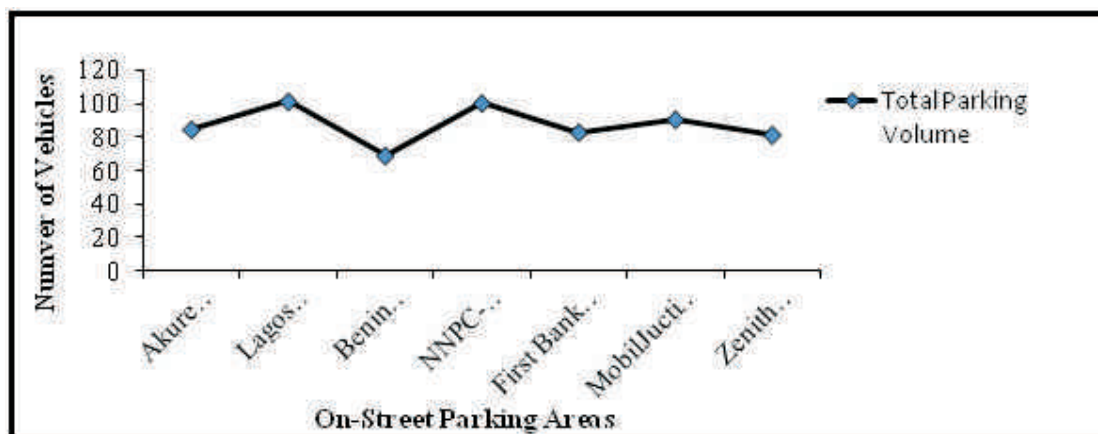


Figure 3: Parking volume of selected days of the week in Ore, Nigeria
Source: Author's Fieldwork, 2018

From Figure 4, it can be established that 53% of the vehicles were cars and buses; 10% was articulated vehicles and Lorries and lastly 37% were motorcycles and tricycles. It can be inferred from this finding that cars and buses were the dominant type of vehicles parked in the sampled on-street parking areas. This showed the due to dominance of this category of vehicle as mode for both private and public intra/inter-township travel in the town. Motorcycles and tricycles

popularly known as Okada had considerable volume and were next to cars and buses. This mode of travel provided flexible and convenient public intra-township travel services leading to its growing popularity as a mode of travel in the town. Articulated vehicles and Lorries had the least volume. They were mostly used for haulage purposes and not for intra-urban travel and they required considerable parking spaces due to their dimensions. These were reasons their

parking volume was quite low compare to the rest categories of vehicle in the various parking areas. From these findings, cars and buses constituted the major parking problems in the study area. The volume of articulated vehicles in the selected parking spaces as depicted in Figure 5 was however remarkable. About 47% of the articulated vehicles parked in the parking spaces under review were found in Lagos Motor Park area. The remaining 6 parking areas had less than 20% each. This implied that Lagos Motor Park area had the largest volume of articulated vehicles and Lorries (Plate 6).

The location of the parking area on the express way was responsible for this, that is, the Shagamu-Benin express way in the town. Articulated and others heavy duty vehicles parked along the express way for fuel refill, repairs, stop-over, shopping, loading among others. However, the concentration of this category of vehicle on one or both sides of the express way was a menace in the study area. The practice led to reduction in the roadway thereby reducing travel speed and caused traffic congestion and accident especially during parking maneuvering.

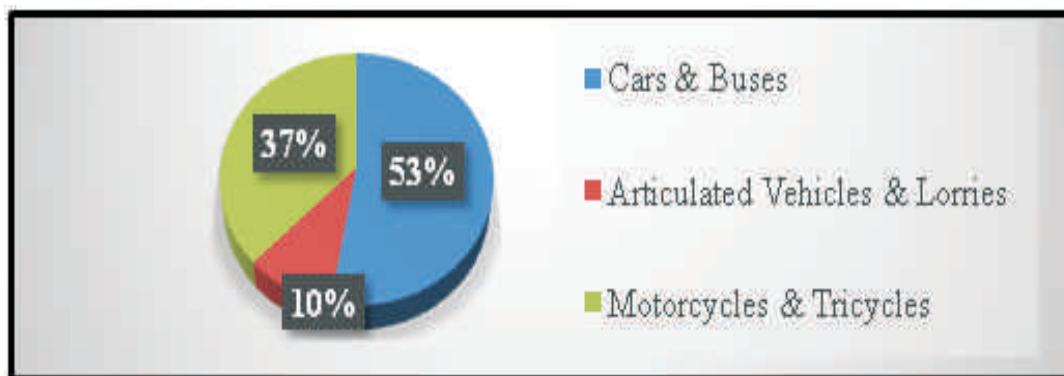


Figure 4: Distribution of vehicle types at selected on-street parking spaces in Ore

Source: Author's Fieldwork, 2018

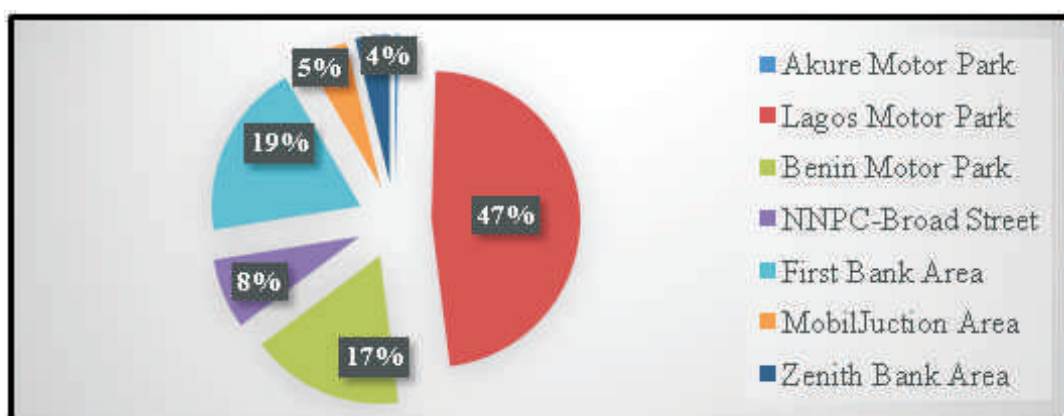


Figure 5. Volume of vehicles/lorries at selected on-street parking spaces in Ore.

Source: Author's Fieldwork, 2018



Plate 1. On-street parking of articulated lorries along Shagamu-Benin Express, Ore
Source: Author's Fieldwork, 2018

4.3.2 Parking volume on selected days of the week in Ore, Nigeria

The information presented in Figure 5 is the on-street parking volume of vehicles on selected days of the week in the study area. These days were Monday, Wednesday, Friday and Saturday. The essence of the survey was to determine the variation in parking volume on these selected days. According to findings, there was only slight variation in the parking volume among the days of the week. In essence, parking volume was almost the same in selected days of the

week. The reason is due to the fact that most of the parking areas were on-street motor parks and there was high concentration of commercial activities around them. The implication of this finding was that, parking related problems such as traffic congestion and accident were almost of the same magnitude in all the days of the week in the study area. However, it was established that the parking volume was slightly higher on Friday and Saturday than on Monday and Wednesday.

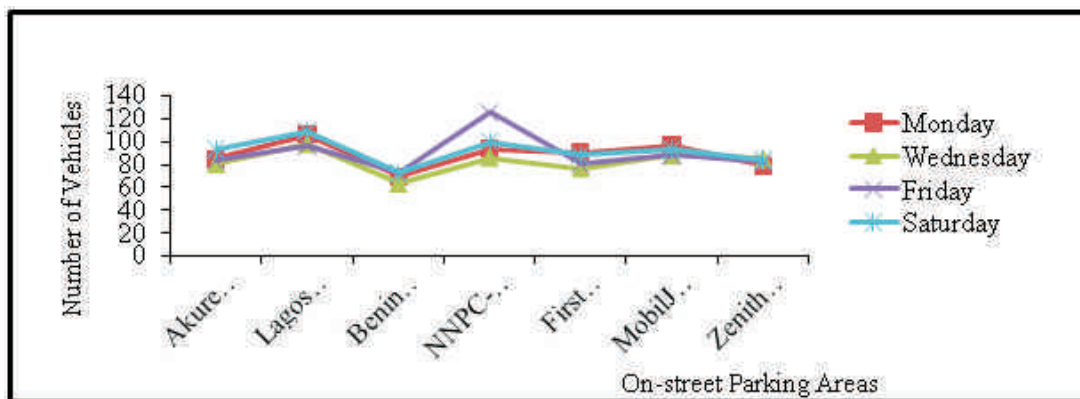


Figure 5. Parking volume of selected days of the week in Ore, Nigeria
Source: Author's Fieldwork, 2018

Parking load of on-street parking areas in Ore, Nigeria

Parking load is expressed as vehicle-minutes or vehicle-hour. This is computed simply by multiplying the number of vehicles occupying a given parking area with parking time interval. It simply gives the area under the parking accumulation of each sampled parking area. Figure 7 is a bar graph showing

the daily average parking load of the sampled on-street parking areas. As can be seen in the Figure, the parking load was large in all the sampled parking areas with an average of 317 vehicle hour. This meant that the sampled parking areas were intensively used. Lagos Motor Park area with 18% had the largest parking load. It indicated that this parking area was the 9most intensively used

by motorists in the study area. It further implied that parking problem was at its peak in this area. However, Benin Motor Park area with 10% had the least parking load. This

similarly implied that this parking area had the lowest usage and parking related problems were at minimum in this location.

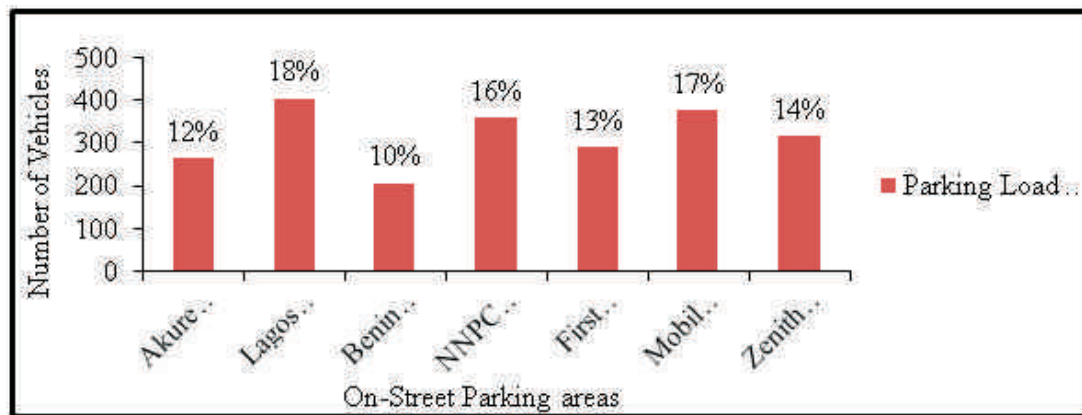


Figure 6. Parking load of on-street parking areas in Ore, Nigeria
Source: Author's Fieldwork, 2018

Suggested parking mitigation measures

Table 4 provides information concerning parking control measures suggested by selected motorists in Ore. From the Table, traffic control and management; and provision of off-street parking spaces were the dominant measures suggested by the selected motorists to address parking related menace in the

town. Noticeably, there was little being done in this regards unlike other major cities like Akure, Ado-Ekiti, Lagos to mention few where parking management was taken as a serious business. In these major cities there were reasonably pragmatic and concerted efforts aimed at ensuring effective traffic management in order to discourage indiscriminate on-street vehicular parking in those cities.

Table 4: Suggested parking mitigation measures in Ore, Nigeria

Mitigation measures	Frequency	Percentage
Provision of Off-Street Parking Spaces	85	27
Effective traffic and Parking Control Measures	118	37
Effective development Control Measures	38	12
Public enlightenment to Motorists	31	10
Demarcation of section of the roads for On-street Parking	43	14
Total	315	100

Source: Author's Fieldwork, 2018

CONCLUSION

This research has revealed that the vehicular parking situation in Ore is problematic and appalling. The study revealed that the dominant parking challenges in the town were mostly traffic congestion and accidents. The ugly situation is brought

about by several factors such as poor parking and traffic management, deplorable condition of roads, proliferation of On-Street parking areas. Traffic congestion and accidents were common place effects of parking problems in the study area. The prevailing parking condition in Ore hinders

smooth inter and intra-urban mobility especially within the core area of the town. It reduces accessibility to corporate institutions and major activity areas in the town. The field survey revealed that all the major roads in the study area were encroached and parking regulatory signs were not provided in these major roads to prevent indiscriminate on-street parking of vehicles. Major roads in Ore were in deplorable structural condition and were mostly narrow. There was proliferation of illegal on-street parking areas along the major roads which were majorly on-street/road motor parks and loading points. The study recommends rehabilitation of roads and removal of structures on the roads' shoulder, enforcement of minimum building setback bye-laws, and provision of off-street parking areas at strategic locations in the study area in order to arrest the ugly development in the town. Governments through their relevant agencies have major roles to play in this regards; including motorists, road users and owners of business activity or properties. This is because; Ore is a strategic settlement in Ondo State with a lot of business and development potentials. Thus, a concerted effort made to halt the emerging poor parking experience in the town will benefit the residents of Ore, Nigeria. Therefore this is the need to effect parking control and management in the study area. Parking regulatory signs should be provided at designated sections along major roads in the study area. Relevant traffic

control agencies and the Police should be empowered and equipped to enforce parking control and other relevant conventional regulations. Fines for traffic offenders should be determined and stated in clear terms. The fines should be reasonable and correlate with the prospective offenses. Public enlightenment should also be conducted for motorists particularly commercial vehicle operators in Ore. They should be taught periodically the proper ways the roads should be used. Minimum building Setback should be enforced by the town planning authority especially within the core area of Ore. This singular action will make available considerable amount of off-street parking spaces. This in turn will reduce the number of vehicles being parked on-street in the study area. Related to this is the need to prohibit on-street trading and hawking in the core area during the rush hours. Public designated off-street parking facilities should be provided in the study area in order to reduce the volume of on-street parked vehicles. The planning authority in Ore should specify and enforce the provision of parking space in connection with new building. The owners of existing buildings in the CBA in the town should be mandated to refurbish them in order to provide adequate parking space. Like the types provided in Akure, designated off-street parking spaces could be provided at strategic locations within the core area to ease parking menace in the town.

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- Reducing Mobility Barriers for Sustainable Intra-Urban Transport Development in Nigerian

CONTRACTOR SELECTION MODEL IN COMPETITIVE BIDDING SYSTEM

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ABSTRACT

The lowest bid has often been favoured for award of contracts in competitive bidding. Despite the fact that the essence is to achieve value for money for the client, studies show that the lowest bid doesn't often guarantee cost efficacy of construction projects. Different models have been developed to improve on the lowest bid award system. Some of the research results produced regression models that will identify not just any lowest bid but the lowest responsive responsible bid among bidders. However, the independent variables in such equations raise some questions that demand answers from research consideration. The major questions were the rational on the choice of variables and the reasons for using only two independent variables in the equations. This research is set to consider those questions in developing a more reliable regression model that will identify the lowest responsive responsible bid in competitive bidding. Water engineering projects competed in the north eastern part of Nigeria between 2015 and 2017 were used. Thirty six (36) completed projects of diverse magnitudes involving 220 bids with diverse level of competition were used. Three new regression models were developed, two of which has 3 independent variables and one has 4 independent variables. Both were compared with earlier similar equations developed with 2 independent variables. It was found that different matrixes of independent variables presented different predictive power of the lowest responsive responsible bid. Comparison shows that the equation with 4 independent variables is the most robust predictor of the lowest responsive responsible bid. However, for the sake of convenience and early identification, the optimum equation with 2 variables containing the number of bids and the consultant's estimate was recommended. This is in line and justifies earlier research recommendations. It is expected that the result will enable quick identification of bona-fide contractor at the early stage of the bidding process through which the cumbersome task of bid analyses will be reduced, as such cost and time of bidding also reduced.

Key words: competitive bidding system, contractor, construction projects, lowest bid, model

INTRODUCTION

Bidding has been and will continue to be important construction undertaking by virtue of its positive contributions to the procurement process (Alumbugu, Ola-Owo, Saidu, Abdullahi, & Abdulazeez, 2014, Oyeyipo *et al*, 2016, Bruik *et al.*, 2017). To the client, bidding is a pre-contract activity that aids in the selection of a competent contractor to handle on his behalf, the construction of a facility called construction project (Aje *et al*, 2016). Getting a competent contractor is vital to any construction project success (Zavadskas *et al*, 2008). There are techniques developed for construction contractor selection (Azeez & Aboelmagd,

2019), among which is the lowest bid system (LBS) (Khan & Khan, 2015). The LBS relies extensively on the lowest price offered by a contractor among competitors as basis to award contracts (Gandu *et al*, 2020). The essence of LBS often cited has been for the purpose of cost savings via reduced contract awarding amount of a project for better value for money invested by the client (OECD, 2011). However, studies have found that the LBS does not guarantee cost savings at the long run in the life of a project (Puri and Tiwari, 2014, Hafez *et al*, 2015). Kim and Skibniewski (2020) argued that there's likelihood unsuccessful higher bid figures justifiably convey more important information than the successful lowest bid,

the information of which will benefit the entire construction process of the proposed project. Such information relating to uncertainties noticed by the bidders could be glossed over by the owner like the scope of work or field conditions not fully considered; or more risk factors becoming visible thus justifying a high offer by a contractor but were overlooked by the lowest bidder. Researchers have therefore tried to find ways to enhance the LBS during contractor selection through models developed to improve the system (Carr, 2005, Gandu *et al.*, 2020). The models have tried to achieve not only the identification of the lowest bid at the early stage of a bidding process, but that the lowest bid must be responsive and responsible that guarantees successful contract implementation (Carr, 2005, Gandu *et al.*, 2020). However, the optimum is yet to attain along this backdrop and there are calls for more research consideration in the field of bidding. For example, Carr (2005) used the number of bidders and the consultant's estimate in the development of a model to predict the responsible lowest bid. Gandu *et al.* (2020) observed that there was no rationale in choosing the two independent variables in Carr (2005)'s equation since there exists other variables that could improve the equation. The researchers believed that Carr (2005) should have tried other independent variables to find which one is most robust in the predictive goal. Gandu *et al.* (2020)'s research then identified four variables which were used in modelling seven regression equations to predict the lowest responsive responsible bid in competitive bidding system. The models generated had either one or two independent variables in each equation only. Comparison of the models found that different matrixes of the independent variables depicted different predictive strengths in identifying the lowest responsive responsible bid. The researchers recommended a model for application in bid selection, but suggested for more research efforts along this line, believing that there are other matrixes not considered that could improve the predictive strength of the model. This research is therefore a buildup along this research line. This work is set to consider

more than two independent variables in regression equations so as to recommend an improved contractor selection model that can predict the lowest bid more accurately in competitive bidding. In doing that therefore:

1. Regression models, two of which have three independent variables and one with four were developed.
2. The models were compared with each other and with similar previous models in the view of recommending a more robust one that can better predict the lowest responsible bid in a competitive bidding system.

Identifying the lowest responsive responsible bid at an early stage of competitive bidding will reduce the burden and cumbersome nature of bid analyses, yet offer opportunity to identify a more reliable bids from bidders. Awarding contracts to the lowest responsive responsible offer will contribute immensely to smooth execution for a successful completion of construction projects.

LITERATURE

Factors affecting estimated figures and bid selection

Estimates are usually the bases for lowest bid selection in competitive bidding. There are factors that affect contractor's company estimated figure, and there are those that affect the bid figure (figure submitted as offer to the client). The company estimated figure is simply the amount arrived at by the estimator as the real figure that will complete a proposed project under given conditions in a construction firm. Researches like Coningam (2017) have documented that the amount of information available, work complexity, risks factors, location of the job, availability of labour and material are among the factors that determine such estimates. These factors guide the estimator in arriving at the actual cost of executing a proposed project which can be referred to as company's estimate. On the other hand, the bid figure is the final amount the contractor agrees to submit to the client in competition which could differ from the company estimate. There are factors affecting this

amount offered by contractor's firm to the client which invariably affect the chances of the contractor winning a competition. Four main factors identified are as follows:

- a. Consultant's estimate: The more the consultant's estimate, the more the general bid prices of all the contractors. The consultant's estimate follows after the nature, characteristics and risk profile of the proposed project, likewise the bid figures offered. The consultant's estimate is often used to determine which contractor wins the contract in bidding (Oladokun *et al.*, 2010). As such, given the same information, the bidder is mindful of the amount the consultant will arrive at and use as bases of judging all bids submissions. In competitive bidding (Kim and Skibniewski, 2020), the consultant can annul all submissions if found that the bids are not within acceptable limit. The contractor therefore targets a consultant's position that can guarantee winning a contract with profit.
- b. Number of competitors: this refers to the number of contractors invited by the client to compete for award of a proposed job. Various strategies have been developed for contractors to outsmart other competitors during bidding. Studies have also shown that the more the number of contractors invited to bid for a particular project the more the likelihood of getting a lower offer (Carr, 2005). Researches have indicated the kind of factors most important and those less important in contractor's bidding strategy (Prajapati, Pitroda and Bhavasar, 2015). One of the strategy to outsmart other competitors, a contractor submits bid lower than others including the consultant's estimate. There are instances that the contractor lowers a bid figure to an unrealistic level just to win the contract. In a lowest bid system, such contractors can still win the contract but most often with associated challenges during contract implementation (Khan & Khan, 2015).
- c. Amount of error: error in estimates come in diverse forms. For example, there is arithmetic error, error of omissions and commissions, error in transfer of figures during bill preparation, etc. The underlying issue here is that error can either add to the bid figure or reduce it. In most cases, it offsets the winning strategy of the bidder, making the offer either too low or too high unlike what the bidder targeted. Error has therefore been seen as affecting the chances of winning contracts.
- d. Average bids: researchers have recommended the use of the average of all the bids to select a winner in construction competitive bidding system. The justification of the recommendation lies on the argument that it represents what the entire group of bidders believe is fair. Sammoura (2010) asserted that, it is what the group of bidders believes to be the fair value of the work and should form the bases of the selection process. Under this system, bids above and below the average could be judged unrealistic. Therefore, with the consultant's estimate and number of contractors invited to bid, after return of offers, the errors in each offer is assessed and then the average of the entire bid figures is computed. Therefore, Carr ((2005) used the consultant's estimate and number of bids to develop a model to predict the lowest bid a contractor should reasonably offer. This research premises that among these four variables, one or a combination should form a better means of determination of the lowest responsive responsibly bid among the

competitors which is the subject of enquiry.

Contractor selection

The selection of the right contractor for a construction job is still a challenging task in the competitive bidding system (Gandu *et al.*, 2020). The promotion of efficiency relates to the selection of the bidder with the lowest price among others so as to achieve best “value for money” on behalf of the investor (OECD, 2011). The lowest bid is still given high considerations and favoured by public clients in the award of contracts. For example, the lowest bid is extensively favoured for award of public works contracts in the US (Shrestha & Pradhananga, 2010), India (Kumar & Raj, 2020) and Pakistan (Khan & Khan, 2015). By implication, contractors that submit the lowest bid during competition usually wins the contract. Purportedly, the lowest bid has not often performed satisfactorily in meeting up with the objectives of the bidding process (Bajaber & Taha, 2012). Shrestha & Pradhananga (2010) demonstrated the impact of competitive bidding on a bid price of the projects and found that, the greater the number of bidders competing in a bidding process, the lower the likelihood bidders will offer. Khan & Khan (2015) observed that unrealistically low bids have won contracts during competitive bidding in Pakistan with consequences of impediments to construction contracts success. Also, the impact of the lowest bid price on the final construction cost of projects was found as not always resulting in a low construction cost (Shrestha & Pradhananga, 2010). There was a proposed statistical procedure based on average bid price to eliminate the unrealistically low bids in competitive bidding (Hiyassat, 2000).

Perturbed by large number of defaulted or failed projects and large number of disputes attributed to contractors during construction contract implementation process, Bajaber and Taha (2012) investigated the way contractors are selected in Saudi Arabia. It was the submission of the researchers that with proper selection of the contractor, the

anomalies will be reduced to a greater extent. The research found among others that the industry relies so much on lowest price as criterion for award of contracts which caused the anomalies. The practice guarantee incompetent lowest bid contractors becoming successful during bidding; and such contractors were behind defaults and failures during the contract execution processes. Mahmood *et al.*, (2010) believe that it is natural that lowest bids contain unreasonable low rates as strategy of winning competitions, and that this has failed to deliver projects within required cost, time, scope and quality demand. In Pakistan, the award of construction projects also favours the lowest bidder most often. The Pakistani public sector relies so much on lowest bid system in construction contracts award the essence of which is to obtain the least cost of construction projects (Khan & Khan, 2015). The effect of this low bid awarding system in public construction projects and also, the general performance of the lowest bid system during construction contract execution in Pakistan was therefore investigated (Khan & Khan, 2015). In a questionnaire survey, Khan & Khan (2015) compared five other contractor selection systems with the lowest bid approach using 10 contractor's performance parameters. The lowest bid system was found to be a poor system in project delivery in terms of cost, time and quality demand. The research found over 50% of the projects studied which were awarded based on the LBS overran their budgets and ended up with higher cost consequences. Respondents opined that the situation will improve if the lowest bid system of award is avoided. Kim & Skibniewski (2020) were in the view that the bids rejected in favour of the lowest could contain more important information beneficial to the project success even better than the lowest bid favoured. Kim & Skibniewski (2020) argued that the possibility exists where some risks were discovered which increased the bids above the lowest one favoured. Kim & Skibniewski (2020) then established that project that experience wider bid variation during competitive bidding tagged as risky projects,

is more likely to end up with higher construction cost when compared to those with narrower bids variations.

The literature therefore established among others, how bidding can affect success of construction contract execution including factors influencing bidding chances.

METHODOLOGY

This paper is a follow-up to the works done by Carr (2005) and Ganduet *al.* (2020). Therefore, following Carr (2005)'s

model, Ganduet *al.* (2020) who were drawn to its weaknesses complemented the research trajectory. Ganduet *al.* (2020) then established seven different regression equations from four identified factors that can predict the lowest bid. The predictive strength of the seven equations were compared with that of Carr (2005) but concluded that Carr (2005)'s model, equation 6 in Table 1 with NB and CE as independent variables was more feasible. Table 1 indicates the selection of variables used by Ganduet *al.* (2020).

Table 1: Independent variables in each equation

Equations	Independent variables			
	CE	ACB	APE	NB
Equation 1	✓			
Equation 2		✓		
Equation 3			✓	
Equation 4				✓
Equation 5	✓	✓		
Equation 6	✓			✓
Equation 7		✓		✓

Source: Gandu *et al.*, 2020

Key

CE	Consultant's Estimate, independent variable (x1)
ACB	Average Corrected Bid, independent variable (x2)
APE	Average Percentage Error, independent variable (x3)
NB	Number of Bids, independent variable (x4)

However, one key finding in Gandu *et al.* (2020)'s research is that the combination of different variables affected the robustness of the equations. There was mutual effects among variables when combined in different equations. Variables exhibited different degrees of influence on lowest bid prediction in different equations. Therefore, the possibility that other robust models exist when more variables are combined in the same equation was established.

Data for the analyses consist of extractions of the required variables, the NB, CE, ACB and APE from bidding reports of a set of hydro engineering water projects that were performed between 2015 and 2017 and supplied by two client organisations- The Sokoto Rima River Basin and Rural Development Authority, and The Hadejia Jamare River Basin. Both organisations that supplied the data are responsible in public water supply projects representing the North Eastern and North Western regions of

Nigeria. Thirty six (36) completed projects of diverse magnitudes involving 220 bids with diverse level of competition was used.

Two regression equations with a matrix of three variables and one with a matrix of four were developed and then compared with the findings reported by Carr (2005) and Ganduet *al.* (2020). The first equation

combined the variables of CE, ACB and APE, while the second one has NB, ACB and APE. The combination pattern of three and four variables is shown in Table 2. The equations derived from numbers 1 and 2 were first compared and the best among them compared with equation from number 3 and then the earlier equation recommended by Gandu et al.(2020).

Table 2: Independent variables in each equation

Numbers	Independent variables			
	CE	ACB	APE	NB
1	✓	✓	✓	
2		✓	✓	✓
3	✓	✓	✓	✓

Key

CE Consultant's Estimate (independent variable x1)
ACB Average Corrected Bid (independent variable x2)
APE Average Percentage Error (independent variable x3)
NB Number of Bids (independent variable x4)

RESULTS

Table 3 reports the results of the summary of the regression statistics of the equations in question. The first values generated in this work are for the equation consisting of variables recommended by Ganduet *al.*(2020) while equations 2 to 4 are values for the new equations generated.

EQUATION	INTERCEPT	SLOPE	R SQUARE	STD. ERROR	SST	SSR	SSE	P-REGRESSION	P-VALUE
1 -CE	8754554.303	0.814	0.954	5640825.187	2.296E+16	2.191E+16	1.050E+15	0.000	0.000
-NB		-1680451.124						0.000	
2 -CE	-1786282.585	0.671	0.929	7150065.567	2.296E+16	2.133E+16	1.636E+15	0.000	0.000
-ACB		0.159						0.209	
=APE		12704627.71						0.614	
3 -ACB	10688477.016	0.828	0.880	8868127.967	2.296E+16	2.044E+16	2.517E+15	0.000	0.000
-APE		106872026.838						0.000	
-NB		-1817926.592						0.003	
4 -CE	8447902.056	0.0653	0.959	5511943.307	2.296E+16	2.202E+16	9.418E+14	0.000	0.000
-ACB		0.0180						0.069	
-APE		23203112.83						0.239	
-NB		-1712754.330						0.000	
Y= 8754554.303+0.814CE-1680451.124NB									-----1
Y= -1786282.585 + 0.159ACB+ 0.671CE+ 12704627.705APE									-----2
Y = 10688477.016 + 0.828ACB + 106873026.838APE – 1817926.582NB									-----3
Y=8447902.056 + 0.0653CE + 0.018ACB + 23203112.83APE - 1712754.330NB									--4

Where Y is the dependent variable (lowest bid), while CE, NB, ACB and APE are independent variables in the equations.

DISCUSSIONS

Table 3 above presents the summary of regression statistics of four equations (eqn. 1-4). The equations have different matrixes of factors that influence the lowest bid in a competitive bidding system. The equations are compared to ascertain the onewith the best tendency to predicting more correctly the lowest responsive responsible bid at the earliest possible time in a bidding process. Three new equations (2-4) were generated and compared with Ganduet *al.* (2020)'s findings reported in equation 1. Gandu et al. (2020) recommended the consultant's estimate (CE) and number of bids (see equation 1) as the best predictor of lowest bid in a bidding system similar to Carr (2005). That analyses of the set of equations by Ganduet *al.* (2020) revealed a case where some variables impacting on the robustness of the equations, especially where the matrixes of two variables were used. The research did not set to combine more variables. As such, the need to investigate further by combining three variables and the four in an equation becomes an issue of research concern which is addressed herein. Comparing the equations 2 and 3 with three variables in Table 3, the p-values of equations 2 and 3 are both 0.000 which is less than 0.05 level of significance. It indicates that the relationship between the dependent and independent variables in each equation is of significant strength. It means both equations can be used in predicting the lowest bid with significant accuracy. The next question is that, when the independent variables change, to what extent does the dependent variable react or change? The Square r values in the table measures the ratio of change in the dependent variable by virtue of the changes in the independent variables, which therefore measures the level of dependency between them. Equation 2 has three independent variables which are CE, ACB and APE, and has a value of square r as 0.929 for the equation. This interprets as 92.9% level of dependency between the dependent and the independent variables. In other words, 92.9% of the change in the dependable variable (Y) is as a result of the change in the independent variables (Xi). Equation 3 shows square r value to be 0.88 or

88% level of dependency and this is less than that of equation 2. It suggests that equation 2 is a better predictor of the lowest responsive bid than equation 3. The sum of squares residue SSR is the measure of the amount of changes in the dependable variable that can be explained. It is said to be explained because the changes are due to the relationship with the independent variables otherwise, other factors outside the relationship could be the cause of the changes. Equation 2 has SSR value as 2.133E+16, i.e. the amount of changes that can be explained and 1.636E+15 (SSE) which cannot. The amount of changes that can be explained is far greater than that which cannot, which also connotes a strong relationship. Comparing equation 2 to equation 3 (equation 3 having the SSR as 2.044E+16 and SSE as 2.517E+15) the relationship between x and y in 2 is stronger than in 3. There is more external influence (SSE) in 3 (2.517E+15) than in 2 (1.636E+15). In other words, a greater amount of changes in 3 cannot be explained as compared to 2. It can be concluded from the analyses that equation 2 is a better predictor compared to 3.

Since we are interested in the best equation, at this level, we eliminate equation 3 to be left with three equations (1, 2 and 4) driven. The first equation (1) has been found to be better by previous researchers and the second (2) established to be better than the other from the analyses of the regression statistics. The two are then compared with equation 4. Equation 1 has two variables, equation 2 has three variables and equation 4 has all the four variables believed to influence the lowest bid combined. The key issue is to find out which among the three equations best predicts the lowest bid in competitive bidding system.

The p-value of equations 1, 2 and 4 are both 0.000. The values are both less than 0.05 level of significance. It indicates that we reject the no significance hypothesis and accept that there is significant relationship between x and y for both equations. By implication, the dependency of the independent variables on the dependent

variables in all the equations is significant. It is established here that the equations are therefore good predictors of the lowest bid. Furthermore, we consider the value of the square r of all the equations which estimates the ratio of influence of the independent variables on the dependent variables. In other words, when the independent variables x_i change, to what extent does the dependent variable y change? Equation 1 has value of square r as 0.954, equation 2 has 0.929 and equation 4 is 0.959. It means the level of dependency of y on x for the equations are 95.4%, 92.9% and 95.9% respectively. Equation 4 has stronger degree of dependency and is therefore a better predictor by virtue of this result followed by equation 1 and then 2. Also, the explained variable SSR in the equations are $2.191E+16$, $2.133E+16$ and $2.202E+16$ respectively. Again equation 4 has higher value of SSR which proves that there is a higher degree of the changes that can be explained which shows that the influence on y as a result of the relationship with x is higher, followed by equation 1 and then 2. Similarly, the external influence in the equations that cannot be explained SSE are $1.050E+15$, $1.636E+15$ and $9.418E+14$ respectively which depicts less value in equation 4. Thus, it still confirms equation 4 as the best and followed by equation 1 also and then 2.

The standard error, is the measure of deviation of the individual values Y_i from the mean of Y_i . The table shows that equation 1, 2 and 4 have standard error values as 5640825.167, 7150065.567 and 5511943.307 respectively. Equation 4 has a lower error value which means that the individual values of Y_i comparatively deviates less from the mean of Y_i . Therefore, the likelihood of error if the equation is used to predict Y is less. This is therefore a better model and followed by equation 1 for having the lower standard errors compared to equation 2. The conclusion under this section is that the best equations to predict the lowest bid among many bidders in an order of priority are equations 4, 1 and 2.

However, looking at equation 1 which has two variables consisting of CE and NB, and both variables are contributing significantly in predicting the lowest bid as their p -regressions values (both 0.000) are less than 0.05 it suggests a good case. Equation 2 on the other hand has three variables which are, CE, ACB and APE. The equation denotes that two out of the three variables, ACB and APE are not contributing significantly in the prediction nature of the equation as the p -regression of both variables are 0.209 and 0.614 for ACB and APE respectively, and each above 0.05. Equation 2 therefore depends heavily on the CE in the prediction effort since ACB and APE are not contributing much. Equation 4 has all the four variables as the independent variables which was also adjudged as the best equation. However, the p -regressions indicate that two variables, ACB and APE are not contributing significantly in the equation also as the p -regressions are greater than 0.05 also, the values being 0.059 and 0.259 respectively. By implication, only the CE and the NB are contributing significantly with p -regressions as 0.000 each which is less than 0.05. It shows that equation 4 depends heavily on the CE and NB which are the same variables contained in equation 1 which can be considered a more feasible equation. Furthermore, equation 1 which depends on CE and NB has the capacity to predict the lowest bid earlier in the bidding process because it can be achieved as soon as the consultant's estimate is ready. By the time the consultant prepares an estimate, the client needs only to decide on the number of bidders in a bidding competition to determine the expected lowest responsive bid. In equation 4, even though being more robust, must wait till the return of bids from contractors and the labour of assessing the errors and average corrected bid before the lowest responsive bid can be ascertained mars the advantage.

CONCLUSION

This research set out to derive a model that can be used to predict the lowest responsive bid in a construction competitive bidding system. Four variables were identified as

having some degree of influence in arriving at the lowest bid offered by the contractor in competitive bidding. The four variables were used to derive a set of regression models using different matrixes. The equations driven were then compared. It was discovered that:

1. Three equations were robust in predicting the lowest responsive bid.
2. There is mutual influence between variables combined in an equation which affect the robustness of an equation depending on the variables combined.
3. The regression model that combines the four variables as independent variables was the most robust with 95.9% dependency followed by the one with two variables (CE and NB) with 95.4%.
4. Error and the average of bidders exert insignificant influence in

predicting lowest bid in competitive bidding. In contrast, the number of bids and the consultant's estimate exert significantly.

5. Predicting the lowest bid depends significantly on two variables which are CE and NB. Even though the contribution of error and average bids in predicting the lowest bid is insignificant in the equations derived, the strength of the equation with both variables included was improved compared to when they were excluded.
6. The lowest bid is directly proportional to the consultant's estimate but inversely proportional to the number of bids solicited. In other words, the higher the consultant's estimate the higher the lowest bid but the more the number of competitors the less the lowest offer, vice versa

RECOMMENDATION

Equation 4 is the most robust predictor of the lowest bid in competitive bidding and is recommended in this work.

$$Y = 8447902.056 + 0.0653CE + 0.018ACB + 23203112.83APE - 1712754.330NB \quad --4$$

However, it can only be used under the condition that bids have been returned and analysed such that the error level of each and the average of all the bids submitted obtained. This limits the prediction in this case to functions just to ascertain the optimum offer for award. Where there is the need for earlier prediction of the lowest bid even before contractors are invited, and if there's need to avoid the laborious bid analyses, then equation 1 is recommended as the optimum predictor of the lowest bid in competitive bidding.

$$Y = 87545544.303 + 0.814CE - 1680451.124NB \quad -----1$$

Equation 1 has CE and NB as the independent variables. This finding further establish the earlier research works done by Carr (2005) and Ganduet *al.* (2020) who recommended the use of CE and NB to predict the lowest responsive bid in a similar study. However, a more scientific justification has been established on the choice of the two independent variables.

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DETERMINATION OF VEGETATION AND RELIEF THRESHOLDS FOR GULLY INITIATION IN KEREKE WATERSHED OF THE LOWER BENUE TROUGH

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ABSTRACT

Gully erosion is a serious environmental problem causing lot of havoc to the global environment including Kereke Watershed of the Benue Trough. This study therefore determines the thresholds of vegetation and relief parameters as intrinsic threshold factors for gully initiation in the Kereke Watershed of the Benue Trough, to enhance gully erosion control. The systematic sampling procedure was used to select thirty-two settlements in the study area as catchment areas for data collection. Data on vegetation, relief parameters and gully intensity/frequency were collected from direct field measurements and participatory observation. Percentages and means were used to depict variations in the data set. Plot scatter graphs were used to establish the relationship between vegetation, relief and gully frequency/intensity to determine threshold values for gully initiation. Findings of the study shows that the critical thresholds of 69% for vegetation cover, 5cm for depth of litter cover, 2° for valley slope angle and 71m for elevation above sea level, are essential for gully initiation in the Kereke Watershed. The study established that Kereke watershed exceeded the threshold values of vegetation cover, depth of litter cover and slope gradient for gully initiation, and therefore gullies were incised in some parts of the watershed. It is therefore recommended that government and individuals should engage in afforestation by planting of trees to help improve vegetal cover, depth of litter cover and slope stability in the study area. This will help to reduce the intensity of gully initiation in the study area for enhanced environmental management.

Key words: Gully initiation, Kereke Watershed, relief, thresholds, Vegetation

INTRODUCTION

Gully erosion poses severe problems to the global environment. Pimental (2006) noted that gully erosion is a very serious environmental problem causing lots of havoc to people in different places. Gullies develop as a result of accelerated erosion in disturbed watersheds; and it is a critical problem of the Nigerian environment as reported by Faniran and Jeje (2000). Udosen (2000), Songu, Oyatayo and Iorkua (2015) observed that gully erosion is an important soil degradation process in a range of environments especially within the humid tropics, causing considerable soil loss and

producing large volumes of sediment downstream due to high rate of surface runoff. Gullies are also, effective links for transferring runoff and sediment from uplands to valley bottoms and permanent channels where they aggravate offsite effects of water erosion like flooding and river poisoning (Fubara, 1988).

Soil erosion is triggered when the threshold conditions or limit values of environmental factors are exceeded (Charlton, 2008). Threshold is therefore the point where a system's behavior changes from normal to a new set of behavioral pattern (Charlton, 2008). Threshold can be influenced by

internal factors such as geologic formation, soil, relief or external factors such as climate, base level and anthropogenic activities. The most common threshold in an environment is soil threshold or resistance of surface materials and water flow or wind velocity for particles and sediment transportation. Gully erosion generally has some thresholds including topographic thresholds, geomorphic, climatic, hydraulic and vegetation thresholds among others. These thresholds help in understanding how changes in watershed parameters influence the initiation of gullies in a drainage basin (Katz *et al.*, 2013). Also, Schumm (1979) opined that identifying threshold conditions of geomorphic phenomena helps in providing explanation for the emergence of landforms; and also to identify insipiently unstable landforms and predict changes that may occur in them.

Charlton (2008) noted that understanding the internal and external thresholds of fluvial systems such as gully erosion serve as guide to the feedback mechanism of such systems. This in turn, is helpful in controlling the extent of landscape evolution due to erosion processes. Feedback therefore, occurs when a change in one variable leads to a change in one or more other variables; which acts to either counter-act (negative feedback) or reinforce (positive feedback) the effects of the original change (Charlton, 2008). Fluvial systems like gully erosion often experience positive feedback, resulting from reinforcement of the effects of the original change caused by both internal and external factors. This becomes detrimental to environmental sustainability; once the threshold points of such controlling factors are exceeded (Charlton, 2008).

Schumm (1979), Ebisemiju (1989), Udosen (2000) noted that in a given landscape, whether a gully is initiated or not, depends on the extent of the alteration of vegetation cover, slope length, slope gradient, nature of earth materials; all of which combine to determine the resistance of earth materials to the tractive force of runoff and other fluvial processes such as soil erosion. The above observations indicate that the process of

gully erosion is dependent on certain critical and boundary conditions of environmental factors; depending on a complex combination of such factors in a given environment. The observed current situation in the Kereke Watershed is that, the incidence of gully erosion has increased to disastrous level in some parts of the basin, especially in North Bank area, Agan, Daudu, Yerewata, Agyaragu among others; which has resulted in the destruction of farmlands, houses and roads. However, literature review indicates paucity of knowledge regarding the threshold values of vegetation and relief parameters as internal threshold factors for gully initiation in the Kereke watershed which ought to be useful for gully erosion control measures. It is against this backdrop, that this paper established thresholds of vegetation and relief parameters for gully initiation as its aim, to bridge literature gap and enhance environmental sustainability.

The aim of the study was achieved through the following objectives:

- (i) To determine the threshold values of vegetation characteristics for gully initiation in Kereke watershed
- (ii) Ascertain the threshold values of relief parameters for gully initiation in the study area.

THE STUDY AREA

Kereke watershed of the lower Benue Trough lies between latitude 7°36'N and 8°20'N and between longitude 8°28'E and 8°50'E (Ministry of Lands and Survey Makurdi, 2016). The Kereke watershed like other parts of the Benue Trough experiences wet and dry climate known as "Aw" by Koppen's climatic classification scheme. This type of climate is also called the tropical humid savanna climate (Tyubee, 2005). The wet season which last for seven months starts from April and ends in October. Conversely, the dry season starts from November and ends in March. The climate is usually associated with torrential rainfall and high temperatures. The annual total rainfall ranges from 1000mm to 2000mm, with an average annual intensity of 44.85mm/hr (NIMET, 2015).

Temperatures are high throughout the year,

averaging 27°C to 31°C. Though, it may occasionally rise to 37°C in some days in March and April. The study area is confined in the Guinea Savanna region of the Benue valley. It is therefore characterised with shrubs, grasses and trees. Some of tree species in the study area include: Raphia palm (*Raphiasudanica*), sheabutter trees (*Butrospernumparadoxum*), Malina (*Gmelinaarbores*), Obeche (*Afzetia Africana*), locust bean trees, Mahogany, Iroko trees. Other economic trees found in the study area are Mango (*mangiferaindica*), Cashew tree (*Anacardiunaccidentale*), Guava (*Psidiumguajava*), Pawpaw (*Caricapapaya*), Palm tree (*Elaeisguinniensis*), Banana (*Musaspp*) and Sweet orange (*citrussinensis*).

The geology is predominantly sandstone. The sedimentary basins found within the Benue trough aulocogen comprises of older and younger sedimentary rocks formed between Paleozoic and Cenozoic era of geologic time scale (Benkhelil, 1989). The superficial geology of the Benue trough is largely meta-sediments, predominantly comprised of alluvial deposits made up of sand, clay, silt, gravel and pebbles and forms the dominant surface geology of the study area (Benkhelil, 1989). The study area is endowed with erodible soils, which are

predominantly deep, sandy and are derived from alluvial deposits. The soil is well drained and so the water holding capacity is limited; and more so, because the soil has moderate organic matter content which enhances permeability (Aneke, 1991).

The Kereke watershed has an undulating terrain with slope angle exceeding 10° in some steep areas. Its general topography varies between 69m – 255m as analysed from Satellite Imagery (SRTM) of the study area. The Kereke watershed is a 4th order drainage basin, with a total of fifty-nine 1st order streams, twenty-seven 2nd order streams, twelve 3rd order streams and one 4th order stream. The Kereke watershed has an average bifurcation ratio of 5.48. The moderate bifurcation ratio could be attributed to the sedimentary rocks which underlain the basin and moderate rainfall intensities. The mean bifurcation ratio of 5.48 implied that the dissection of the Kereke drainage basin is coarse and this could influence channelised flow especially at the lower segment of the basin and thereby influencing gully initiation in some parts of the basin. Figures 1 and 2 are location and relief maps of the study area.

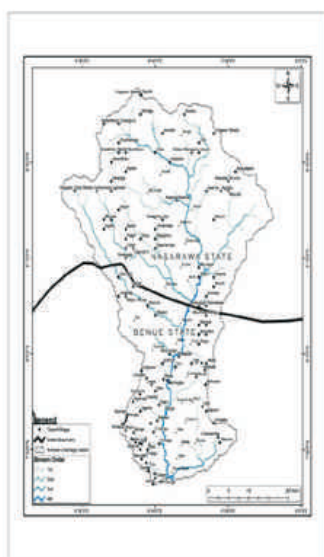


Fig 1: Location of Kereke watershed

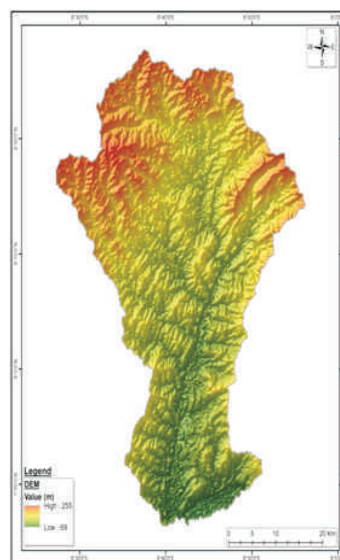


Fig.2: DEM of Kereke watershed showing variation in relief

Source: Authors' GIS Analysis from SRTM, 2018

METHODOLOGY

The field observation design with emphasis on direct field measurements was adopted in this study. Sample size for the study was determined by using topographic map sheets Makurdi 251 NW, Makurdi 251 NE, Makurdi 251 SW and Makurdi 251SE at the scale of 1:50,000; published by the Federal survey of Nigeria in 1970 (Office of the Surveyor General of Nigeria, 2016). The entire Kereke watershed which is 372.41km² identified on the map, was covered with network of grid lines at interval of 1cm;

which represented 500m on the ground. All the grids were then numbered; and the total number of grid cells covering the drainage basin were 62; representing the sample frame. The systematic sampling procedure was then used to select 32 grid cells at every second grid cell, which represented interval of 1km² for data collection. The systematic sampling procedure was achieved by selecting the grids with even numbers, and with a starting point of 0. Location of the sampled grids is shown in Table 1.

Table 1: Location of sampled grids

S/N	Selected Grid Number	Settlement (catchment area)
1	0	Low cost housing, North Bank
2	2	Agan
3	4	Daudu
4	6	Ikpam
5	8	Gide
6	10	Iyorkyaa
7	12	Akiki
8	14	Kwabo
9	16	Gever
10	18	Asamakaha
11	20	Ukpian
12	22	Ajo
13	24	Kyaan
14	26	Usan
15	28	Amala
16	30	Agena
17	32	Hinyam
18	34	Yerewata
19	36	Ande
20	38	Kyado
21	40	Kadarko
22	42	Akumba
23	44	Gogo
24	46	Achuwa
25	48	Gaval
26	50	Giza
27	52	Ume
28	54	Adobi
29	56	Aloshi
30	58	Agyaragu
31	60	Adugu
32	62	Agaza

Source: Authors' Analysis, 2018

Data needs on vegetation and relief parameters were collected as follows: information on vegetation was sourced from field measurements using survey equipment. Vegetation parameters needed were vegetation cover and litter cover, which were measured and expressed in percentage and centimeter (cm) respectively. Vegetation cover was determined using visual estimation method by measuring the extent of the leave coverage on ground in meters using a measuring tape. Depth of litter cover was measured by digging through the soil using a hand trowel and measuring the depth of litter cover with a ruler. Relief parameters such as valley slope angle and elevations were also measured on the field using an Abney Level and a hand-held Global Positioning System (GPS) Germin 12 version and expressed in degrees and meters respectively. Field measurements were done as shown below.

(I) Vegetation cover: Vegetation is an assemblage of plant species and the ground cover they provide by extension of their branches and leaves is referred to as vegetation cover (Charlton, 2008). It is important to note that in erosion research, it is imperative to know the proportion of the ground that is covered, especially near the ground. This gives the measure of the ability of vegetation to intercept raindrops or alternatively; the proportion of bare ground open to direct rain drop splash. The method that was used to measure vegetation cover was the visual estimation method, using quadrat size of 10m x 10m. Because of the large size of the quadrat, vegetation cover was measured at two different areas within each of the 32 sampled areas. The choice of the large quadrat size was based on the cleared vegetation in some parts of the basin. This was to enhance the availability of different trees and shrub species for observation and measurement and average vegetative cover was then computed.

The visual estimation method was adopted because it was fast, required no specialised equipment, and was adapted on plants of various growth forms. The vegetation cover was determined as an estimate of the area of

influence of the plant leaves and canopy by estimating the area of a quadrat that is covered by a plant's canopy. It was calculated by measuring the extent of the leave coverage on ground in meters, divided by the total quadrat area and multiplied by 100 percent.

(ii) Litter cover: Litter cover is dead plant materials that have fallen to the ground surface. This detritus or dead organic material and its constituent nutrients are added to the top layer of soil (Brady and Weil, 2000). The depth of litter cover for each sampling area was measured with the aid of a ruler by digging through the soil at the depth of 30cm and expressed in centimeters. Two measurements were taken in each of the sampled grid and average was then computed for analysis

(iii) Valley slope gradient: This is the gradient or inclination of an area along a slope profile from upslope to downslope (Young, 1972). Valley slope gradients in the sampled grids were measured using the methods devised by Young (1972) using random sampling method. Slope angles were measured within each sampled area using an Abney Level and expressed in degrees..

(iv) Elevation (Relief): The elevation of a geographic location is its height above or below a fixed reference point, most commonly a reference geoid or Earth's sea level as an equipotential gravitational surface (Charlton, 2008). The heights above sea level in the study area were determined in each of the thirty-two sampled settlements using a Global Positioning System (GPS) GERMIN 12 version. The hand held GPS was switched on, allowed to receive signal and then placed on the ground where the measurement was to be taken in each of the sampled settlements. In gullied sites measurements were taken 5m away from the gully channel, to identify the critical relief associated with the gully development.

(v) Gully frequency/Intensity: This is the number of gullies incised in an area. In geomorphological study, it is used as a measure of the extent of gully initiation as

reflected by the intensity or frequency of the gully erosion channels. The gully frequency/intensity in the study area was determined as the number of gully channels per square kilometer (Udosen, 2008).

Data collected was analysed using descriptive statistics such as percentage and mean to ascertain variation in the data set and presented in tables. Percentage was computed using the formula:

$$\frac{n}{\sum N} \times 100 \dots \dots \dots (1)$$

In the formula, n, is the value of each individual score and $\sum N$ is the sum of the all the scores.

Mean was calculated using the formula:

$$\frac{\sum N}{n} \dots \dots \dots (2)$$

where $\sum N$, is the sum of all the value observation and n, is the number of observation.

The independent variables that were used to determine thresholds of gully erosion initiation in this research were: vegetation and relief characteristics. The dependent variable that was used is gully frequency or intensity. The Microsoft excel software was used to plot the scatter graphs for independent and dependent variables. The point where the slope of the regression line (b) cut or interfaced with the x-axis represented the threshold value of the independent variable. One of the major limitations of Microsoft excel software was that, points along x and y axis with the same value were plotted as one value, instead of repeated plottings. Therefore, in most cases fewer than expected points were shown on the scattergrams.

RESULTS AND DISCUSSION

Thresholds of Vegetation Characteristics for Gully Initiation in the Study Area

Data on vegetation characteristics were collected on vegetation cover and depth of litter cover. The results are presented in Table 2.

Table 2: Vegetation cover, depth of litter cover and Gully frequency in the study area

Serial Number of Sampled Areas	Vegetation cover (%)	Depth of litter cover (cm)	Gully frequency/intensity
1	38.9	1.4	1.0
2	41.9	4.8	1.0
3	43.5	1.5	1.0
4	50.2	2.8	0.0
5	39.3	2.7	0.0
6	51.0	3.4	1.0
7	70.5	3.5	0.0
8	53.2	2.7	1.0
9	66.9	2.4	0.0
10	52.2	2.3	1.0
11	41.8	2.7	0.0
12	55.9	2.3	2.0
13	43.7	1.7	0.0
14	41.5	3.3	1.0
15	56.2	2.9	1.0
16	51.9	2.4	0.0
17	45.9	2.5	0.0
18	48.8	2.6	0.0
19	55.6	3.5	1.0

Serial Number of Sampled Areas	Vegetation cover (%)	Depth of litter cover (cm)	Gully frequency/intensity
20	62.9	3.0	0.0
21	58.8	5.3	0.0
22	64.5	4.2	0.0
23	54.3	2.2	1.0
24	65.7	2.0	0.0
25	49.1	2.3	1.0
26	46.8	2.6	0.0
27	53.8	2.4	0.0
28	71.0	1.9	0.0
29	48.6	2.0	1.0
30	47.0	2.5	1.0
31	54.8	5.2	0.0
32	60.8	3.5	0.0
Total	1686.2 (%)	89.7 (cm)	15
Mean	52.7%	2.8cm	

Source: Authors' field work, 2018

The results presented in Table 2 contains information on vegetation cover and depth of litter cover as measured in the field in the course of this study. Table 2 also contains the computed average values of vegetation cover and depth of litter cover in the study area. Available results on vegetation cover indicated that the mean value of vegetation cover in the Kereke watershed is 52.7%. The moderate mean value of vegetation cover showed that, the area is endowed with secondary vegetation of different trees and shrubs species that produce moderately large vegetation canopy for shielding the ground surface from direct raindrop impact. It is therefore obvious that where vegetation cover is large, rainfall droplets are likely to be intercepted by the leaves of the plants; and this has implication on the energy exerted on the earth surface at any given time in relation to gully initiation.

Results on depth of litter cover contained in Table 2 shows a mean value of 2.8cm. The mean depth of litter cover in the Kereke watershed is considered moderate. Litter cover plays a significant role in gully erosion control, where there is huge deposit of litter within the upper layer of the soil profile, the tractive force of surface runoff is reduced. At the initial stage of soil erosion development,

in form of sheet erosion through rill and subsequently gully erosion, the depth of litter cover helps to limit the development of these erosion stages by way of providing the organic matter in form of humus needed to bind the soil particles together thereby improving infiltration into the soils, its cohesiveness, thereby reducing its erodibility.

It was observed in the field during this research, that most of the litter cover was in form of semi-decayed leaves, freshly deposited leaves, remains of animals and decomposed organic contents. This could be the rationale behind the moderate depth of litter cover in the Kereke watershed, as most of the organic matter contents were found not to be completely decomposed; and therefore could not be carried down the soil profile.

Scatter graphs were plotted using the data in Table 2 in Microsoft excel software to determine the threshold values of vegetation parameters for gully initiation in the study area. Figure 1 is a scattergram showing the relationship between vegetation cover and gully frequency vis-à-vis the threshold value of vegetal cover for gully initiation in the study area.

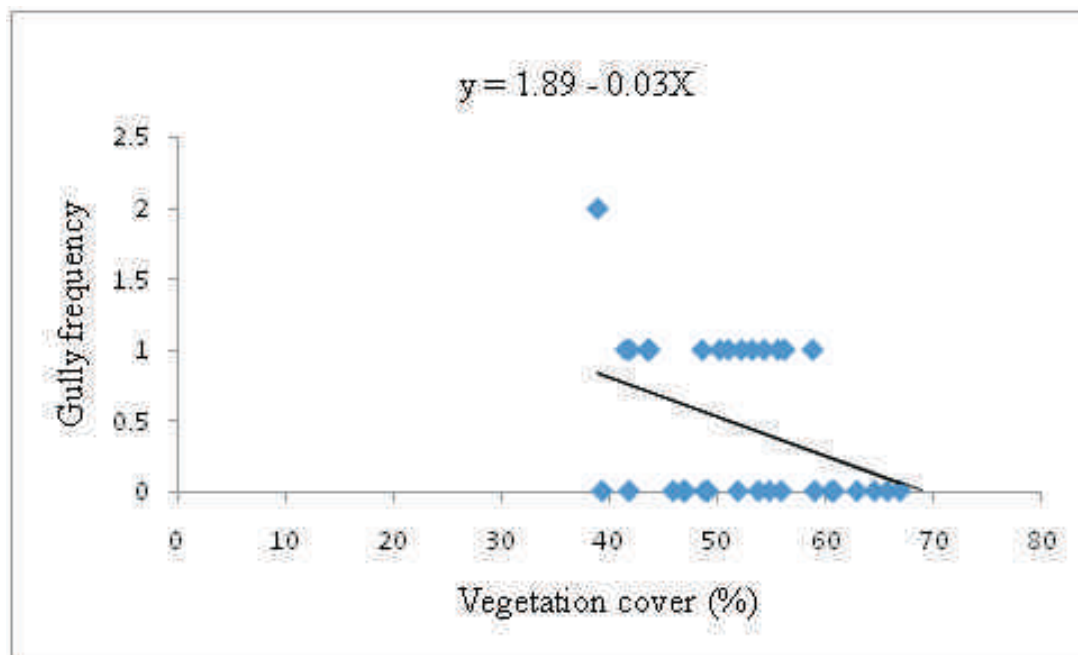


Figure 1: Scattergram showing the vegetation cover and gully frequency
Source: Authors' Analysis, 2018

Fig. 1 shows that the threshold value of vegetation cover for gully initiation in the Kereke drainage basin is 69%. This was determined using the point where the slope of regression line or line of best fit cuts the X-axis on the line of independent variable (vegetal cover). The negative slope of regression line of best fit indicated that gully erosion is likely not to be initiated if the threshold value of vegetation cover is met and vice versa. Therefore, the threshold value for vegetation cover of 69% is considered the minimum value of vegetal cover in the study area that could be sustained for controlled gully initiation in the study area. Notwithstanding, vegetal cover of 40% to 65% as shown on the scattergram are critical values for gully initiation in the study area, just before the threshold condition is met. This is evident in the study area, as some of the selected settlements are incised with gullies, except areas that the threshold value of vegetal cover has not been met such as Akiki and Adobi settlements (Table 2).

The threshold value of vegetal cover for gully initiation in the study area is considered high; and this could be attributed to the nature of the superficial materials and the

nature of the soils in the area. Once this threshold of vegetal cover is not exceeded gully erosion may not to be initiated in Kereke watershed. This was observed in settlements such as Akiki and Kadarko. In settlements where thresholds were exceeded such as Federal low cost estate, Agan, Kwabo, AJo, Usan, Ande, Gogo among others were found to be initiated with gully erosion (Table 2). This was attributed to reduced vegetal cover in Agan, Kwabo, Ajo, Usan, Ande, Gogo and the nature of soils and geology of the area which is made up of predominantly sandstones.

The limiting value of 69% vegetal cover demarcated gullied areas from ungullied areas in the study area. The threshold values of vegetal cover for gully initiation in the study area is lower than values obtained in other places. For instance, Udosen (2000) reported an inverse relationship between vegetal cover and gully frequency, with a higher threshold of vegetal cover of 72.5% for gully initiation in Akwalbom State of Nigeria; and this was attributed to high intensity of rainfall in the area. The threshold value of vegetation cover (69%) in the

Kereke watershed approximated and agreed with the results reported by Udosen (2000) in Akwalbom State. This was based on the similar and sizeable nature of tree species found in the tropical Savannah environment of the Kereke watershed such as Malina (*Gmelina arborea*), Obeche (*Afzeta Africana*), locust bean trees, Mahogany, Iroko trees which are also found in the tropical rain forest of Akwalbom State. However, [Fen-Li Z heng](#)(2016) reported lower threshold vegetation cover of 50% in China; and it was attributed the soils and

moderate rainfall intensity in the study area. The high threshold value of vegetation cover (69%) observed in the study area is capable of protecting the ground surface from severe gully erosion initiation. This is because a high amount of vegetal cover in an area reduces the effect of direct raindrop impact, sediment loss and the tractive force of runoff that could enhance gully erosion initiation. Figure 2 is a scatter graph showing the threshold of depth of litter cover for gully initiation in the study area.

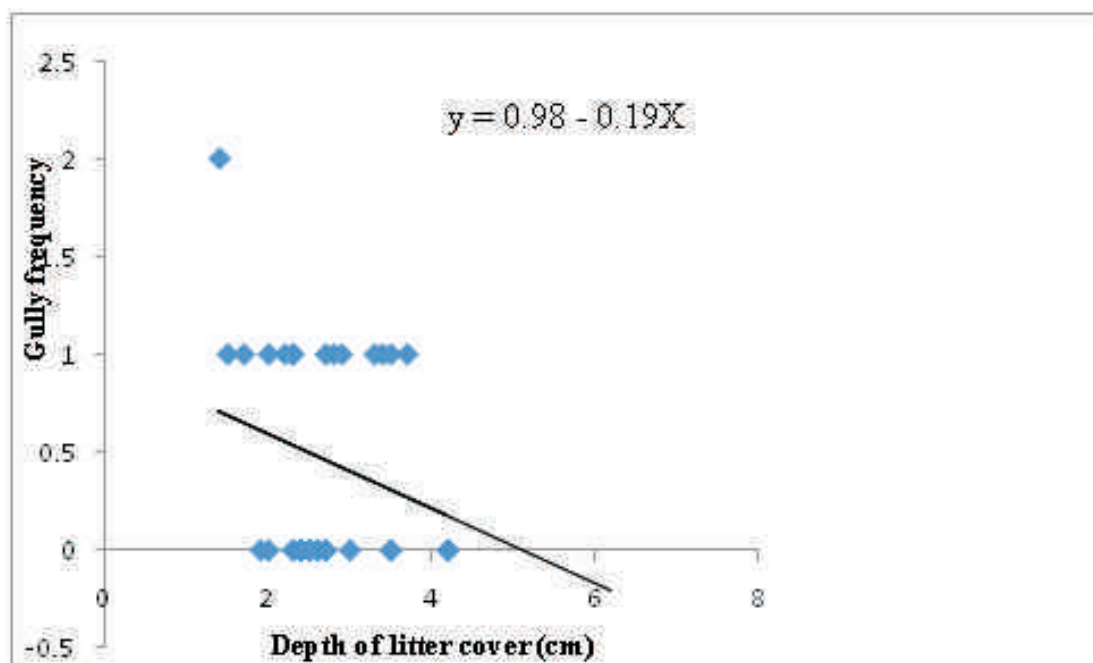


Figure 2: Scattergram of the litter cover and gully frequency

Source: Authors' analysis, 2018

The scattergram in Figure 2 shows that threshold value of depth of litter cover for gully initiation in Kereke drainage basin is 5cm. The negative slope of regression line indicated that gully erosion is not likely to be initiated if the threshold value of depth of litter cover is met and vice versa. The threshold value of 5cm is the depth of litter cover needed to prevent the initiation of gully erosion in the study area. Once this threshold value is not met, gully erosion is triggered. It was observed in most sampled settlements in the study area that the depth of

litter cover was lower than the threshold value, except in one settlement such as Adugu settlement (Table 2). The settlement was found to be ungullied, unlike other gullied settlements with lower depth of litter cover. High amount of litter cover helps to provide the soil with organic matter that binds the soil particles together and makes the soil more cohesive, enhance infiltration and thereby improving its ability to withstand the tractive force of surface runoff. The amount of decayed or semi-decayed leaves deposited on the ground surface

largely constituted part of the litter cover that helped to protect the soil from been eroded.

Threshold value of litter cover was not met in most of the settlements such as Low cost housing estate North Bank, Agan, Daudu, Ikpam, Gide, Iyorkya, Akiki and Kwabo; except Adugu settlement with number where it was met (Table 4.2). Most of the settlements where the threshold value of litter cover was not met were initiated with gully erosion. The inverse relationship observed between depth of litter cover and gully frequency/intensity in the study area indicated that gullies may not be initiated if the threshold value of litter cover is met. This was observed in the Kereke watershed as gullies were found to be initiated in areas where threshold value of litter cover was not

met. This finding confirmed those of *Gholami and Khaleghi (2013)*, who discovered that litter cover with a depth of 5.2cm played a significant role in reducing rate of sediment loss due to water erosion in the humid climate of the Haraz River basin.

Thresholds of Relief Parameters for Gully Initiation in the Kereke Watershed

Relief parameters considered in this study for gully initiation are slope angle and elevation of areas above sea level. These relief parameters were considered based on their impact on gully initiation, in terms of influencing surface runoff and sediment entrainment down slope. Data on relief parameters are contained in Table 3.

Table 3: Relief parameters and Gully frequency in the study area

Serial Number of Sampled Areas	Slope angle (degree)	Elevation above sea level (m)	Gully frequency/intensity
1	4	97	1.0
2	5	103	1.0
3	6	105	1.0
4	2	94	0.0
5	2	95	0.0
6	4	107	1.0
7	3	87	0.0
8	6	125	1.0
9	6	70	0.0
10	8	128	1.0
11	5	103	0.0
12	9	134	2.0
13	7	94	0.0
14	8	98	1.0
15	9	126	1.0
16	3	87	0.0
17	2	71	0.0
18	4	73	0.0
19	10	98	1.0
20	7	97	0.0
21	5	95	0.0
22	2	86	0.0
23	8	102	1.0
24	7	104	0.0
25	5	85	1.0
26	3	98	0.0
27	7	89	0.0
28	7	93	0.0
29	13	173	1.0
30	12	154	1.0
31	11	134	0.0
32	13	156	0.0
Total	203⁰	3361m	15
Mean	6⁰	105m	

Source: Authors' field work, 2018

Results on relief parameters were obtained directly from the field using an Abney level and GPS. Available data on slope angle shows that the mean slope angle in the study area is 6°. This slope angle observed in the Kereke watershed could have hydrological implications for the initiation of gully erosion. Mean slope angle of 6° is moderate to enhance surface runoff which in turn could initiate gully erosion in the study area. On a steep slope greater 6° gully erosion may be initiated faster than gentle slopes; especially when the removal of surface water is concentrated in narrow channels which eventually develop into gully erosion.

Results on elevation of areas above sea level in the Kereke watershed contained in Table 3

reveals that the mean elevation is 105m. The elevation of areas within the Kereke watershed is considered moderate. The effect of this level of relief in the study area is the enhancement of positive feedbacks in the initiation of gully erosion. This is because such elevations could enhance the concentration of surface runoff downstream and thereby influencing the initiation of gullies.

The thresholds of slope angle and elevation for gully initiation were determined and the result is presented in Figures 3 and 4. Figure 3 is a scattergram showing the relationship between slope angle and gully frequency in the study area.

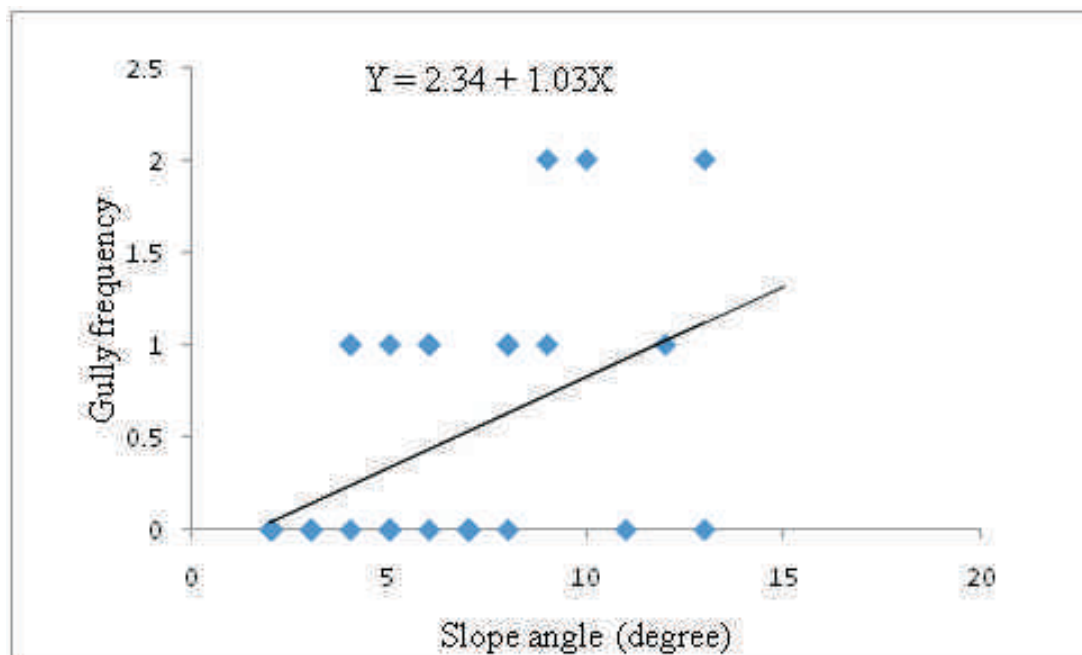


Figure 3: Scattergram of slope angle and gully frequency in the study area
Source: Authors' Analysis, 2018

The scattergram revealed a direct positive relationship between slope angle and gully frequency as indicated by the slope of regression line. This positive and direct relationship implies that gully erosion is likely to be initiated if the threshold value of slope angle is exceeded and vice versa. It is also observed that the threshold value for gully initiation in the Kereke watershed is 2°. The direct positive relationship observed between slope angle and gully frequency in

the study area implies that gully erosion is likely to be initiated if slope angle exceeds the threshold value of 2°. Thus, valley slope gradients above 2° could influence the initiation of gully erosion in the area. While slope gradients below 2° will be relatively stable. This is because steep slopes enhance the concentration of surface flow, thereby creating channels in form of interrills and rills that could become gullies if left

unabated; with more of the effects on steep to gentle slopes; where surface runoff is not quickly removed. Where the threshold value of 2° is not met in the study area, gullies are likely not to develop, except where other factors such as rainfall impact, soils and relief have dominated influence on gully initiation. Settlements such as Ikpam, Gide, Hinyam and Akumba are some of the areas where the threshold value of slope gradient has not been exceeded; and thereby with no gully initiated. While threshold of slope gradient was exceeded in settlements such as Low Cost housing estate, Daudu, Agan and those areas were found to be initiated with gullies.

The scattergram also shows that slope angle of 3° to 13° are critical points for gully initiation in the study area. Settlements in the study area that are situated on such slope range are very prone to gully erosion. Some of these settlements include Agan, Asamakaha, Ajo, Usan, Agyaragu, Adugu and Agaza. However, it was observed that

Adugu and Agaza settlements are not gullied; and this could be attributed to resistance of the soils to tractive force of runoff and dense vegetation cover in the area. The threshold value for slope gradient of 2° in the Kereke watershed corroborated the findings of Udosen (2000) who reported a threshold value for slope gradient of 1° for gully erosion initiation in Ikpa drainage basin of Akwa Ibom State. This was attributed to the nature of the relief and superficial geology found in the two areas. Both areas are predominantly low lying covered with alluvial sediments. However, Ebisemiju (1989) reported higher threshold value of 5° for gully initiation in the humid tropical Guyana, Brazil. The relationship observed between slope gradient and gully intensity in the study area could be attributed to the sandy nature of soils and the land cover of varying types.

The scattergram in Figure 4 shows the relationship between elevation and gully frequency in the study area.

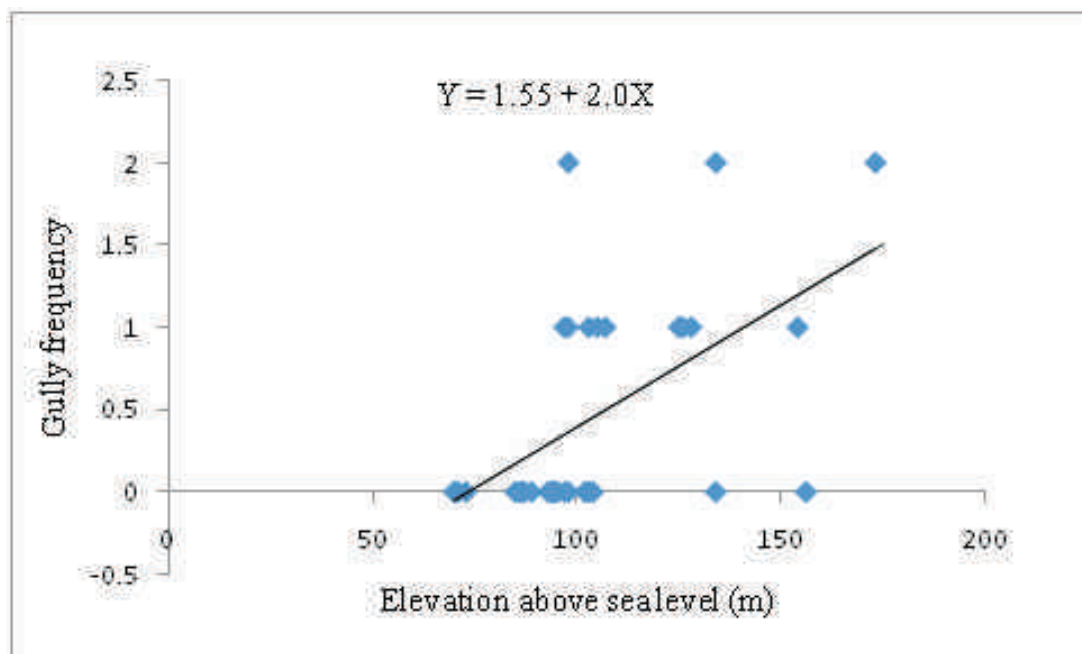


Figure 4: Scattergram of elevation and gully frequency in the study area.

Source: Authors' Analysis, 2018

The scattergram shows that threshold point of elevation for gully initiation is 71m. This threshold point is the point at which gullies are likely to be initiated in the study area; all areas lying above this threshold point are at risk of gully erosion. Hence, elevations between 72m to 150m are critical points for gully initiation in the study area. This was consequent upon the direct positive nature of the relationship between elevation and gully frequency in the study area. As elevation increases above the threshold point, gullies are likely to be initiated in the Kereke watershed. The threshold value of elevation asl was exceeded in almost all the settlements, except two settlements which are Gever and Hinyam settlements (Table 3).

These two settlements were found to be ungullied. Notwithstanding, in some of the settlements, it was observed that the threshold of elevation was exceeded but remained ungullied. Some of the settlements are Ikpam, Gide, Akiki, Kyaan, Akena, Yerewata, Giza, Ume among others (Table 3). The implication of this is that, gully erosion initiation in Ikpam, Gide, Akiki, Kyaan, Akena, Yerewata and Giza areas is not only dependant on elevation, but also a combination of initiation factors such as relief, slope gradient, vegetal cover of the area and sandy nature of the soils which collectively impacts gully initiation in Kereke watershed. Where these other factors have higher influence than elevation asl, gullies could be initiated as observed in some of the settlements such as Ikpam, Kyaan, Akena among others (Table 3).

C O N C L U S I O N A N D R E C O M M E N D A T I O N S

Gully initiation in a watershed as expressed by gully frequency/intensity is useful in assessing the extent to which environmental factors such as vegetation cover, slope gradient among others influence environmental degradation caused by gully erosion. The study established that Kereke watershed exceeded the threshold values of vegetation cover, depth of litter cover and slope gradient for gully initiation. However, along the trough variations in each of these parameters were observed. Threshold of

vegetation cover was exceeded in most of the sampled settlements, except in areas such as Akiki and Adobi settlements, where the threshold hold was not exceeded, and these areas were not gullied. In settlements such as Federal low cost estate, Agan, Kwabo, AJo, Usan, Ande, Gogo among others where threshold of vegetation cover was exceeded were found to be initiated with gully erosion.

Also, threshold value of litter cover was not met in most of the settlements such as Low cost housing estate North Bank, Agan, Daudu, Ikpam, Gide, Iyorkya, Akiki and Kwabo; except in Adugu settlement where it was met and Adugu settlement was found to be incised with a gully erosion due to the inverse relationship observed between depth of litter cover and gully initiation in the study area. The threshold value of slope gradient was not exceeded in settlements such as Ikpam, Gide, Hinyam and Akumba, and thereby with no gully initiated. While threshold of slope gradient was exceeded in settlements such as Low Cost housing estate, Daudu, Agan and those areas were found to be initiated with gully erosion. Moreso, the threshold value of elevation asl was exceeded in almost all the settlements, except two settlements which are Gever and Hinyam settlements, and these two settlements were found to be ungullied. It was therefore concluded that vegetation and relief parameters have severe impact on gully initiation in the study area; and areas where threshold values of vegetation and relief parameters were exceeded, gullies were initiated.

It is therefore recommended that federal government of Nigeria should ensure strict compliance on deforestation and afforestation laws in the Kereke watershed of the Benue trough. This will help to reducing the rate of deforestation in the area and enhance increased vegetal cover and slope stability for improved environmental management and reduced gully intensity in the area. There should also be controlled cultivation along slopes to reduce channelised and concentrated peak flows that could initiate gully erosion in the Kereke watershed.

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DIURNAL VARIATION OF URBAN CANOPY HEAT ISLAND IN THE WET SEASON IN BENIN CITY, EDO STATE, NIGERIA

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ABSTRACT

This study assessed the diurnal variation of Urban Canopy Heat Island (UCHI) in the wet season in Benin City, Edo State, Nigeria. Stewart and Oke (2012) system of classification was used to classify Benin City into ten climate field sites. DS1921G – F5 Thermochroni Button data logger was used to collect the temperature measurements from the stations. Data entry, coding, cleaning and test for normality was made following standardized procedures. Quantitative statistical methods was employed to analyze the information collected from the field. Result of the analysis showed that the highest temperature in the wet season was 27.40°C, while the lowest was 24.5°C. The highest UCHI values were 2.9°C, 2.59°C and 2.47°C while the lowest values of UCHI were 1.24°C, 1.38°C and 1.68°C. Maximum UCHI were recorded at 15:00 hours with an UCHI value of 7.13°C and 6.48°C while the lowest UCHI value recorded in this season was at 05:00 hours with a diurnal UCHI value of -0.64°C. The study therefore recommended the use of climate-sensitive planning and design schemes such as inclusion of building codes, adoption of planning methods of green city, and green roof approaches.

Key Words: Heat, Planning, Spatial, Temperature, Urban

INTRODUCTION

The climate in cities and other built up areas is altered mostly by the modification humans make to the surface of the earth during urbanization. City surfaces are typically rougher and often drier as naturally vegetated surfaces are replaced by buildings and paved streets. Buildings along streets form urban street canyons that cause the urban surface to take on a distinctly three-dimensional character. These changes affect the absorption of solar radiation, evaporation rates, storage of heat, the turbulence and wind pattern of cities and the surface temperature (Voogt, 2004).

Montavez *et al.*, (2008) defined Urban Heat Island (UHI) as the temperature differences between the urban area and its rural surroundings, always assuming that the records should be similar if there were no urbanizations. Usually these differences

show that cities are warmer than the surrounding rural areas. In most developed countries where the divide between compact urban areas and sparsely populated peripheries is comparatively clear and abrupt, the temperature difference between the air in the urban area and air in the rural reference area outside the settlement is significant and comprises of intensities greater than 4°C (Stewart and Oke, 2012).

UHI is categorized into three main types based on scale and method of measurement (Oke, 2012). First, surface urban heat island (SUHI), which refers to higher temperature of urban surfaces. This is determined by measuring the thermal infrared radiation emitted and reflected by the surfaces. It is normally done using satellite remote sensing and Geographic Information System (GIS) techniques. Second, urban canopy heat island (UCHI), which refers to higher

temperatures obtained within urban canopy layer. Urban canopy layer is the layer of air between the ground and treetops or roofs of buildings, where most of human activities take place. Third, urban boundary layer heat island (UBLHI), which refers to higher air temperatures within urban boundary layer. This layer is located above the urban canopy layer and its characteristics are affected by the presence of the urban canopy layer (Voogt, 2004). UCHI is the type of UHI that this study is designed to investigate. This is because UCHI investigates ambient air temperature which directly influences human comfort.

Several studies have been carried out in Nigeria to investigate the relative warmth of cities by measuring air temperature (also known as ambient temperature). Nduka (2011) used Thermochroni-Button data-loggers to assess the urban canopy heat island variation and land use/land cover in Onitsha metropolis in the hot and dry season. The study established a significant variation in both the spatial and temporal distribution of UCHI in the metropolis. Abdulhameed (2011) measured temperature data in Kano using an automatic temperature data logger and determined the UCHI from the data collected. The different sample stations were determined using the canyon zoning system known as the Urban Climate Zone (UCZ). The UCHI Characteristics shows a generally warm profile during the day time and night periods, suggesting that most of the stations had high temperatures. Usman (2016) investigated the effect of surface cover composition on spatial and temporal variations of UCHI in Kaduna metropolis, Nigeria. The results of this study using one-way ANOVA revealed a significant spatial and temporal variations of UCHI in March and August and only significant spatial variation in January.

Benin City and its surrounding areas has experienced changes in its morphology over the years. In Benin City, there are some areas where the buildings are tall, for example Akpakpava, Government Reserved Area (GRA), Airport road, Mission road and Sapele road. There are also some areas in

Akpakpava, Igun Street, Igbesonwa and Sakpoban road where the buildings are tightly spaced; the distance separating these houses ranges from 1m - 10mm in the traditional areas and 30m - 50m in the planned areas. The height of these structures and the way they are spaced cause a reduction of turbulence that in turn keep air trapped within buildings. Benin City has also experienced dramatic changes in building patterns, moving from single-storey buildings to multiple-storey buildings, zinc to aluminum roofing sheets and louvers to sliding windows that trap solar radiation during the day and emit heat in the night. These have markedly altered the surface properties of the area and hence modified the energy and water balance of the area, which result in increased temperature of the urban canopy of Benin City. Commercial activities in Benin City also add human metabolic heat into the atmosphere, these includes the various markets where you have high concentration of people. Others are increase in the numbers of buildings, structure and warm air from air conditioners that adds warmth to the surroundings, which pollute and radiate heat into the surrounding landscape and also turning of landscape into townscape also altered the natural environment. These have markedly altered the surface properties of the area and hence have modified the energy and water balance of the area, and resulted in increased temperature of the urban canopy of Benin City (Omogbai, 1985 and Efe, 2006).

The continuous growth of population and urbanization in Benin City has left in its wake emerging development of infrastructures and housing patterns which have given the urban fabric of the city a new look. These infrastructures and housing patterns have led to the development of Local Climate Zones (LCZs) in conformity with the delineations outlined in Stewart and Oke (2012) which have an impact on the socio-economic and thermal comfort of the inhabitants. These impacts can no longer be neglected. Therefore, this study as well examined the spatial variation of urban canopy heat island in Benin City in the wet season using the following objectives;

- I. Identify the local climate zones (LCZs) in the study area
- ii. Determine the nature and spatial variations of UCHI in the wet season
- iii. Assess the diurnal variation of UCHI in the wet season in the study area

THE STUDY AREA

Benin City comprises three Local Government Areas namely Egor, Ikpoba Okha and Oredo. It is located within Latitudes $6^{\circ}20'55''\text{N}$ to $6^{\circ}58'39''\text{N}$ and Longitudes $5^{\circ}35'18''\text{E}$ to $5^{\circ}41'18''\text{E}$. It broadly occupies an area of approximately 112.552km (Efe, 2006. This extensive coverage suggests spatial variability of

weather and climatic elements (Figure 1). The study area has a tropical climate characterized by two distinct seasons, the wet and dry seasons. The wet season covers the months of March to October with an annual rainfall amount usually up to 2000 mm and a mean temperature of approximately 27°C (Odekunle, 2004). The month of March is the warmest in the study area due to increasing cloudiness during the transition from the dry season to the wet season, while July is one of the months of peak rainfall since rainfall is bimodal with September being the second month of peak rainfall (Atedhor & John-Abebe, 2017).

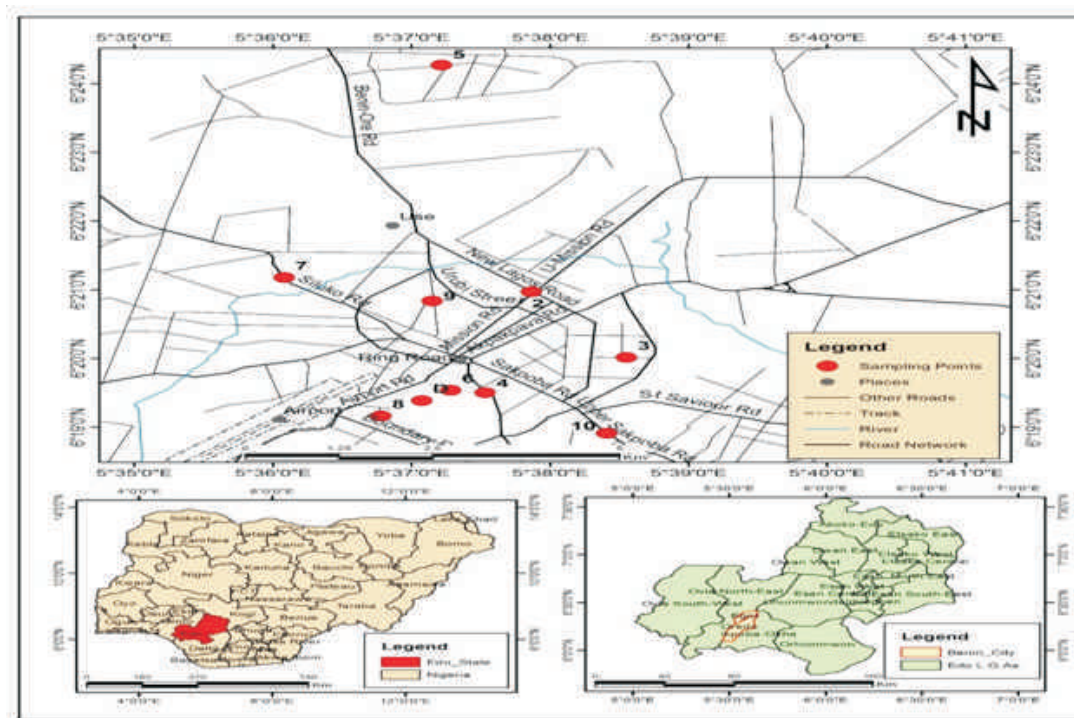


Figure 1: The Study Area showing Selected Sites

Source: Adapted and modified from Benin City Map (2011)

As observed during the assessment of the urban troposphere using sensitive rain gauges of the American origin, the rainfall amount, its intensity, duration as well as its distribution throughout the city are determined by the prevailing maritime winds, changing clouds, temperatures, and circulating pressures.

Based on the 2006 national census, Benin City has a total population of 1,086,882 (NPC, 2009). The City has a radial network of roads which converge in the city centre. Economic activities are dominantly commercial and are largely concentrated in the city centre. These commercial activities generate huge waste that sometimes constitutes a nuisance due to poor refuse

evacuation. The high vehicular traffic coupled with pockets of industrial activities remains sources of effluents and favours development of UCHI.

METHODOLOGY

Metadata was used in preparing datasheets for all the probable zones. Each datasheet was then compared with the general properties of the site it represents in the LCZ classification datasheets of Stewart and Oke (2012). Then the best match or best fit for each site was identified (a site whose metadata are fairly aligned with those in the data sheets containing the general properties) and selected. In addition to the identification of the LCZ, a temperature recording site was also located in each LCZ.

The data used for this study include geo-coordinates, elevation, satellite imageries, and the eye-level photograph of sites and temperature data. Both the geo-coordinate and elevation data of selected sites were captured using a hand-held Garmin GPS receiver. Other data collected that were relevant to this research include the nature of traffic flow, the height of buildings, the width of streets, the predominant function of the area (residential, commercial, industrial, educational, among others.). These data were used to select local climate field sites based on Stewart and Oke (2012) LCZ classification method. Traffic flow was graded as heavy, medium or light (Table 1 and Figure 1).

Table 1: Selected Sites, their Corresponding LCZ Designations and code for Temperature Recording Station in each LCZ

Site	Name	LCZ	Designation	Station code	Traffic
1	New Benin	LCZ 2	Compact midrise	NB	Heavy
2	Textile Mill Road	LCZ 3	Compact low-rise	TM	Moderate
3	Permanent Secretariat	LCZ 4	Open high-rise	PS	Moderate
4	Faculty of Social Science	LCZ 5	Open midrise	FS	Low
5	G.R.A Benin	LCZ 6	Open low-rise	GR	Low
6	NIFOR	LCZ D	Low plants	NI	Low
7	Welu, Igor Axis	LCZ 7	Lightweight low-rise	WI	Low
8	Kada Plaza	LCZ 8	Large low-rise	KP	Heavy
9	Wire Road	LCZ 9	Sparsely built	WR	Low
10	Nigerian Brewery	LCZ 10	Heavy industry	BR	Moderate

Source: Field Work (2019)

DS1921G – F5 ThermochroniButton data loggers were used for collecting the temperature data simultaneously from the ten (10) stations that were set up within the study area. The sites for temperature measurement were selected according to Stewart and Oke (2012) local climate zones (LCZ) system of classification. Only nine of the sites outlined in Stewart and Oke (2012) were identified in the study area as built up while NIFOR served as the control site. The ThermochroniButton is a 17.25mm diameter by 6mm thick instrument. The data loggers were programmed to record air temperature at 30 minutes interval throughout the study period. According to Balogun, Ahmed, and Zachariah (2011), the calibration of the

iButtons will make it effective for the area under study. This study covers the period of 1st to 31st June 2019 (Wet Season).

Data Analysis

Quantitative statistical methods were employed to analyze the information collected from the field. Firstly, average temperature value for every hour of the study period was calculated from the recorded temperature data of each site. It is from this hourly temperature data that UCHI was computed. In this study UCHI was determined as follows:

$$UCHI = T_{LCZn-LCZD} \text{ (Stewart and Oke, 2012)}$$

Where:

T = temperature of a sample station,

LCZ = local climate zone, n = built type zone from 1 to 10, D = land cover type zone (low plants)
Secondly, mean UCHI for each LCZ type was calculated.

Results and Discussion

Identification of LCZs

The identification of each LCZ was defined based on Stewart and Oke (2012) and the best fit urban fabric was selected to match each LCZ (Table 2)

Table 2: Identification of LCZs

Eye-Level Picture	Coordinates	Site Satellite Imagery
New Benin Market Area (LCZ 2)	6°20' 58"N - 5°37' 52"E	
	6°21' 32"N - 5°36' 54"E	
Permanent Secretariat (LCZ 4)	6°24' 16"N - 5°37' 13"E	
	6°19' 30"N - 5°37' 32"E	
Faculty of social science (LCZ 5)	6°19' 30"N - 5°37' 32"E	
	6°19' 32"N - 5°37' 17"E	
GRA, Benin (LCZ 6)	6°19' 32"N - 5°37' 17"E	

Eye-Level Picture	Coordinates	Site Satellite Imagery
Welu, Igor axis (LCZ 7) 	6°21' 32"N - 5°36' 58"E	
Kada Plaza (LCZ 8) 	6°19' 32"N - 5°37' 31"E	
Wire road area (LCZ 9) 	6°20' 50"N - 5°37' 9"E	
Nigeria Brewery Benin (LCZ 10) 	6°20' 48"N - 5°39' 54"E	
NIFOR (LCZ D) 	6°33' 27"N - 5°37' 27"E	

Source: Field Work (2019) and Google Earth Imagery

Spatial Air Temperature Variation

The variation of near-surface air temperature of the study area was collected for the season under study. The mean monthly temperature for the wet season (June) was calculated from the daily temperature recorded for each station and presented in Figure 2. WR has the

highest temperature of 27.40°C, followed by FS, GR, and KP with 27.07°C, 26.94°C and 26.57°C respectively. On the other hand, the lowest temperature of 24.54°C was recorded in NI while the mean temperature range for the wet season was 3.76°C.

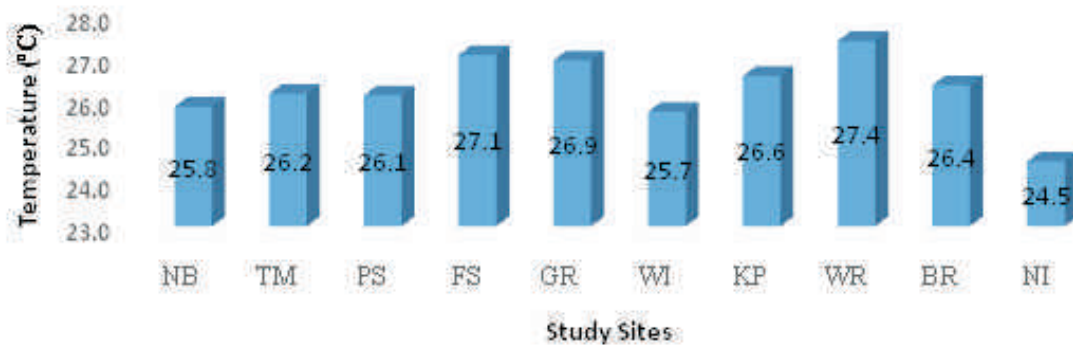


Figure 2: Mean Spatial Air Temperature Variation for June (Wet Season)

Source: Author's Analysis (2019)

The high temperature at WR is due to the surface characteristics of the site. The low temperature across the sites is slightly due to the availability of moisture which reduces the latent heat of vaporization, land and sea breeze developing across the study area and cloud cover which tends to reduce the amount of solar radiation that reaches the earth surface. The highest mean value recorded during the wet season of 27.40°C is slightly higher than what was obtained in

Kaduna (26.93°C) by Usman (2016) within the same season. However, it is lower than the temperature value obtained in Kano (30.47°C) by Abdulhamed, Nduka, Sawa, and Usman (2015) within the same period.

Spatial Variation of UCHI

To assess the nature and spatial pattern of UCHI in the study area, the spatial variation of UCHI was calculated from the near-surface temperature using the formula;

$$UCHI = T_{LCZn-LCZD}$$

Where:

T = temperature of a sample station, LCZ = local climate zone

n = built type zone from 2 to 10, D = land cover type zone (low plants)

The spatial variation of UCHI in the wet season was calculated from the mean hourly temperature of the wet season. The resultant mean UCHI is presented in Figure 3

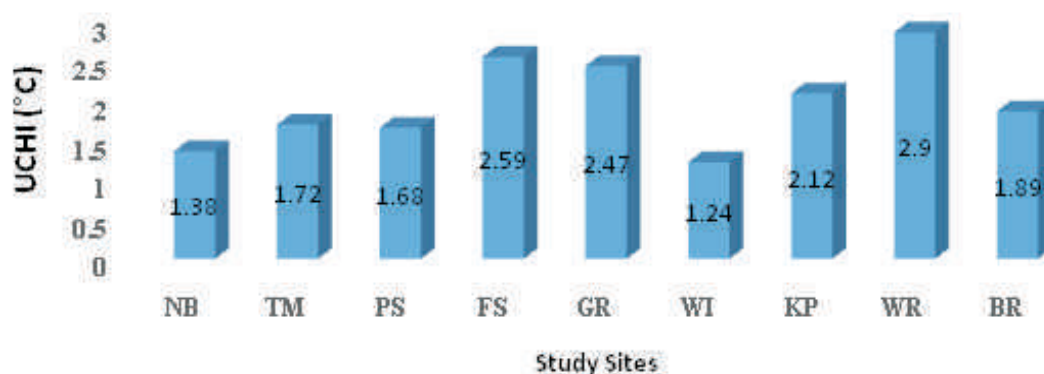


Figure 3: UCHI Variation in the Wet season

Source: Author's Analysis (2019)

Figure 3 shows that the highest UCHI values were recorded at WR, FS, and GR with 2.9°C, 2.59°C and 2.47°C respectively while the lowest values of UCHI were recorded at WI (1.24°C), NB (1.38°C) and PS (1.68°C). The highest value of UCHI recorded in WR (2.9°C) can be closely attributed to high vehicular movement and traffic congestion during the day which leads to increased emission of heat by trapping heat generated from fumes within a small air plume thereby increasing ambient air temperature and thus leading to increase in UCHI.

On the other hand, WI has the lowest UCHI in the wet season with 1.24°C. The reason for this, in addition to thermal storage resulting from lack of skyscrapers, is the massive reduction in traffic flow, cloud cover, and reduction in heating and cooling demand.

Diurnal Variation of UCHI in the Wet season

Mean diurnal UCHI variation in wet season (June) was calculated from mean hourly

UCHI values. In order to investigate the diurnal variation of UCHI, four hours were chosen which are 05:00, 12:00, 15:00 and 20:00 hours. These hours represent, early morning (05:00 hours) when there is net radiative energy loss to an unobstructed sky and less polluted atmosphere prior to sunrise (Balogun, Balogun and Adeyewa, 2012), noon (12:00 hours) which represents full sunlight, afternoon (15:00 hours), which represents a period of peak absorption of solar radiation by surfaces and night-time (20:00 hours) about two hours after sunset which represents the period of active release of heat by urban surfaces. From Figure 4, it can be clearly seen that the highest diurnal UCHI recorded in the wet season was 7.13°C.



Figure 4: Diurnal UCHI Variation for Wet season
Source: Author's Analysis (2019)

The highest UCHI value was recorded in 15:00 hours at WR (7.13°C) and WI (6.48°C), fairly higher UCHI were recorded at midday with FS (5.80°C) and GR (5.08°C) while the lowest UCHI value recorded in this season was at 05:00 hours with a diurnal UCHI value of -0.64°C at WI. It is worthy of note that two points fell below the zero mark (negative values), indicating that these points are less than the control site, a situation called cool island (Stewart and Oke, 2012).

Also as indicated by Figure 4, between 20:00 hours and 05:00 hours, UCHI ranges from -0.64°C to 1.65°C in all study sites except WR, thereby giving an UCHI range of 2.29°C among most stations while between 12:00 and 15:00, UCHI range between 1.88°C to 7.13°C giving an UCHI range of 5.25°C. The diurnal range for this season is 7.77°C. The highest diurnal UCHI of 7.13°C recorded in the wet season is lower than what was obtained in Kano (9.78°C) (Abdulhamed *et al.*, 2015) but higher than what was recorded in Kaduna (3.32°C) (Usman, 2016) and Enugu (3.5°C) (Enete and Alabi, 2012) during the same season.

Also the minimum UCHI intensity of -0.64°C recorded in this study is lower than what was obtained in Enugu, Kano and Kaduna with 3.2°C, 1.75°C and 0.3°C (Enete and Alabi, 2012), (Abdulhamed *et al.*, 2015) and (Usman, 2016) respectively. However unlike what was obtainable in Kaduna (Usman, 2016) and Enugu (Enete and Alabi, 2012) where UCHI intensities were highest at nocturnal hours, this study reveals that UCHI intensities are highest during the day, therefore agreeing with the work of Abdulhamed, *et al.*, 2015 in Kano and Balogun, Balogun and Adeyewa, 2012 in Akure.

The high intensity of UCHI recorded is partly due to the nature of the surface materials, especially its permeability which

allows it retain water after the rain, thereby reducing the amount of ambient heat through evaporative cooling. On the other hand the extremely low UCHI intensity (Cool Island) recorded at WI at both 20:00 hours and 05:00 hours local time is as a result of wetness of surface, green house effects (which causes micro climate modification), low thermal storage resulting from lack of tall skyscrapers that would have restricted thermal radiation, reduced turbulent exchanges and others.

CONCLUSION

The study confirms the existence of urban heat island in Benin City, and thus has a strong implication on the bio-climatological aspect of the urban environment and physiological comfort of the urban inhabitants. The study also showed that there is variation in the distribution of temperature within the urban canopy of Benin City. The variation in UCHI in the study area was attributed to the characteristics of surface cover and anthropogenic factors since the higher the impervious surfaces, the higher the spatial variation of UCHI intensities. The temporal variation of UCHI among the LCZs shows that UCHI values were higher during the night than at day. The study therefore recommends the following:

- i. The government should enact regulations on the adoption of climate sensitive planning and design schemes.
- ii. There should be the adoption of planning methods of green city, green roof approach as this will help to regulate urban climate.
- iii. Building codes should be formulated which should provide standards for construction and discourage the use of dark coloured roofs, wall paints and pavements. This is because dark surfaces are good absorbers of heat thus, increase UCHI intensity

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ETHNO - RELIGIOUS RESIDENTIAL SEGREGATION AND PROPERTY INVESTMENT PERFORMANCE: EVIDENCE FROM KADUNA, NIGERIA

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ABSTRACT

This research primarily focused on the performance of real estate investment in the ethno-religiously segregated residential property markets of Kaduna State, Nigeria. It conducted a comparative analysis of the performance of residential property investment in Northern and Southern areas of Kaduna metropolis for a period of 10 years (2011-2020), focusing on rental and capital values appreciation, average return and risk adjusted return. The property types considered include 2-bedrooms, 3-bedrooms and 4-bedroom semi-detached bungalows. From the findings of the study residential properties in Barnawa shows a greater annual mean return of 23.55% compared to 21.72% for residential properties in UngwanRimi. On the basis of risk profile, residential properties in Barnawa have a standard deviation (risk) of 8.57% which is slightly better than 8.70% for residential properties in UngwanRimi. Applying the coefficient of variation also known as risk-to-reward ratio, residential property investment in Barnawa still outperforms residential property investment in UngwanRimi with coefficients of variation of 0.36 and 0.41 respectively, the study concludes that the results are not unconnected to the migration of people and businesses southward, resulting from the ethno-religious crisis bedevilling the area for the last four decades. The study recommends that government at all levels should provide enabling environment for investments to thrive and ensure the protection of lives and properties to attract investors.

KEYWORDS: Ethno-Religious, Segregation, Residential Property Investment, Performance Appraisal, Investment Decision.

INTRODUCTION

Real estate investment is becoming increasingly international with the deregulation and integration of global capital markets, growth of emerging economies, demographic trends in developed economies and geographical and socio-cultural changes globally are presenting opportunities for international real estate investors in a fascinating complex and interconnected market place (Adama *et al.*, 2018; Olaleye *et al.*, 2010 and Hoesli and Lizieri, 2007). It appears that Africa is a focus for international real estate investors and Nigeria in particular is making a quiet and steady effort to internationalize its economy in a quest to attract Foreign Direct Investment (Hasting & Nordy, 2007).

Investment decisions are often made with the primary objective of maximizing financial

return and mostly in an environment that allows investment to thrive. Unfortunately, this cannot be said in most part of Nigeria, particularly in Kaduna, the alleged capital of the Northern region where recurring and increasing ethno-religious and other factional difference bedevilling the metropolis for almost four decades have significantly influenced both residential mobility, property values and property investment performance (Purokayo and Gadbo, 2013; Gandu, 2011; Dandien and Ozigi, 2008). Most neighbourhood in Kaduna metropolis have either become homogenously Christians or Muslim. This type of residential segregation has progressively partitioned the metropolis into two distinct parts by having an area that is solely for Christians and the other for Muslim (Gandu, 2011). This study therefore, seeks to undertake a comparative assessment

of the performance of residential property investments in ethno-religiously segregated areas of Kaduna metropolis with a view to providing information to enhance investment decisions and risk management and protection for investors in Kaduna and other comparable locations in Nigeria.

REVIEW OF RELATED LITERATURE

Owing to the incessant sectarian violence being experienced in the northern parts of Nigeria, from the Maitatsine riots in Kano, Yola and Maiduguri in the 1970s to the more recent crises in Jos, Kaduna and other northern states, a progressive segregation pattern amongst its residents on the grounds of religion, ethnicity, and other factional differences has been observed (Purokayo and Gadbo, 2013), and this appears to have established a link that these crises are the cause of the pattern of residential segregation that is being observed in these parts of Nigeria. Similarly, Gambo and Omirin (2012), noted that the religious fundamentalism of the 1980s has been an important component in defining settlement pattern along religious lines and ethnic formations in the northern cities of Kaduna, Kano, Jos, Bauchi amongst others. Non-indigenes and non-Muslims residing in most of the cities in Northern Nigeria do so along religious and/or ethnic divide. Hence segregated residences in the northern towns have become the basis on which people decide where to live and where not to live.

Several other studies (Mayhew, 1992; Philip, 2000; Adefemi and Gaskiya, 2001; Amadasun, 2004; Yakubue *et al.*, 2005; Gandu, 2011; Elong, 2019), observed that the current ethno-religious disturbances in Kaduna metropolis engendered the on-going form of residential neighbourhoods being evidenced. The trend of the residential movement seems to generate the segregation of residents into the different dwelling locations along ethno-religious bias. The obvious impact on the metropolis is the alteration of the structural outlook of the living neighbourhoods from being heterogeneous to being homogenous in terms of religious beliefs and ethnic background. Kaduna is split into two parts as

the northern metropolis, comprising areas like Kawo, Ungwan Dosa, Ungwan Sarki, Rigasa, Ungwan Rimi, Malali, and Ungwan Muazu and southern axis, housing suburbs like Sabon Tasha, Ungwan Television, Nasarawa, Gonin-Gora, Narayi High Cost, Ungwan-Romi, Barnawa and parts of Kakuri, with the River Kaduna serving as the natural boundary (Amadasun, 2004).

It is widely acknowledged that several studies that have relevance to the study of real estate investment have been conducted, particularly in the United Kingdom (UK), United States of America (USA), some developed and emerging economies. These studies look at the performance of real estate investments from diverse perspectives. Studies that have helped to elucidate the performance of real estate includes (Wendt and Wong, 1965; Zerbst and Cambon, 1984; Brueggman *et al.*, 1984; Ibbotson and Siegel, 1984 and Olaleye *et al.*, 2010). These studies drew comparison between the performance of real estate with the performance of non-real estate investments such as gilts, stocks and bonds. The major deduction from these studies is that real estate performed better than other investment and further serves as an overall risk leveler when included in a portfolio.

Some other studies examined the relationships between indirect and direct real estate investment performance. Among them are Giliberto (1990), Newell *et al.*, (1997), McAllister (2000), Newell *et al.*, (2004), Newell *et al.*, (2005), Hoesli & Lizieri (2007), Newell & Hsu (2007) and Newell *et al.*, (2009) who considered the performance of direct real estate alongside that of indirect real estate investment represented by listed companies and REITs returns in the UK and USA respectively. The outcome of the studies revealed that direct real estate produced lower returns and lower risk. It further established that indirect property investment performs partly as stocks and partly as real property investment.

In a study that evaluated the relative performance of residential property against

securities in terms of mean returns, risk adjusted return, income growth and capital growth in Lagos, Nigeria. Bello (2003) established that investment in ordinary share performed above that of residential property in absolute term and risk adjusted return, while risk associated with residential property performed lower than that of ordinary shares. Similarly, in a study that examined the characteristics of direct property and listed Property Company in comparison with other securities in the Nigerian Stock Exchange over the period of 7 years (2001-2007), Olaleye *et al.*, (2010), evaluating the capital return and diversification potential through the use of mean return, standard deviation, correlation and Sharp market index model. The results showed that real estate investments performed better than stocks and offered diversification benefits for investors of a mixed assets portfolio, while various investment options in real estate and stock market offered attractive returns.

Other indigenous studies such as Amidu *et al.*, (2008), Olaleye and Ajayi (2009), and Adegoke (2009), considered the performance of property investment in general, indirect property investment or residential property investment and stocks. To measure the return from an investment in property entails the evaluation of the property's performance. It is common knowledge that prudent investment strategy requires and demands that investment performance be evaluated or measured regularly. According to Ajayi (1998) profit maximisation and risk reduction is the ultimate aim of all rational investors. Ajayi (1998) further defines investment performance "as the degree of achievement of this aim measured against a set of objectives and targets". None of these available indigenous studies has examined

the disparities between the performances of residential real estate investments in an ethno-religiously segregated environment as is considered in this study.

METHODOLOGY

The survey was carried out by the use of structured questionnaires and interviews to source for data on residential property investments in Kaduna. Owing to the problem of heterogeneity of real property investment, UngwanRimi and Barnawa were purposively selected for the study, the basis for selection hinges on the fact that both areas arguably represents the highest brow residential areas in the northern and southern parts of the state respectively. The class of property surveyed are 2, 3 and 4 bedrooms, because a pilot survey revealed these class of property represents over 75% of the residential units in the areas. The data for the study was collected from all thirty-nine (39) Estate Surveying and Valuation (ESV) Firms practicing in the study area (NIESV, 2020). Thirty (31) of the ESV Firms responded positively, representing 80% of the population which is adequate and provides a basis of discussion in the paper. Data collected includes rental values and capital values over a period of 10 years (2011-2020). To calculate the returns on investment, the Holding Period Return (HPR) method was adopted. The yearly returns on investment data was computed from the appraised capital values and annual rental values of the various types of residential properties in the area for the period under study. The risk- return ratio (coefficient of variation) was used in the determination of the performance of various property investments. To measure risk, standard deviation of the annual returns from the mean HPR (MHPR) was computed. The HPR is mathematically represented as:

$$HPR = \frac{(CV_t - CV_{t-1}) + RV_t}{CV_{t-1}} \times 100 \dots \dots \dots (1)$$

Where: CV_t = Capital value for the current year, CV_{t-1} = Capital value for the previous year and RV_t = Rental value for the current year. While the coefficient of variation was computed using, COV = σ/MHPR(2)

RESULT OF DATA ANALYSIS AND DISCUSSION

The discussion centers on the result of the data analyzed, which include profile of the ESV firms in the study area and information on rental values and capital values of selected properties over a period of 10years (2011-2020). Analysis of the data as seen on Table 1, shows that 8 of the 31 ESV firms studied, representing 29% has been in practice in the study area for a period of 21 – 30 years, while 14, representing 45% have been practicing for between 11 and 20 years. Cumulatively, all 31 ESV firms in the study area, have been practicing for an average 15 years. On the Academic and professional qualifications of the responding Estate

Surveyors in the firms, 4, 7, 9 and 11 of 31 respondents have acquired PhD, M.Sc., B.Sc. and Diplomas, representing 13%, 23%, 29% and 35% respectively, while 6, representing 19% of the total respondents have attained the highest peak of their professional calling and are Fellows of the Nigerian Institution of Estate Surveyors and Valuers (NIESV). 8, 14 and 3, representing 26%, 45% and 10% are Associate (above), Associate (below) and Graduates or Probationers respectively. Majority of the respondents are Males (81%), while 6 (19%) are females. Given this outcome, one may conclude that most firms are aged and experienced and can be relied upon to give reliable data on the study.

Table 1: Socio-Economic Characteristics of the Respondents

Item	Description	Frequency	Percentage
Number of Years in Practice in the Study Area	1 - 10	9	29
	11 - 20	14	45
	21 – 30	8	26
	30 - Above	0	0
	Total	31	100
Academic Qualification of Respondents	Doctorate	4	13
	Masters	7	23
	Bachelors	9	29
	Diplomas	11	35
	Others	0	0
	Total	31	100
Professional Cadre	Fellow	6	19
	Associate (Above)	8	26
	Associate (Below)	14	45
	Graduate/Probationers	3	10
	Total	31	100
Gender	Male	25	81
	Female	6	19
	Total	31	100

Source: Field Survey, 2020

The analysis of rental values and capital values of selected properties over a period 2011 to 2020 as seen on Table 2, shows the upward movement of rent for the selected class of properties, 2BR, 3BR and 4BR, and across the study areas for the period under study. The values are the computed average gotten from all 31 ESV firms practicing in the study area. The performance and rental

and capital growth of properties in Barnawa over the UngwanRimi is expected, as it appears there is a huge movement of people and business from the northern part of the State to the southern part, this agrees with the findings of Philip (2000), Adefemi and Gaskiya(2001), Amadasun (2004), Yakubuet *al.*(2005), Gandu (2011), Elong (2019) and Abubakar(2018).

Table 2: Average Rental Values and Average Capital Values of Residential Properties in UngwanRimi and Barnawa (N)

Period	Average Rental Values						Average Capital Values					
	Barnawa			UngwanRimi			Barnawa			UngwanRimi		
	2BR	3BR	4BR	2BR	3BR	4BR	2BR	3BR	4BR	2BR	3BR	4BR
2011	185,500	250,500	295,000	135,500	175,000	215,500	2,500,000	3,340,000	4,200,000	1,800,000	2,350,000	3,100,000
2012	206,500	315,000	355,500	175,000	225,000	260,500	2,750,000	4,500,000	5,070,000	2,350,000	3,000,000	3,700,000
2013	242,500	322,500	380,000	175,000	240,500	295,000	3,500,000	4,605,000	5,850,000	2,500,000	3,450,000	4,550,000
2014	262,500	387,500	432,500	220,000	275,000	325,000	3,750,000	5,960,000	6,650,000	3,150,000	3,930,000	5,000,000
2015	295,000	390,500	480,000	235,000	325,000	375,000	4,500,000	6,000,000	8,000,000	3,615,000	5,000,000	6,250,000
2016	312,500	417,500	550,000	275,000	340,000	400,000	4,800,000	6,950,000	9,150,000	4,230,000	5,250,000	6,660,000
2017	347,500	457,500	620,000	295,000	400,000	450,000	5,800,000	7,625,000	11,250,000	4,915,000	6,660,000	8,180,000
2018	375,000	477,500	667,500	310,500	420,500	480,500	6,250,000	8,700,000	12,150,000	5,175,000	7,000,000	8,750,000
2019	405,000	527,500	750,000	332,500	450,000	525,000	7,400,000	9,600,000	15,000,000	6,045,000	8,180,000	10,500,000
2020	432,500	552,500	810,000	375,000	475,500	615,000	7,900,000	11,050,000	18,200,000	6,800,000	8,650,000	12,300,000

Source: Field Survey, 2020 **Key:** 2BR = 2 Bedroom, 3BR = 3 Bedroom, 4BR = 4 Bedroom and ₦ = Naira symbol

Table 3: Annual Capital Returns on Residential Properties in UngwanRimi (%)

Period	UngwanRimi			Barnawa		
	2BR	3BR	4BR	2BR	3BR	4BR
2011	-	-	-	-	-	-
2012	18.3	44.2	29.2	40.28	37.2	27.8
2013	36.1	9.5	22.9	13.83	23.02	30.95
2014	14.64	37.8	21.1	34.8	21.9	17
2015	27.87	7.2	27.5	22.2	35.5	32.5
2016	13.61	22.8	21.3	24.62	11.8	12.96
2017	28.1	16.3	29.7	23.17	34.5	29.6
2018	14.22	20.4	13.9	11.61	11.42	12.84
2019	24.9	8.23	29.6	23.24	23.3	26
2020	12.6	20.9	13.4	18.7	11.56	23
AMRR	20.7	20.01	22.9	22.74	23.37	23.35

Source: Field Survey, 2020

Table 4:MHPR and Risk Analysis on Residential Properties in UngwanRimi and Barnawa

Location	Property Type	MHPR	Mean Variance	Risk/SD	Cov
Ungwan Rimi	2BR	21.15	0.006212	7.88	0.37
	3BR	20.82	0.01483	12.18	0.59
	4BR	23.19	0.00366	6.05	0.26
Barnawa	2BR	23.61	0.00745	8.63	0.37
	3BR	23.40	0.00979	9.89	0.42
	4BR	23.63	0.00518	7.20	0.30

Source: Field Survey, 2020

The MHPR for 2 bedrooms semi-detached in Ungwan Rimi, Kaduna is 21.15%, risk is 7.88% and COV is 0.37, implying that 0.37 unit of risk was taken for every unit of return earned. For 3 bedrooms semi-detached is holding period return is estimated at 20.82%, while risk is 12.18% and COV is 0.59. Therefore, 0.59 unit of risk was taken for every unit of return earned. 4bedroom bungalow returned 23.19%, with 6.05% as risk and 0.26 covariance. Therefore, 0.26

unit of risk was taken for every unit of return earned. In Barnawa study area, the MHPR for 2, 3 and 4 bedrooms returned 23.61%, 23.4% and 23.63 respectively, with a risk-return ratio of 8.63%, 9.89, 7.20 and COV of 0.37, 0.42 and 0.30 for 2bedroom, 3bedroom and 4bedroom respectively. Indicating the units of risk taken for every return made. The table below summarizes the performances of all property types considered in this study in the two areas.

Table 5:AMRR and Risk Analysis on Residential Properties in UngwanRimi and Barnawa

	<i>UngwanRimi GRA</i>	<i>Barnawa GRA</i>
<i>Arithmetic Mean Return (AMRR) (%)</i>	21.72	23.55
<i>Standard Deviation/Risk (%)</i>	8.70	8.57
<i>Coefficient of Variation</i>	0.41	0.36

Source: Field Survey, 2020

From the Table 5 above, Residential properties in Barnawa show a greater annual mean return of 23.55% compared to 21.72% for residential properties in Ungwan Rimi. On the basis of risk profile, residential properties in Barnawa have a standard deviation (risk) of 8.57% which is slightly better than 8.70% for residential properties in Ungwan Rimi. Applying the coefficient of variation also known as risk-to-reward ratio, residential property investment in Barnawa still outperforms residential property investment in Ungwan Rimi with coefficients of variation of 0.36 and 0.41 respectively. This study therefore, agrees with the findings of Dung-Gwom, 2008, 2009; Aliyu et al., 2012; Yakubuet al, 2005; Gandu, 2011; Elong, 2019, that the outward movement of people from Kaduna North towards Kaduna South and the negative rent paying abilities of locals in Kaduna State will greatly affect the performance of residential investment properties in Kaduna North as settlers would be more inclined to residing in the Southern part of the State, this arguably explains why properties in Barnawa performed better than properties in UngwanRimi due. Barnawa is also the social hub of Kaduna metropolis with several social activities carried out on a daily basis which can improve the economy of an area and in turn enhance investment performance.

SUMMARY OF FINDINGS

Focusing on investment performance of some selected types of properties and in selected ethno-religiously segregated residential areas in Kaduna metropolis from 2008-2017, it is the finding of this study, that 4 bedroom bungalows in Ungwan Rimi GRA had the highest rental and capital

growth throughout the period under study while 2 bedroom flats in Barnawa GRA had the lowest rental and capital growth. 4 bedroom bungalows and 3 bedroom flats in Barnawa provided investors with the highest average returns at 23.63% and 23.61% respectively, while 3 bedroom flats in Ungwan Rimi GRA provided the lowest average return of 20.82%. The study also revealed that 3 bedroom flats are the most volatile of the three property types considered in this research with a risk of 12.18% and 9.89% for Ungwan Rimi and Barnawa GRA respectively, while 4 bedroom bungalows were the least volatile throughout the period under study with a risk of 6.05% and 7.20% for Ungwan Rimi and Barnawa GRA respectively.

4 bedroom bungalows also performed better than other property types having the lowest risk-return relationship of 0.26 and 0.30 for Ungwan Rimi and Barnawa GRA respectively, while 3 bedroom flats had the least performance with a Coefficient of Variation of 0.59 and 0.42 for Ungwan Rimi and Barnawa respectively. Overall, residential property investments in Barnawa GRA performed better than residential property investment in UngwanRimi GRA as they provided greater returns, had lower risks and lower risk-return relationships. Given the focus of the study, it is in agreement with the findings of Oluwole (2014) and Mudashir (2013) that the directional movement of households from Kaduna North to Kaduna South and vice versa is largely occasioned by ethno-religious factors which will not be unconnected to intolerance and sectarian crisis in these areas.

CONCLUSION

This study carried out a comparative analysis of investment performance of residential properties in two areas of UngwanRimi and Barnawa in Kaduna and showed that rental value for all the categories of properties maintained an upward increase during the period under study. This study concludes that residential property investment has performed very well in Kaduna throughout the period under study and that real estate investments in Barnawa slightly performed better than real estate investments in UngwanRimi since they have a lower mean covariance lower risks and provided greater returns than their counterparts. Sequel to the findings of the study, the following recommendations are deemed necessary:

- i. Real estate investors should consult professional Estate Surveyors and Valuers for advice before investing in a particular property type, in a

particular location and at a given time.

- ii. Similarly, existing investors should demand performance assessment of their investments from their property managers at least every two years.
- iii. Since past performance is a basis for future decisions, investors seeking to invest in real estate in the study area should consider investing in 4 bedroom and 3 bedroom flats in Barnawa GRA, and 4 bedroom bungalows in UngwanRimi GRA.
- iv. The federal and state governments should encourage the investors in residential property through aggressive overhaul of the security architecture of the region and introduce changes in monetary and fiscal policies to enhance residential property development.

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ENHANCING COST ADVICE OF PUBLIC SECTOR CLIENT ORGANISATIONS BY FORMALISING BUILDING PRICE FORECASTING PROCESS

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ABSTRACT

Public sector procurement laws require that building price forecast be established in-house at construction project initiation. This has often posed problems of performance most times due to poor budgeting (causing building projects cost and time overruns) for proposed projects especially public funded projects. Thus, Building Price Forecasting (BPF), which is the basic for cost advice that public client organisations use as budget for assessing building projects funds from government is of significant importance within the context of organisational management and performance. Organisation management theory state that the outcome of organisations is influenced by behaviours inherent in organisations. Hence, attempts at improving building price forecasting in public client organisations would require an understanding of the effect of the behaviours therein. Exploring Organisational Behaviour (OB) model, this paper presents and discusses theoretical conceptions for understanding BPF process within public sector client organisations with a view to improving and formalising the process. The model conceptualises building price forecasting at the three levels of an organisation i.e. individual, group and organisation within the 'input-process-output' framework. For the required data, expert survey and focus group discussion were conducted based on the outcome of a literature review which gave insights to the likely steps required for a formalised BPF process. 40 questionnaire were distributed to professionals in 40 firms both in Kaduna and Abuja, descriptive and inferential analysis was used to analyse their responses. To appraise potential influences of organisational behaviours on BPF process, 70 questionnaire were distributed to participants of BPF production units in six Universities and Partial least square – structural equation modelling (PLS – SEM) was used to analyse the relationships and the influences. The study found that organisational behaviours interactions with one another do influenced an individual task performance, which ultimately affects the outcome. The study also found that there is no formalised and documented BPF process, therefore, the study recommends that public client organisations should adopt the formalised process established herein and ensure the policy of forming teams for the purpose of BPF formulation in order to enhance the performance of the BPF.

Keywords: Building price forecasting, Cost advice, Organisational behaviour, Public sector client organisation.

INTRODUCTION

Clients of the construction industry need reliable cost advice to use in making their building construction investment decision; but this has been hampered by many factors causing poor performance in construction industry and dissatisfaction to the client, Fortune (1999). Eythorsdottir (2012) observed that the underperformance of the construction industry (CI) has direct link with unrealistic and unreliable cost estimates the world over, resulting in schedule delay and unexpected cost overruns. Erdis (2013) lamented how these unexpected cost overruns caused considerable losses to both parties the contractor and client and ultimately led to reduction in value for money and dissatisfaction.

Flyvbjerg (2013) argued that such unexpected deviations in construction costs cannot always be traced to only technical explanations. He observed that if under performance is attributable to issues of cost overruns and delays, then an improvement in accuracy could, over time be expected as estimators learned from their experiences. Some researchers have drawn different conclusions to rest on such as, human error (Skitmore, 2009); planners and or promoters deliberately make optimistic forecast as a necessary means to getting projects approved (Bayram, 2013) and poor cost estimation models, (Eythorsdottir, 2012). However, Zadawa, Shehu, Ahmed and Gambo (2017) observed that the causes of these ongoing problems are the uncertainties in the feasibility stage of projects when project investment decisions are made. Essa and Fortune (2009) opined that such poor performance can be expected to be made worse by the government's policy of including budget in its future publicly funded projects. This situation has drawn researchers in the field of construction to call for improvement in the quality and performance of cost advice in the construction industry, Eythorsdottir (2012). But despite the theories of cost estimates and cost planning, Scholars are still seeking for solutions to the achievement of this need.

Among many factors militating against the realisation of quality cost advice is the setting of the reliable building budget estimates which is building price forecasting, Fortune (2007). Interestingly & Kirkham (2015) corroborated that formulating price forecast to set up a budget is strategic cost advice and it will help the prospective client to decide on whether to proceed with his project investment proposal or not. Abanda, Kamsu-Foguemand Tah (2017) observed that strategic cost advice is very important and is the only substantive thing that brings tangible expectations to a prospective client who wants to invest in a building project.

Cost advice has been linked with organisations' behaviour (OB) with clear pointer that study in this area should be aligned with the theory of OB. Mullins(2010); Robbins and Judge, (2013) indicate that organisational outcomes are influenced by behaviours inherent in organisations. Impliedly therefore, BPF is affected by OB and this effect will determine its success or otherwise, since Cost advice is the outcome of BPF it shows is a reflection of organisational performance. Bayram & Al-Jibouri (2016) observed that for sustainable development solution, building price forecasting systems need to consider the influence of human behaviour in the process of formulating cost advice the clients in their investment decision making. Fortune and Cox (2005) posit that in order to develop an understanding of how BPF advice can have its quality enhanced, it was necessary to consider the process itself. This begets the need for understanding the process of formulating the BPF to set the budget which, according to Kirkham (2015) is done at the very early stage of the project inception long before working drawings are made.

THE RESEARCH PROBLEM

Zadawa *et al.*, (2017) lamented that lack of compliance with the guidelines of the Public Procurement Act (PPA, (2007), and especially the unknown method by which organisations, especially Public Sector Client Organisations (PSCO) come about the budgets for their building projects is one of the major contributors to poor performances

of construction projects in Nigerian construction industry (NCI). This is especially true in the case of assessing funds from Tertiary Education Trust Fund (TETFund) by various institutions. Zaki, Musa-Haddary, Kolo, and Abdullahi (2019) posits that if BPF formulation process is formalised and followed during budget preparation for assessment of funds from TETFund there wouldn't be time and cost overruns or delay in projects in Nigeria's tertiary institutions. This study seeks to formalised the BPF process in order to address this gap.

LITERATURE REVIEW

Yang *et al.*, (2013) trailed the development of organisational theories to three recognisable stages, namely, classical, neoclassical and modern. Walker (2015) posits that these theories have been developed into and variously explained in a four-approach category framework comprising classical, human relations, systems and contingency. Among these theories, while the majority of researches in BPF have largely been driven by the classical theory – technical, modern day consideration of organisational management requires that such considerations should be driven by both the system and contingency theories. Mullin (2010) posits that organisations do not only work by focusing on the social aspect (though an important and critical component for success), the systems theory integrates both the classical and human relation approaches and promotes the importance of the socio-technical system while considering the organisation within its external environment. This is achievable through OB.

THE BUILDING PRICE FORECASTING (BPF) PROCESS

Building Price Forecasting is essentially done to help in critical decision making at the very initial stage of project proposal and its process is aimed at providing standard to use to meet or ensure adherence to public capital procurement requirements while utilising industry standards and best practices (GAO, 2010). Surprisingly, this research could not find documented standard processes for

preparing BPF in the United Kingdom (UK) literature apart from specific narration of the constituents of the processes. Although the studies of both Bowen (1993), and Fortune (1999) were about the BPF processes, but the steps involved were not documented. However, the study found that Governmental Accounting Office (GAO, 2010) documented 12 STEPS which have been adopted by Department of Energy (DOE, 2011) for use in United States (US) public sector. Even though the Quantity Surveying practice in UK may differ from that of US it was worth the pains-taken for the fact that the documented 12 STEPS are found to be in tandem with the specific narrations identified from the UK textbooks thereby making the steps seemingly generic in global context.

The Essence of Organisational Behaviour (OB) Theories in BPF Process

Organisational behaviour is described by Robbins and Judge (2013) as 'a field of study that investigates the impact that individuals, groups and structure have on behaviour within organisations, for the purpose of applying such knowledge towards improving an organisation's effectiveness,' and further defined it simply as 'the study of what people do in an organisation and how their behaviour affects the organization's performance'.

Mullins (2010) describes OB as being, 'concerned with the study of behaviour of people within an organisational setting. It involves the understanding, prediction and control of human behaviour.' They further defined it simply as, 'the study and understanding of individual and group behaviour and patterns of structure in order to help improve organisational performance and effectiveness'. These definitions are a pointer to why OB consideration in BPF process gaining essential ground.

Apart from itobvious focus on the people dimension (and behaviours) in organisations as shown in the descriptions and definitions

above, Quick and Nelson (2012) posit that the importance of OB in BPF process is the systematic approach it adds to improving the predictability of these behaviours. Other benefits include: helping employees balance work-life conflicts, creating a positive work environment, and improving ethical behaviour, Robbins & Judge, (2013). Hence, Mullins (2010) opines that an understanding of the human element and behaviour of people are necessary for the organisation to achieve her goal. Cooke (2015) corroborates that organisations operate on defined aspects which entail getting outputs of individuals and/or groups in an fashionable organisational structure process to achieve sufficient outcome. Achieving this individual task performance in sufficient manner Robbins & Judge (2013) provides an overview of the OB model. The OB model (see Fig.1) is comprised of three types of

variables i.e. inputs, processes, and outcomes; operationalised at three levels of analysis present in all organisations namely: individual, group and organisational. The OB model does not show the lines of relationship between the variables within the organisation, which according to Cooke (2015) is necessary to have the knowledge of the existence of the relationships in the organisation. Giving the reasons for this necessity, Quick and Nelson (2012) stated that it is necessary because it explains the organisation's reality and challenges and form the aspects of the organisation's functionality. In line with this argument the lines of relationships within an organisation (see Fig. 2) not provided in the OB model was derived from the data collected in the column of influence (function) in Tables 1 and 2.

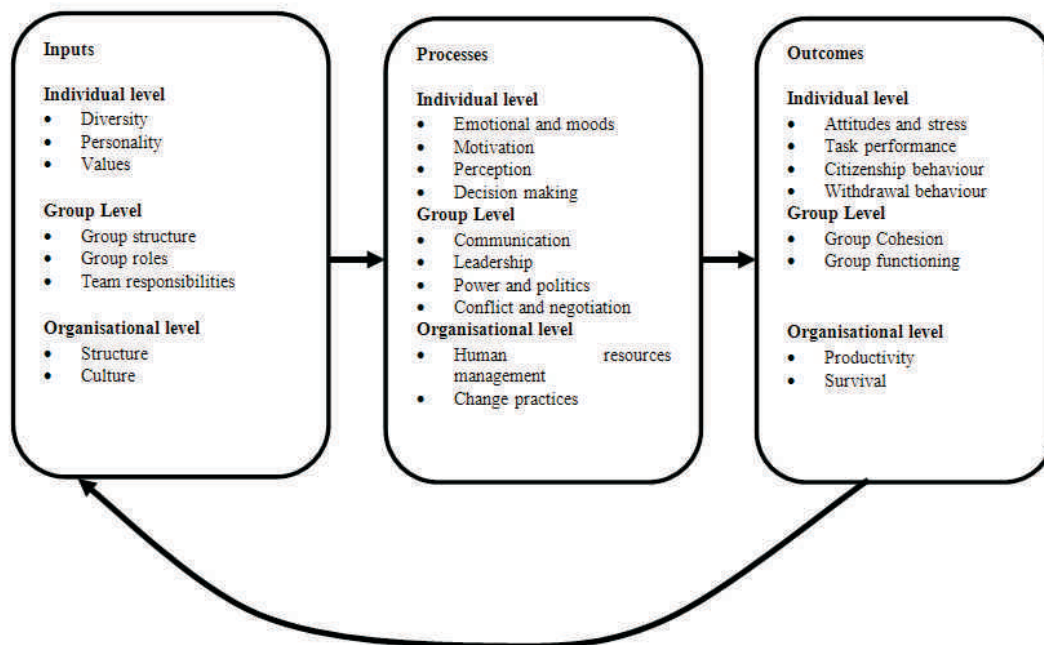


Fig. 1: A Basic Organisational Behaviours' Model

Source: OB (Robbins and Judge 2013)

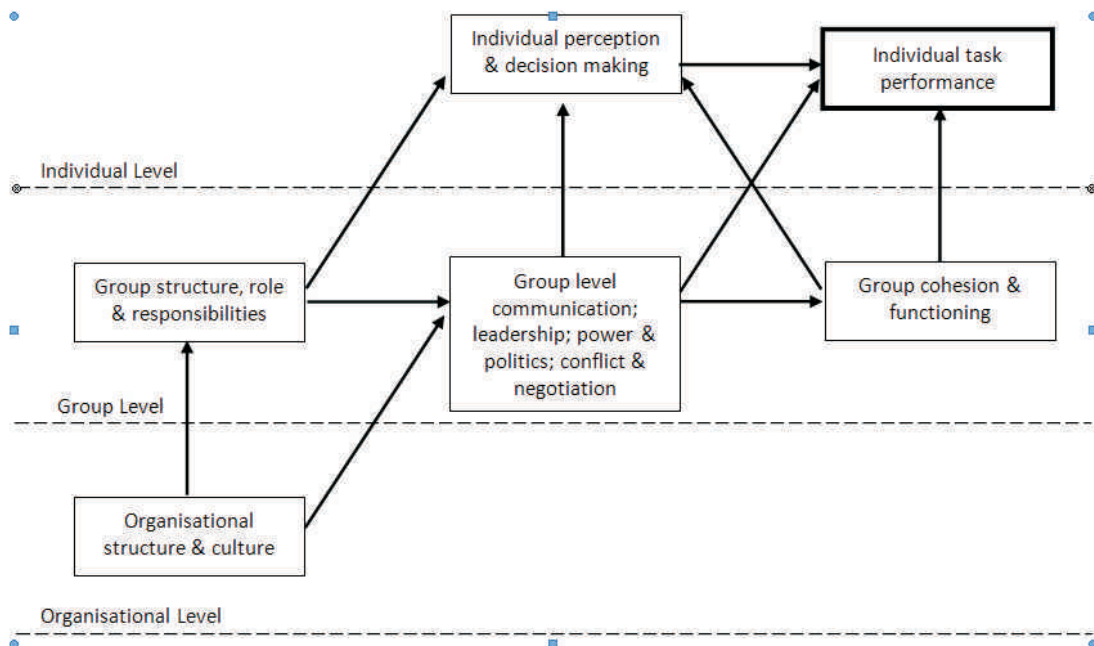


Fig. 2: Framework of the influences/functional lines of relationships in an organisation

Formalising the BPF Process

For a relatively long period of time the concepts of the cost advice function of the quantity surveyors (QS) in terms of theories, principles and procedures; have largely revolves around consultancy services whereby the QS assumes an independent and impartial position in providing services to the industry. However, recent developments are challenging this position whereby in-house QS services are once again becoming popular and in demand. Two major support for this changing landscape in QS services is the increasing demand for cost advice in construction firms, Donald (2015). Thesecond, which is very instructive, is the changes brought by the introduction of standards NRM for providing early stage estimates (RICS, 2011; 2013) i.e. NRM1 – the order of cost estimate (which wasnot a consideration before the coming of the NRMs i.e. 1, 2 & 3 in to the industry), which is the main outcome of any BPF system. The NRM3 also targeted at providing the means of forecasting cost maintenance of building, makes it and the NRM1 more client organisation orientated, hence further

promoting and reinforcing the need for in-house QS services.

Bringing the strategic considerations of public sector organisations in terms of construction projects to the fore the failings of the traditional approaches to cost advice i.e. evaluative approach has to give way to paradigms that situate BPF as a core function within these organisations. This therefore, challenges the application of theories outside contemporary organisation management (particularly organisational behaviour) towards solving the inherent problems of organisations. Hence, the need to harness the theories of organisational behaviours among others in investigating the problem identified in this research as suggested in the call for a systems view to solving organisational problems in construction (Kelly, Male & Graham, 2015; Walker, 2015); and the need for considering the OB in building construction cost advice became imperative. This is because according to Walker (2015), Cost advice of construction projects is an individual task performance that requires collaboration, commitment and dedication

of other professionals in the field to be accomplished. This means teamworking in terms of gathering information. Tanner (2014) observed that, 'an individual's function revolves round the cooperation he obtains through collaboration with other construction team members'. Thus, there is the need for formalising the BPF process.

Exploring these concepts and theories this paper identified ten processes that are known to influence behaviours in organisations, namely: perception, motivation and decision making - at the individual level; leadership, communication, power, politics, and conflict - at the group level; while at the organization level - human resource management and change practices (were not considered in this paper because they are functions carried out at the point of employment/engagement). Figure 3 shows the possible influences the behaviours have on each other and an indication of the fifteen mediation hypotheses established from literature.

METHODOLOGY

The target population for the study is client organisations' BPF production participants (i.e Architects, Quantity Surveyors, Builders, and services engineers) being the unit of analysis. The Sample size of the population was drawn based on purposive sampling technique, reason for the choice being that a good BPF technique relies on competent judgement based on construction experience and knowledge. First, a total of forty (40) structured questionnaire were distributed to seek for the professionals' EXPERT opinion in establishing the BPF process steps. Second, a total of 70 structured questionnaire (using sampling units to draw the sampling size owing to the fact that the population is known) were distributed to professionals in both Estate departments and

procurement units of six Universities in the second phase of the data collection. This was done with the view of ascertaining the basis for assessing what is done in-house in some public Universities. The Universities involved were five federal Universities and one state University - namely, Ahmadu Bello University (ABU), University of Jos (UniJos), University of Abuja (UniAbuja), Federal University of Technology Minna (FUTMinna), Bayero University Kano (BUK) and Kaduna State University (KASU).

To establish a theoretical framework for explaining the relationship between client organisation and BPF, two tools were adopted - descriptive statistics using questionnaire survey, and inferential using focus group discussion (FGD). The descriptive analysis provided mean values, standard deviations and percentages in arriving at the BPF processes and professionals roles as obtained in practice in the NCI. The focus group discussion was held with the academicians which formalised the BPF process steps. Establishing the nature of relationships and the influences between client organisations and BPF variables was achieved by using PLS - SME (Partial Least Square - Structural Model Equation) for the analysis.

Results and Discussion

The Robbins and Judge's (2015) model that was used is a two dimensional variable-based typology, vertically defined by the various levels in organisations i.e. individual (QS), groups/team and organisation; and horizontally by the nature/type of variable i.e. inputs, processes, and outputs. So Experts' opinion was sort for and their responses are presented in the Tables below.

Table 1: Establishing BPF Process and Organisation Highest Influence on the BPF

S/N	Perceived Forecasting Steps	N	The QS	Group or Team	The Organisation
			1	2	3
1	Establish level of details required in the forecast	40	47.5%	15.0%	37.5%
2	Make formal request for forecast	39	5.1%	7.7%	87.2%
3	Collect, clean & analyse cost data	40	97.5%	0%	2.5%
4	Qualify estimate (in terms of excludes)	40	85%	5%	10%
5	Determine type of estimate required e.g. preliminary, viability etc	40	70%	5%	25.0%
6	Gather relevant project information	39	71.8%	28.2%	0%
7	Determine value for money for the client	31	32.3%	61.2%	6.5%
8	Prepare the estimate	40	97.5%	2.5%	0%
9	Consider project factors (including uncertainties)	39	74.4%	12.8%	12.8%
10	Select, adjust & apply cost data/info	40	100%	0%	0%
11	Apply necessary skills, expertise and judgment	33	81.8%	15.2%	3%
12	Select price estimating methods e.g. functional, superficial etc	40	100%	0%	0%
13	Identify client's needs & objectives	37	13.5%	43.25%	43.25%
14	Monitor and review estimate	40	77.5%	12.5%	10%
15	Check governance policies	39	30.8%	43.6%	25.6%
16	Scan and understand available information	40	72.5%	7.5%	20%
17	Consider factors affecting accuracy of estimate	30	96.7%	3.3%	0%
18	Establish desired accuracy level	40	62.5%	7.5%	30%
19	Communicate the estimate	40	65%	35.0%	0%
20	Determine purpose of forecast	40	35%	17.5%	47.5%
21	Consider factors affecting selection of estimate methods	27	96.3%	0%	3.7%

Table 1: The table sought to find out who the respondents feel is responsible for carrying out each of the steps' function. The result shows the respondents had undivided opinions only on numbers 10 and 12 given the steps' function 100% to the QS. The overall picture gives QS the major participant in the BPF process as the QS got highest percentage ranging from 62% – 100% in 15 steps apart from 'establish level of details required in the forecast' which has 47.5%. The grey area is seen in the

proportion of responses on the issue of 'identify client's needs & objectives' 43.25% of the respondents were of the opinion that is the 'group or team', and the 'organisation' that influence the step. This perhaps depicts the notion that 'client's needs and objectives' are inclusive in the brief and not a step on its own since both the group or team and client are involved at the brief stage. Invariably, the result proved there is no formal BPF process in NCI.

Table2: Focus group validation of BPF process Steps

S/N	Identified forecasting activities	Agreed/ accepted activity	Order To form steps	Who carries the activity (QS=1; Group or team=2; Organisation=3)
1	Establish level of details required in the forecast	✓	2	3
2	Make formal request for forecast	✓	1	3
3	Collect, clean & analyse cost data	✓	10	1
4	Qualify estimate (in terms of excludes)	✓	14	1
5	Determine type of estimate required e.g. preliminary, viability etc	✓	4	3
6	Gather relevant project information	✓	6	2&3
7	Prepare the estimate	✓	13	1
8	Consider project factors (including uncertainties)	✓	8	1
9	Select, adjust & apply cost data/info	✓	11	1
10	Select price estimating methods e.g. Functional, superficial etc	✓	9	1
11	Monitor estimate	✓	16	1
12	Check governance policies	✓	8	1&3
13	Scan and understand available information	✓	7	1
14	Establish desired accuracy level	✓	5	1
15	Communicate the estimate	✓	3	1
16	Determine purpose of forecast	✓	15	3
17	Apply necessary skills and expertise judgement	✓	-	-
18	Adjudication	✓	17	3
19	Editing final forecast	✓	17	1
20	Brief	✓	2	3
21	Time horizon	✓	12	3
22	Review estimate	✓	17	1&3

Table2: The result shows that 22 steps were highlighted by the participants. During discussions the ordering had the same number to multiple steps such as in the case of 'establish level of detail required in the forecast' and 'brief' they came 2; 'consider project factors (including uncertainty)' and 'check governance policies' came 8. The 'adjudication', 'edit final forecast', and 'review estimate' came 17. Worthy of noting is the final number arrived at which is 17 (see table 3) as the initial steps figured out by the researchers.

The influence column pointed out the influence (referred to here as responsibility) of every entity, which clearly show that most functions are an individual's function and the QS is the one responsible for most of them. Specifically the QS is involved in all except in 7 steps where the influencer is the client (organisation) that is in the case of 'make formal request for the forecast', 'establish detail required for the forecast', 'determine the type of estimate required', 'determine the purpose of the forecast', 'adjudication', 'brief', and 'time horizon'.

The Table shows that gathering of relevant project information require the participation of the team and organisation for all the inputs to be put together for quality BPF outcome. The very interesting point to note is the 'apply necessary skills and expertise judgement' a step the participants accepted it should be included as a step. The step was initially included to test the knowledge of professionals in the questionnaire as explained under Table 1. However, when the participants came to arrange the steps in the order they should be, significantly they could not find it as a step nor who should be responsible of influencing it. This perhaps construed studies by Keith (2009), Cartlidge (2009), Kirkham (2015), and RICS (2013) all asserts that procurement and design of projects, providing cost advice to clients, cost management of construction projects require professional competencies, skills and expertise innovations in carrying the tasks. This then proved that for a professional to be involved in the exercise of BPF the professional must be judged to have necessary skills and expertise judgement that he can apply in making decisions.

Table 3: Focus group validated BPF process Steps

S/N	ESTABLISHED ACTIVITIES	ORDER OF STEPS
1	Make formal request for forecast	1
2	Establish level of details required in the forecast	2
3	Brief	2
4	Determine the purpose for the forecast	3
5	Determine the type of estimate required e.g preliminary, Viability, etc	4
6	Establish desired accuracy level	5
7	Gather relevant project information	6
8	Scan and understand available information	7
9	Consider project factors (including uncertainties)	8
10	Check governance policies	8
11	Select price estimating methods e.g functional, superficial, etc	9
12	Collect, clean & analyse cost data	10
13	Select, adjust & apply cost data/information	11
14	Time horizon	12
15	Prepare estimate	13
16	Qualify estimate (in terms of excludes)	14
17	Communicate the forecast	15
18	Monitor the forecast	16
19	Adjudication	17
20	Edit final forecast	17
21	Review estimate	17

Table 3: Table presents the validated BPF process steps that can be adopted for use in the NCI especially the Public client organisations that are the target of this study. The final result of the validation can be deduced to be 17 STEPS in all. The reason for this is confirmed in DOE (2011) work break down structure (WBS). The WBS shows that establishing details required for forecast entails detailed and well understanding briefing. This means brief is contained in step 2. The WBS also show that considering project factors (uncertainties) entails statutory policies must be checked.

This shows that governance policies are checked in step 8. The same explanation could be given to 'adjudication', 'edit final estimate', and 'review estimate'. The WBS shows that they all belonged to one step – Review estimate.

However, the study integrated the processes from the professionals in the field with the Focus Group and what is obtainable in the WBS and it came up with 17 STEPS as “FormalisedBPF Process Steps” as can be seen in Table 4.

Table 4: Formalised BPF process Steps

S/N	ESTABLISHED ACTIVITIES	ORDER OF STEPS
1	Make formal request for forecast	1
2	Establish level of details required in the forecast	2
3	Determine the purpose for the forecast	3
4	Determine the type of estimate required e.g preliminary, Viability, etc	4
5	Establish desired accuracy level	5
6	Gather relevant project information	6
7	Scan and understand available information	7
8	Consider project factors (including uncertainties)	8
9	Select price estimating methods e.g functional, superficial, etc	9
10	Collect, clean & analyse cost data	10
11	Select, adjust & apply cost data/information	11
12	Time horizon	12
13	Prepare estimate	13
14	Qualify estimate (in terms of excludes)	14
15	Communicate the forecast	15
16	Monitor the forecast	16
17	Review estimate	17

Table 5:- Extent OB Determinants are Exhibited

OB Behaviours	Level	Extent Exhibited
Perception	Individual	Low
Motivation	Individual	Moderate
Decision making	Individual	High
Leadership	Group	Moderate
Power	Group	Moderate
Communication	Group	Moderate
Politics	Group	Moderate
Conflicts	Group	Moderate

Table 5 shows the perceptions of the participants of the BPF process is low. A moderate level of motivation is exhibited by professionals engaged in the BPF process while the level to which they engage with an appropriate decision making model is high. At the group/organisation level, both leadership and power are exhibited to a moderate level, while meeting the requirements of effective communication is exhibited to a moderate level. Similarly, both politics and conflicts are exhibited to a moderate level in public client organisations relative to the BPF process. Hence, apart from perception of the BPF process and engaging with appropriate decision making models both of which are behaviours determinants at the individual level (and exhibited to a low and high extent

respectively), all the remaining determinants (all at the group/organisation level except one) are exhibited to a moderate level within the BPF process in public client organisations. The result depicts the outcome at the individual level could affect the attainment of BPF requirements (i.e. in terms of information and teamwork) seeing that perception has positive relationship with both motivation and decision making – (see Fig 3), which has positive influence on individual task (in this case BPF), low perception could affect all other behaviours (Boakye, 2015).

Conclusion and Recommendation

The need for a formal documented BPF process is paramount for realistic construction projects in PSCO and CI in

general. This study could not find a formalized documented BPF process to explore for the understanding of BPF process in UK domain from which our NCI adopts its practice. The results from the investigation carried out proved there is no formalized documented BPF process in our NCI either leaving the formulation of BPF to the acceptance standard of the organization concern. Hence, this study established a formalized BPF process steps for realistic and reliable cost advice in not only in PSCO but in CI in general. In addition, for quality BPF to be produced, the study assessed the interrelationships of the participants of the

BPF process for healthy behaviours among the participants. The result in this paper shows the relationships of the participants is not optimal and especially the individual's perception.

Having established the formalized BPF process this study recommends the PSCOs and CI in general to adopt it as matter of necessity, and eradicate the indicators that could lead to wrong perception in their policy of forming teams for the purpose of BPF formulation in order to enhance the performance of the BPF.

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IMPACT OF KNOWLEDGE MANAGEMENT PRACTICES ON PERFORMANCE OF CONSTRUCTION FIRMS IN NIGERIA

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ABSTRACT

The performance of an organization is primarily driven by knowledge thus the essence of KM (Knowledge Management) in organizations. The need to improve performance of construction firms have been emphasized severally in literature. Impact of individual KM practice on performance is yet to be established. This study examined the relationship between individual KM practice and performance of construction firms in Nigeria by identifying ten KM practices and six performance measures from the literature. Purposive sampling method was adopted. A structured questionnaire was administered to 358 construction firms out of which 217 (60.6%) were completed and analyzed. Descriptive statistics and structural equation modeling were used in the analysis. The results of the descriptive statistics show that Knowledge process integration ranked the highest with a mean of 4.79 while the findings of performance measure show that efficiency and safety measures ranked the highest with mean of 4.28 each. The results of the structural equation modeling show that eight of the ten KM practices have significant influence on Performance of construction firms in Nigeria. Integration of HRM and KM should be encouraged for performance improvement in Nigerian Construction firms.

Keywords: *Construction Firms, Knowledge management, KM Practices, Performance,*

INTRODUCTION

In the 1990s, Knowledge Management (KM) was identified as a management discipline. KM can be defined as the process of creating sharing and managing the knowledge and information of an organization for future use and application. (Ragab & Arisha, 2013). KM initially gained acceptance into commercial firms before penetrating into both public and private sectors (Kamhawi, 2012). It further gained acceptance in non-governmental organizations when major global funders such as the World Bank and the Department for International Development accepted and publicly supported it (Durst & Edvardsson, 2012). The development and sustenance of KM is vital for the success of a firm as it is believed that implementing KM practices is vital for attaining success in a business venture (Andreeva & Kianto, 2012). KM has been recognized as an instrument for achieving competitive edge as it enhances customer

focus, employee relation, innovation and development, (Abdullahi *et al*, 2013; Cohen & Olsen, 2015). The effect of KM on the performance of organizations is an evolving topic (Theriou, Maditinos & Theriou, 2011)(Wang, Chiang & Tung, 2012) that has been investigated in various context, countries and industries as a novel and influential approach to management (Inkinen *et al*, 2015). It is a discourse widely promoted by consultants, academics, practitioners and the general business world because of its importance in the establishment of a framework with which innovative strategies that can influence performance of firms can be implemented. (Harvey *et al*, 2015).

KM gives opportunity to firms to explore the tacit and explicit knowledge that exists in firms and convert the gathered knowledge into organizational asset for decision making, thereby enhancing the effectiveness

and efficiency of the workforce (Birasnav, 2014). Since the performance of an organization is primarily driven by knowledge, it can be argued that if the organizational knowledge quality is good, the organizational performance will improve significantly. Hence, the application of knowledge gives opportunity for higher performance (Donate & Canales, 2012; Lee et al, 2013). Performance of organization is the act that involves the analysis of what the firm has achieved against the set goals and objectives of the firm (Gupta & Chopra, 2017). It compares the real results obtained with the intended output. A correct adoption of KM practices can have a positive effect on organizational performance. Hence, the stronger the KM practices, the better the influence on performance over time (Hormiga, Batista-Canimo & Medina, 2011; Singha *et al.*, 2015). A review of recent literature shows that existing research appears to focus on issues relating to generic knowledge processes like knowledge acquisition, knowledge sharing and knowledge creation. Only a few studies such Chuang, Liao & Lin (2013), Chen and Huang (2009), Donate and Canales (2012) have examined the impact that the KM practices have on firm performance. To effectively assess KM, it should be carried by assessing the practices (Harvey *et al.*, 2015). The observable facets of Km are referred to as its practices which is the focus of this research. This study focused on the general aspect of firms' performance. Thus, the relationship between specific individual practices and performance is an issue worthy of further studies (Heisig, 2014; Perez-Arrauetal, 2014; Soto-Acosta *et al*, 2014). This study therefore investigates the relationship between specific KM practices and performance. this was achieved by identifying KM practices, examining performance measures and empirically establishing the relationship between the two concepts.

LITERATURE REVIEW

Knowledge Management Practices

Practices are observable facets of concepts (Wang et al, 2012). KM practices can be

defined as activities initiated by management of firms aimed at improving the effectiveness and efficiency of the knowledge resources of organizations (Gracia-Morales et al, 2012). Such practices can be operated and managed by deliberate and focused activities of management. At the empirical level, the assessment of the existence of KM and what makes up KM is made at the level of practices (Heisig, 2014). Practices can be referred to as the observable facets of KM. Through the observable facets, managers work to achieve improvement in their firms (Valmohammadi& Ahmadi, 2015). KM can also be viewed as the aspect of organizations that can be deployed and intentionally controlled by the activities of management (Cao, 2013). KM practices are generally described as the set of managerial actions that aid organizations deliver value from the knowledge-based assets (Kim & Hancer, 2010). Ten KM practices were adopted for this study: Technology, Structure, Culture, Knowledge Process, People, Strategy, Leadership, Resources for KM, Network and alliances and Assessment of knowledge initiatives.

KM1: Technology: KM Technologies support strategies, processes, methods and techniques that aid in creating, sharing and the application of the best knowledge across the teams and across organizations (Kuo, 2011). They refer to the tools that aid in achieving success in adopting the practice. IT technology refer to IT support, involvement of hard IT practices, IT capable of supporting management decisions and knowledge work. It also includes KM systems and tools that are widely accepted and regularly updated, KM system capable of sharing data and information with all stakeholders and KM system sufficient to support daily work.

KM2: Structure: KM structure can be defined as the organization and arrangement of interrelated elements in a system, or the process of organizing a system (Wang *et al.*, 2012). It involves decentralization, less formalization, work teams, communities of practice, and expertise networks.

Km3: Culture: This refers to the right vision, strategies and tactics that aid organizations to achieve the benefits of KM and overcome its barriers (Tzortzaki & Mihiotis 2014). KM culture includes collaboration among employees, trust in the organisation, and constant learning. It also includes innovative culture to encourage research and development, culture that values knowledge-seeking and problem-solving, strong belief in the philosophy of sharing of knowledge. Employment of experienced employees to share knowledge with new recruits, team work for knowledge sharing, and environment that encourages to develop and implement ideas are also important in the development of KM culture.

KM4: Knowledge processes: These refer to the sequence of actions or steps taken in order to achieve a successful KM adoption (Chen & Huang, 2009). The steps of Knowledge process include acquisition and absorption market focus, sensitivity to market changes, technological human capital profile and partnership with international customers. Other steps include the organizations values system, employees' attitudes and opinions. It considers if the organization has well-developed financial reporting system, ensures that the organization gets information from market surveys, identifies internal source of expertise experiments/learns regarding customers and markets. It further includes experiments/learns regarding products and service, experiments/learns regarding operations and technology, and exploits external knowledge.

KM5: People (Integration of HRM and KM): Recent HRM literature recommends the need for organizations to investigate the coordination of HRM strategies and KM strategies to identify sources of value creation (Hsiao *et al.*, 2011; Kushwaha & Rao, 2015). This can be achieved by combining different theoretical perspectives that originated in the field of knowledge management. They must have common objectives in the context of HRM theories such as T-shaped skills i.e. depth of skills and

ability to collaborate across disciplines. Others include soft HR practices i.e. approach based on individuals, competence development and management based on rewards knowledge sharing (monetary incentives and non-monetary incentives), and knowledge sharing as a part of performance appraisal.

KM6: KM Strategy: This refers to plans that describe how organizations will better manage knowledge and information received for the benefit of the organization and its stakeholders (Lee *et al.*, 2012). This is a vital factor for the success of KM adoption since KM strategy must be closely aligned with the overall strategy and objectives of the organization. Understanding of the organization as an overall system, clear objectives for KM, and explicitly documenting the KM rules.

KM7: KM leadership: The role of leadership in driving the success of any organizational initiative cannot be over emphasized. Leadership is an important dimension in organizational success (Ragab & Arisha, 2013). The role of leaders is vital in achieving successful KM adoption. The cultural and maturity level of KM in most organizations echoes the role of leaders. It involves leaders acting as catalysts for knowledge sharing, establishing conditions set by management, ensures top management act as a role model for KM, and it involves the commitment and support to KM by top management.

KM8: Resources for KM: This refers to typical supply of funds, materials, staff, and other assets that can be drawn on by a person or organization in order to effectively adopt KM (Chien & Tsai, 2012). This can be referred to as the consideration of resource availability when investing in KM, budgeting for KM, sufficient financial resources for KM, sufficient human resources for KM, and providing time to employees for KM.

KM9: Network and alliances: This is a process where the most effective members

for a team are selected and united for the common goal of an organization. Members that form alliance consist of individuals, organizations, businesses or groups (Chuang *et al.*, 2013). Common areas of interest and concerns are identified and shared. Available resources are used to achieve common goals. Network and alliance can generally be referred to as a manifestation of cooperative strategies to improve the operations of organizations. This involves dedicating resources to obtain external knowledge, participating in teams where external members are also members, membership of industry bodies, processes for customer feedback and processes for exchanging knowledge with business partners and suppliers.

KM10: Assessment of knowledge initiatives: KM initiatives are the actions taken or statements made with the intention of solving a problem. KM is not only about information, it also involves people recruited, trained, developed and promoted in an organization (Donate & Canales, 2012; Kianto *et al.*, 2014). KM initiative provide resources to learn what works and what does not work and the reason for such failures. It further explores effective models that address urgent social challenges. Assessing KM initiatives involves benchmarking, assessment matrices (financial and non financial) and measurement of intellectual capital.

Categories of Performance Measurement PMBOK Guide (2007), grouped the mostly used performance measures into six general categories

1 Effectiveness: this can be referred to as the capability of producing a desired result or achieving a set goal. A process characteristic indicating the degree to which the process output (work product) conforms to requirements (Are we doing the right things?)

2 Efficiency: A process characteristic indicating the degree to which the process produces the required output at minimum resource cost. (Are we doing things, right?).

this ensures that materials, energy, efforts and funds are not wasted in the process of achieving desired goals.

3 Quality: The needs of the client is paramount, the aim of any business venture or organization is to ensure that their customers are satisfied with the quality of output. The degree to which a product or service meets customer requirements and expectations.

4 Timeliness: Meeting the needs of customers at the expected or favorable time is important. Timely delivery is vital Measures whether a unit of work was done correctly and on time. Criteria must be established to define what constitutes timeliness for a given unit of work. The criterion is usually based on customer requirements.

5 Productivity: the efforts involved in any venture must be effective. Productivity measures how effective the input to a production process is. The value added by the process divided by the value of the labor and capital consumed.

6 Safety Measures: These are activities and precautions taken to improve safety, i.e. reduce risk related to human health, the overall health of the organization and the working environment of its employees.

KM Practices and performance

KM culture practice should ultimately culminate in ensuring a competitive edge for the organization thus should positively influence performance (Hurmelinna-laukkanen, 2011). KM has increasingly become vital for the success of organizations, implementation of right technology for KM would positively influence performance (Valmohammadi & Ahmadi, 2015). Firms that are able to effectively implement and adopt KM practices will remain competitive in the long run even though the implementation may expensive and time consuming (Jian *et al.*, 2014). Right adoption of KM technology and leadership practices will positively influence Organizational Performance (Wang *et al.*, 2012). It is expected that the

benefits will offset the cost intensive procedure of KM adoption. KM literature has overtime supported the synergy between KM strategy and performance, it is believed it would improve the performance of firms (Lee et al, 2012). KM Network and affiliation practices are of value to a manager as research has shown that successful KM adoption influences organizational effectiveness (Kianto et al, 2014). Well-planned and well executed KM Resources and Leadership practices function as enablers for the achievement of better performance of an organization. Performance benefits of KM adoption can only be achieved if firms develop strategies for filtering knowledge, strengthen the philosophy of corporate organizations and enhance effective communication (Steinfeld et al, 2010; Palacios et al, 2013). Assessing Knowledge initiatives, integration of HRM and KM, KM technology and KM Structure enhances performance of organizations positively (Kushwaha & Rao, 2015). However, Chen & Huang (2009) believe that KM processes does not positively influence performance of firms. This is however yet to be empirically established.

METHODOLOGY

Data collection technique

The study considered theories and collect data hence the deductive approach will be the most suitable. Identifying the relationship between KM and performance will add an important level of understanding that can help in improving performance of organizations. The deductive approach points towards a survey method of data collection. A survey method allows for the collection of quantitative data which can be analyzed using descriptive and inferential statistics. The survey method has been used in past researches examining aspects of KM (Lee et al., 2013), performance (Kuo, 2011) and relationship between KM and performance (Perez-Arrau et al., 2014). According to quantitative methods can provide a high level of measurement precision, statistical power, and high levels of reliability of data. In order to utilize the statistical power of the quantitative method

the data was analyzed using statistical (quantitative) analysis procedure.

This study focused on construction organizations registered with the Bureau of public procurement (BPP) in Nigeria. Firms not expressly practicing KM were included because they may not be specifically familiar with KM but may be practicing the principles routinely without knowing it. It means that their response will be practical rather than theoretical knowledge. A total number of 88,424 construction companies are registered with the BPP in Nigeria (Olaleye et al., 2019).

Purposive sampling technique was adopted. A sample of 383 was drawn from the population at 95% level of confidence. A sample size of 383 is needed to arrive at a sample with a sampling error of at least 5%. This number (383) is further collaborated by the tables presented by (Saunders et al, 2009, Cohen et al, 2007) the choice of 383 is consistent with the two tables for a population size of less than 100,000 with 95% confidence level and 5% margin of error. A total number of 383 questionnaires were administered to employees of construction firms and 217 (60.6%) were retrieved and analyzed.

The variables used in the questionnaire were extracted from a review of relevant literature, on a five-point Likert scale ranging from 5: strongly agreed, to 1: strongly disagreed, respondents were asked to indicate their perceived level of agreement with statements on KM and performance. The questionnaire was divided into three sections. Section A covered the demographics of the respondents, Section B covered questions on KM Practices while section C covered questions on the performance measures of the organizations studied.

Analysis and Results

A descriptive analysis of the collected data was done using SPSS version 21 and the partial least square structural equation modelling (Smart PIs 3) for the inferential statistics.

Table 1: Knowledge Management (KM) Practices

CODE	KM PRACTICES	MEAN
KM Technology		
K1A	Effect IT support in place	3.20
K1B	Hard IT Practices are identified and utilized	3.72
K1C	Available IT is capable of supporting management decision and Knowledge work	4.59
K1D	KM systems and tools are widely accepted and regularly updated	4.53
K1E	KM systems are capable of sharing data and information with all stakeholders	4.70
K1F	KM systems are sufficient to support daily work	4.22
KM Structure		
K2A	Decentralization of Processes and procedures	3.88
K2B	Less formalization of work procedure	4.03
K2C	Effective work teams in place	3.97
K2D	Communities of practices	4.17
K2E	Expertise networks	4.49
KM Culture		
K3A	Effective collaboration among stakeholders	4.11
K3B	Established trust in the system	4.42
K3C	Learning of Processes and procedures is enforced	4.43
K3D	innovative culture to encourage research and development	4.36
K3E	culture that values knowledge seeking and problem solving is in place	4.39
K3F	Believes in the philosophy of sharing knowledge	4.44
K3G	Experienced employees share knowledge with new recruits	4.40
Knowledge processes		
K4A	knowledge Process conversion	3.41
K4B	knowledge process application	3.54
K4C	knowledge process dissemination and sharing	2.66
K4D	knowledge process responsiveness	2.34
K4E	knowledge process integration	4.79
Integration of HRM and KM		
K5A	integration of T-shaped skills	4.67
K5B	Adoption of soft HR practices	4.62
K5C	Approach based on individuals	4.54
K5D	competence development and management based on competencies	4.65
K5E	rewards knowledge sharing	4.34
K5F	knowledge sharing as part of performance appraisal	4.04
KM Strategies		
K6A	Aligning the KM strategy with organizational strategy	4.23
K6B	Understanding the organization as an overall system	4.18
K6C	Clear objectives for KM	4.23
K6D	Explicitly documenting the KM rules	4.51
KM Leadership		
K7A	Leadership is acting a catalyst for knowledge sharing	4.03
K7B	establishes conditions by management	4.37
K7C	top management as a role model for KM	4.36
K7D	Commitment and support to KM by top management	4.31

Resources for KM		
K8A	Consideration of resources available when investing in KM	4.36
K8B	Budgeting for KM	4.53
K8C	Sufficient financial resources for KM	4.54
K8D	Sufficient human resources for KM	3.76
K8E	Providing time to employees for KM	3.92
Network and Alliances		
K9A	Dedicating resources to obtain external knowledge	3.06
K9B	Participating in team where external members are also members	2.86
K9C	Membership of industry bodies	4.65
K9D	Processes for customer feedback	4.52
K9E	Processes for exchanging knowledge with business partners and suppliers	4.41
Assessment of Knowledge initiatives		
K10A	Benchmarking	4.05
K10B	Assessment of financial and non-financial matrices	3.98
K10C	measurement of intellectual capital	3.81

Source: Field Study 2019

Table 1 shows the result of the descriptive statistics of KM practices. The findings show that Knowledge process integration ranked the highest with a mean of 4.79, this is followed by integration of T shaped skills with a mean of 4.67 and adoption of HR

practices with a mean of 4.62. knowledge process responsiveness ranked the lowest with a mean of 2.34 followed by knowledge process dissemination and sharing with a mean of 2.66.

Table 2: Performance Measures

Code	Performance measure	Mean
P1	Effectiveness of processes and procedure	4.20
P2	Efficiency of processes and procedure	4.28
P3	Quality of finished product	3.92
P4	Timeliness of delivery	4.01
P5	Productivity of manpower	4.10
P6	Safety Measures	4.28

Source: Field Study 2019

Table 2 shows the result of the descriptive statistics of the performance measures identified from literature. The findings show that efficiency and safety measures ranked

the highest with mean of 4.28 each followed by effectiveness of processes and procedures with a mean of 4.20 while quality ranked the lowest with a mean of 3.92.

Table 3: Internal Consistency, Convergent Validity, R^2 and Q^2 results

	AVE	Composite Reliability	Cronbachs Alpha	R Square	Q Square
KM Technology	0.6355	0.7155	0.8557		
KM Structure	0.5334	0.7140	0.8306		
KM Culture	0.5828	0.8926	0.8666		
Knowledge processes	0.6211	0.7181	0.8298		
Integration of HRM and KM	0.5522	0.8794	0.8352		
KM Strategies	0.5524	0.8269	0.7776		
KM Leadership	0.5350	0.8153	0.7094		
Resources for KM	0.5660	0.7935	0.6335		
Network and Alliances	0.6768	0.7987	0.7143		
Assessment of Knowledge initiatives	0.5625	0.7100	0.7655		
Performance	0.6498	0.8238	0.7402	0.7239	0.2881

Source: Field Study (2019)

Internal consistency: The results of the internal consistency also referred to as composite reliability for the firms is presented in table 3. Smart Pls prioritizes the indicators according to their individual reliabilities and thus utilize composite reliability as against the traditional criterion of internal consistency (Cronbach's alpha). It is however interpreted in the same way as Cronbach alpha. All the constructs meet the minimum threshold of 0.70. The scores as presented in table 3 are as follows: KM Technology 0.716, KM Structure 0.714, KM Culture 0.892, Knowledge processes 0.718, Integration of HRM and KM 0.874, KM Strategies 0.827, KM Leadership 0.815, Resources for KM 0.794, Network and Alliances 0.799, Assessment of Knowledge initiatives 0.710 and Performance 0.824.

Convergent validity: A common measure used in establishing the convergent validity

of constructs is the Average Variance Extracted (AVE). this is referred to as the grand mean of the squared loadings of the indicator associated with each construct. Table 3 shows the AVE of the model. The findings show that the 10 constructs meet the minimum 0.50 threshold. KM Technology 0.636, KM Structure 0.533, KM Culture 0.583, Knowledge processes 0.621, Integration of HRM and KM 0.552, KM Strategies 0.552, KM Leadership 0.535, Resources for KM 0.566, Network and Alliances 0.677, Assessment of Knowledge initiatives 0.563 and performance 0.650.

Coefficient of determination (R^2): Table 3 shows the results of the firms. The findings indicate that the ten KM practices subculture types explain 72.39% of the variance in Performance (Substantial).

Table 4: Path coefficient

CODE	KM PRACTICE	PERFORMANCE
K1	KM Technology	0.0038
K2	KM Structure	0.6452
K3	KM Culture	0.0718
K4	Knowledge processes	0.1172
K5	Integration of HRM and KM	0.1872
K6	KM Strategies	0.0142
K7	KM Leadership	0.7736
K8	Resources for KM.	0.1171
K9	Network and Alliances	0.1572
K10	Assessment of Knowledge initiatives	0.7045

Source: field study (2019)

Path Coefficients: Table 4 shows the results of the path coefficients. The results show that the path coefficient between KM Technology and performance is 0.038, KM Structure and performance is 0.6452, KM Culture and performance is 0.0718, Knowledge processes and performance is 0.1172, Integration of HRM/KM and performance is 0.1872, KM Strategies and performance is 0.0142, KM Leadership and performance is 0.7736, Resources for KM and performance is 0.1171, Network and

Alliances and performance is 0.1572, Assessment of Knowledge initiatives and Performance is 0.7045. the results show that KM leadership has the strongest relationship with performance, followed by assessment of Knowledge initiative and KM structure. The weakest relationship exists between KM strategies and performance. The findings show that all the KM practices have positive relationship with performance.

Table 5: Mean, STDEV, T-Values, Sig Level

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (O/STERR)	SIG LEVEL
K1 -> P1	0.287	0.018	0.147	0.147	1.953	*
K2 -> P1	0.592	0.038	0.179	0.179	3.313	***
K3 -> P1	0.452	-0.075	0.102	0.102	4.439	***
K4 -> P1	0.398	-0.140	0.148	0.148	2.693	***
K5 -> P1	0.357	0.213	0.135	0.135	2.650	**
K6 -> P1	0.412	-0.007	0.142	0.142	2.904	***
K7 -> P1	0.215	0.056	0.159	0.159	1.357	NS
K8 -> P1	0.519	-0.033	0.175	0.175	2.969	***
K9 -> P1	0.157	0.135	0.105	0.105	1.501	NS
K10 -> P1	0.305	0.302	0.101	0.101	3.030	***

Source: Field Study (2019) Note: NS = not significant. a. Bootstrap confidence intervals for 10% probability of error ($\alpha = 0.10$). * $p < .10$. ** $p < .05$. *** $p < .01$.

Size and significance of path coefficients:

Table 4 shows the t statistics and p value results associated with each path result for the firms. A total of ten path relationships exist between the ten KM practices and performance. A total number of eight significant and two non-significant relationships exist between the exogenous and the endogenous variables. The empirical results of the paths significance show that KM practices influence performance.

DISCUSSION

The findings show that the eight (KM Technology, KM structure, KM culture, KM knowledge process, Integration of HRM and KM, KM Strategy, Resources for KM and Assessment of Knowledge Initiatives) of the ten KM practices identified in this study have significant relationships with firm performance. While two practices (KM Leadership and Network and Affiliation) have non-significant relationships with performance. KM Technology if properly adopted, can lead to enhanced knowledge sharing in firms. This finding corroborates the earlier findings of Palacio-Marques et al, (2013), Singha et al, (2015) and Kushwa and Rao (2015) that concluded that KM culture, KM Processes and assessment of knowledge initiative practices play a significant role in the performance of firms. The findings are also in line with the findings of Zack et al (2019) whose findings show that KM Technology, KM Strategy, KM Network and affiliation have positive relationship with

performance of firms. The findings are however not in line with the findings of Ragab & Arisha (2013), as leadership was found to have a negative relationship with performance of organizations. KM strategy was also established to have a negative relationship with performance, this is not in line with the findings of Lee et al, (2012)

CONCLUSION

This study examined the relationships that exist between KM practices and performance of construction firms in Nigeria. It points out the individual KM practices identified and the specific relationship of each practice with performance of firms. Eight of the ten practices identified have significant relationship with performance of construction firms. KM leadership and KM network and affiliations are not significantly linked with the performance of Construction organizations in Nigeria. The extent of these practices must be improved to improve the performance of Construction organizations in Nigeria.

RECOMMENDATIONS

1. Management of construction firms should ensure Integration of HRM and Km to improve their performance.
2. Efficiency of Processes and procedures should be improved in Construction firms

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INFORMAL TRADING ACTIVITIES: A STUDY OF THE IMPACT ON THE PHYSICAL CHARACTER OF BUILDINGS AND STREET SCAPE OF AHMADU BELLO WAY, JOS. PLATEAU STATE. NIGERIA.

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ABSTRACT

Informal Trading Activities has become a normal economic activity in our cities and this comes with various impacts on the surrounding buildings, streetscape, landscape, and circulation. The Paper investigates the negative impact these informal activities brings on the buildings and the streetscape of Ahmadu Bello Way, Jos.

The paper used questionnaires as the instrument to collect data reflecting the opinions of respondents. The respondents were randomly picked from business owners and the general public utilizing that street. The Chi – Square Statistical Analysis was used because it is a test that measures how a model compares to actual observed data. Results showed that informal trading activities on Ahmadu Bello Way, Jos which happens to be one of the busiest streets, had a negative impact on the streetscape and other physical infrastructure. The study gathered the importance for an organized architecture for street activities which should factor in these informal trading activities. Recommendations were further made to Government Agencies and market associations on modifications to be implemented, so that our streets with their bustling business activities remain sane and beautiful.

KEYWORDS: *Informal Trading Activity, Physical Infrastructure, Streetscape, Pedestrian & Vehicular Traffic.*

INTRODUCTION:

Informal trading activities in cities and towns, affects the physical characteristics of our buildings, streetscapes and cityscape. The study is set to investigate the negative effects of open market of goods as it defaces the buildings, thereby affecting the streetscape of our cities. Open market displays and alterations to building plans have overtime redefined our streetscape through negative impact of physical qualities like material, openings, color, roofing

systems and projections. Open market display of goods would consist of display and sale of goods or services with the primary objectives of generating employment and incomes without having a formal and permanent built-up structure such as shops for which to sell the goods. They may be stationary in the sense that they illegally occupy spaces surrounding building facades, the pavements, roadsides or other public/private spaces (Bhomik 2005).



Figure 1 & 2: Ahmadu Bello Way Jos Showing Open Display of Goods: Author, (2020)

Informal trading activities are often seen by the authorities as an ugly phenomenon and a nuisance. Therefore, conflicts arise between urban authorities trying to keep their cities clean and informal traders who need structures and open spaces for their activities. The Government through its

agencies usually frowns at this, which results in forceful evictions. This has been the case in Jos, Plateau State. This at the end of the day doesn't go down as a permanent solution because the traders gradually find their ways back to these streets.



Figure 3: Ahmadu Bello Way Jos Showing Littered Streets: Author, (2020)

This paper will specifically test two hypotheses;

i. H_0 = There is no significant relationship between open market display of goods and aesthetic appearance of the ambience of buildings.

H_1 = There is significant relationship between open market display of goods and aesthetic appearance of the ambience of buildings.

ii. H_0 = There is no significant relationship between open market display of goods and the surrounding landscape / visual continuity of the streetscape.

H_0 = There is significant relationship between open market display of goods and the surrounding landscape / visual continuity of the streetscape.

The scope is specifically restricted to one aspect of informal trading activity which is open market display of goods and has been carried out using 30 buildings randomly selected along Ahmadu Bello Way, Jos.

The Significance of the study lies in the fact that the results would proffer solution which could be implemented by the government to address the challenges and negative impact of open market display of goods.

The Urban residents would benefit from organized and orderly activities on the streets, where there will be clearly defined

pedestrian paths, vehicular parking and road sizes.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK:

Open market display of goods has overtime become a normal trend in our cities, taking away the ambience and visual continuity of our streets.

Streets are equally the predominant element of a city whose path network usually forming strong characteristics which forms strong images in the minds of residents. Considerable evidence has been collected showing that the physical characteristics of an urban environment have the potential to affect the attainment of environmental spatial knowledge (Cubukcu and Nasar, 2005; Garling et al., 1986; Weisman, 1981)

Omer and Jiang, 2008 wrote that when the focus is on the physical qualities of the urban environment and how they relate to attributes of identity and structure. Legibility becomes synonymous with image ability, namely "that quality in a physical object which gives it high probability of evoking a strong image in any given observer" (Lynch, 1960).

A city center is the commercial, cultural and social center of a city where natural and man-made physical objects combine to create a vibrant urban environment with modern amenities in order to serve the needs of all people (Roever, 2014).

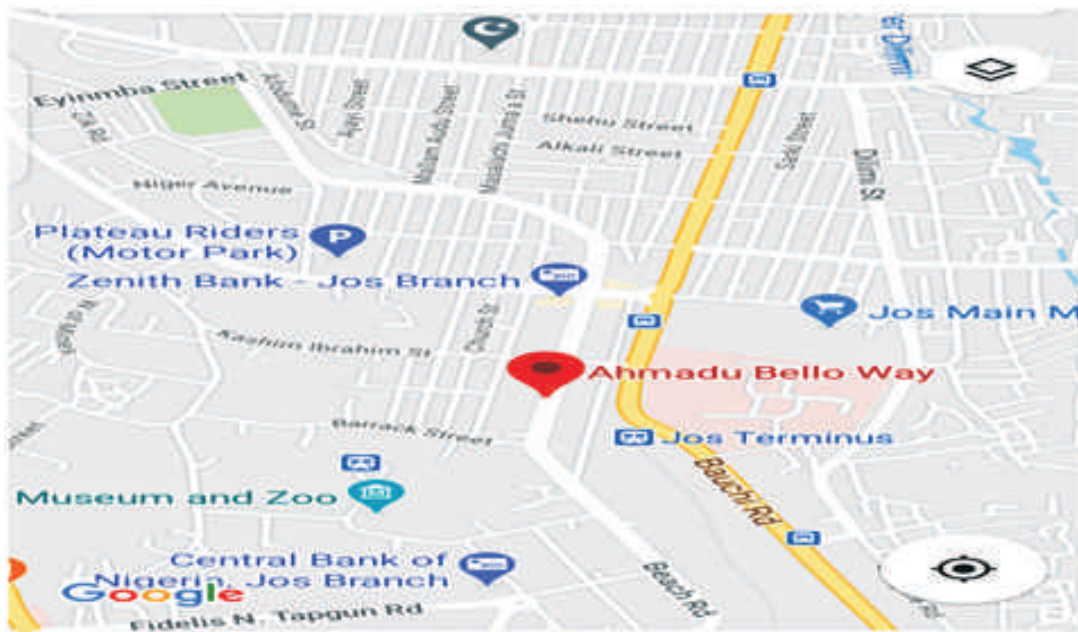


Figure 4: Map of Jos showing Ahmadu Bello Way: Google Earth Map, (2020)

City centers have image or character which are usually borne from building aesthetics, façade and street visual continuity. The imageries of the visual continuity on the Ahmadu Bello Way, Jos is visually poor and lack any form of organized pattern. The era

and legacy of failed master plans that are rigid and fixed have left cities, urban areas, residents and the surrounding environment poorly equipped to cope with the exploding urbanization levels (Jiriko, 2008).



Figure 5: Ahmadu Bello Way Jos Showing a Disorganized Streetscape: Author, (2020)

Open market displays of goods on Ahmadu Bello Way, Jos constitute an eye sore even though the authorities have tried severally to stop such operators, they find a way to come back thereby interrupting movement and visual experiences. Therefore, the hazardous presence of the urban street open market display goods deserves careful study because it has become protracted, attained epidemic proportions and has implications for building aesthetics, street continuity and governance in Jos.

The vibrancy of the street trading landscape with its multifarious forms are good, but also the resultant congestion and inhibition of human traffic flows, mobile and immobile vendors (in makeshift structures), with various types of display operate adjacent to

the shops, either on the pavements or along the road itself. Therefore, there is a mixed use of the commercial space where shop owners, wholesale and street vendors compete with and/ or complement each other to provide goods and services to customers.

Open market display goods or street trading is a situation of economic exchange in a selling place characterized by its precarious occupation of public and by the mobility of the traders and /or of the customers. Street trading is carried out in public spaces that are not specifically designated for trade, and as such, it enters into competition with other urban services such as traffic flow, access to buildings and other commercial activities in the city.

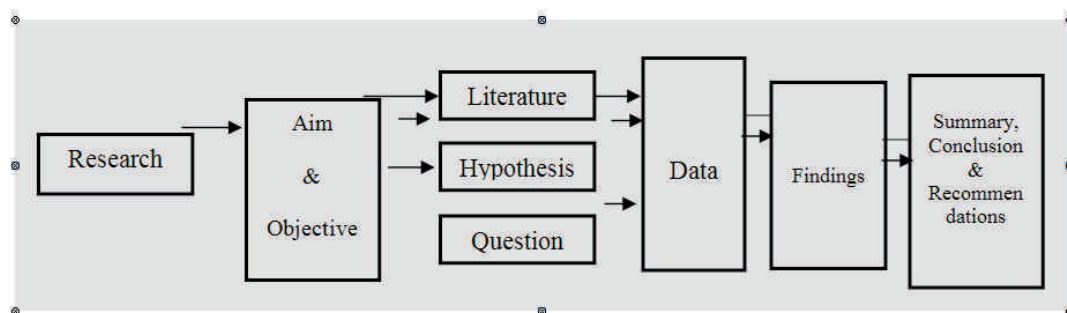


Figure 2: Model Structure for the Research Design; Author, (2020)

The Model (Figure 2) provides a frame work for understanding the structure of the research. The proposed model flow diagram provides description and highlights of the following topics of the research;

- I. The associated characteristics of Open market display of goods activities.
- II. The problem studied and investigated.
- III. Tools and Instrument of the Research.
- IV. Data gathering and preparations.
- V. The analysis of data and outcomes.

The Methodology used involved gathering data through administering structured questionnaire to over 60 respondents cut across 30 complex buildings on Ahmadu Bello Way Jos randomly selected. The investigations were on perceptions and opinions on how they agree or disagree on

the effects of urban informal commercial activities, as they impact on physical form and street scape

All data gathered were analyzed using the CHI- SQUARE Test Analysis. The Chi – Square Statistical Analysis was used because it is a test that measures how a model compares to actual observed data; it compares the size, any discrepancies between the expected results and the actual results, given the size of the sample and the number of variables in the relationship. Commonly it is used for testing relationships between categorical variables. The null hypothesis is that no relationship exists on the categorical variables in the population; they are independent. The population sampling was randomly cut across 30 complex buildings on Ahmadu Bello Way, Jos and about 65 respondents were administered questionnaires.

FINDINGS/RESULTS

FREQUENCY TABLES:

Table 1 showed that majority of the respondents which were 55.4% agreed while another 13.8 strongly agreed that open market displayers of goods actually end up erecting unregulated structures.

Table 1: Open market displayers usually erect unregulated structures and building forms

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	6.2	6.2	6.2
	Disagree	9	13.8	13.8	20.0
	Neutral	7	10.8	10.8	30.8
	Agree	36	55.4	55.4	86.2
	Strongly agree	9	13.8	13.8	100.0
	Total	65	100.0	100.0	

Source: Authors Field Survey, (2020)

Table 2 showed that majority of the 65 respondents which are 53.8% agreed and another 20% strongly agreed that open markets bring about haphazard refuse dumps

Table 2: Open market displays usually brings about haphazard refuse dumps

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	1.5	1.6	1.6
	Disagree	8	12.3	12.5	14.1
	Neutral	7	10.8	10.9	25.0
	Agree	35	53.8	54.7	79.7
	Strongly agree	13	20.0	20.3	100.0
	Total	64	98.5	100.0	
Missing	System	1	1.5		
Total		65	100.0		

Table 2: Open market displays usually brings about haphazard refuse dumps

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	1.5	1.6	1.6
	Disagree	8	12.3	12.5	14.1
	Neutral	7	10.8	10.9	25.0
	Agree	35	53.8	54.7	79.7
	Strongly agree	13	20.0	20.3	100.0
	Total	64	98.5	100.0	
Missing	System	1	1.5		
Total		65	100.0		

Source: Authors Field Survey, (2020)

In Table 3, the general outlook, scenery and beauty of the street which is also a concern had 41.5% and 43.1% agree and strongly agree respectively that open markets affect the beauty of the street.

Table 3: Does open market display of goods affect the beauty of the street?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	1.5	1.5	1.5
	Disagree	1	1.5	1.5	3.1
	Neutral	8	12.3	12.3	15.4
	Agree	27	41.5	41.5	56.9
	Strongly agree	28	43.1	43.1	100.0
	Total	65	100.0	100.0	

Source: Authors Field Survey, (2020)

53.8% agreed while 33.8 strongly agreed in Table 4 that informal open markets affect space allocation in terms of disrupting both vehicular and pedestrian movements.

Table 4: Does open market display of goods affect the management of the street in terms of space allocation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	5	7.7	7.7	7.7
	Neutral	3	4.6	4.6	12.3
	Agree	35	53.8	53.8	66.2
	Strongly agree	22	33.8	33.8	100.0
	Total	65	100.0	100.0	

Effective circulation of activities which is most of the user's desires had Table 5 showing that 53.8% agreed while 27.7 strongly agreed thereby accepting that informal open markets affects free flow of activities on Ahmadu Bello Way Jos.

Table 5: Does open market of goods hinder free flow of activities on the street

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	4.6	4.6	4.6
	Disagree	4	6.2	6.2	10.8
	Neutral	5	7.7	7.7	18.5
	Agree	35	53.8	53.8	72.3
	Strongly agree	18	27.7	27.7	100.0
	Total	65	100.0	100.0	

Source: Authors Field Survey, (2020)

Ownership and maintenance of public infrastructure for sustainability shows good value for tax payers monies spent and Table 6 showed that 46.2% agreed and 27.7% supported by strongly agreeing that informal open markets and display of goods damages public infrastructure put on the streets by Government.

Table 6: Does open market display of goods damage public infrastructure put in place on the street

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	3.1	3.1	3.1
	Disagree	7	10.8	10.8	13.8
	Neutral	8	12.3	12.3	26.2
	Agree	30	46.2	46.2	72.3
	Strongly agree	18	27.7	27.7	100.0
	Total	65	100.0	100.0	

Source: Authors Field Survey, (2020)

Table 7 shows a majority of the 65 respondent's agreeing by 43.1% and strongly agreeing by 43.1% that solutions to the problems emanating from informal commercial activities be found and resolved by meeting with all stakeholders involved in informal commercial activities on Ahmadu Bello Way, Jos.

Table 7: The government should organize a meeting with open market display stakeholders to find a solution to the problem

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	4.6	4.6	4.6
	Neutral	6	9.2	9.2	13.8
	Agree	28	43.1	43.1	56.9
	Strongly agree	28	43.1	43.1	100.0
	Total	65	100.0	100.0	

Source: Authors Field Survey, (2020)

Final Table 8 showed a majority of respondent agreed by 38.5% and strongly agreed by 35.4% that the Government or authorities should consider creating legal hawking zones or areas on the street to bring some sort of sanity and beauty to our streetscape.

Table 8: Government should create legal hawking zones in multiple places within the city

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	6	9.2	9.2	9.2
	Disagree	6	9.2	9.2	18.5
	Neutral	5	7.7	7.7	26.2
	Agree	25	38.5	38.5	64.6
	Strongly agree	23	35.4	35.4	100.0
	Total	65	100.0	100.0	

Source: Authors Field Survey, (2020)

TESTING FOR HYPOTHESIS:

HYPOTHESES ONE

Ho: There is no significant effect on physical attributes associated with open market display of goods on the buildings and streetscape.

Hi: There is a significant effect on physical attributes associated with open market display of goods on the buildings and streetscape.

Table 9: Case Processing Summary. Crosstabs

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
QUESTIONS * RESPONDS	260	100.0%	0	.0%	260	100.0%

Table 10: QUESTIONS * RESPONDS Cross tabulation

Count		RESPONDS					
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Questions	Question 1	4	9	7	36	9	65
	Question 2	5	5	4	38	13	65
	Question 3	5	6	13	33	8	65
	Question 4	1	8	7	35	14	65
Total		15	28	31	142	44	260

Source: Authors Field Survey, (2020)

Table 11: Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.541 ^a	12	.040
Likelihood Ratio	13.135	12	.059
Linear-by-Linear Association	.698	1	.003
N of Valid Cases	260		

Source: Authors Field Survey, (2020)

From the Tables 9, 10, 11 above, the chi square value is 12.541 with degree of freedom 12 and P Value of 0.403. Since the P Value (0.040) is less than 0.05, we reject the null hypothesis and conclude that there is no significant effect on physical attributes associated with open market display of goods on the buildings and streets.

HYPOTHESESTWO

Ho: There is no effect of open market display of goods on surrounding landscape and visual continuity of the streetscape

Hi: There is an effect of open market display of goods on surrounding landscape and visual continuity of the streetscape

CROSSTABS

Table 12: Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
QUESTIONS * RESPONDS	260	100.0%	0	.0%	260	100.0%

Table 13: QUESTIONS * RESPONDS Cross tabulation

Count		RESPO					
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Questions	Question 1	1	1	8	27	28	65
	Question 2	0	5	3	35	22	65
	Question 3	3	4	5	35	18	65
	Question 4	2	7	8	30	18	65
Total		6	17	24	127	86	260

Source: Authors Field Survey, (2020)

Table 14: Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.334 ^a	12	.022
Likelihood Ratio	17.457	12	.033
Linear-by-Linear Association	6.661	1	.010
N of Valid Cases	260		

Source: Authors Field Survey, (2020)

From the Tables 12, 13, 14 above, the chi square value is 15.334 with degree of freedom 12 and P Value of 0.022. Since the P Value (0.022) is less than 0.05, we reject the null hypothesis and conclude that there is an effect of open market display of goods on surrounding landscape and visual continuity of the streetscape

SUMMARY AND CONCLUSION:

Urban street informal commercial activities (open street trading) and their effects on physical attributes of building and the streetscape would be a continuous problem because of unemployment and the rural – urban migration in search of greener pastures.

The aim of the research was to investigate the impact of informal trading activities (Open market display of goods) on physical attributes on the buildings and streetscape with particular interest to Ahmadu Bello Way Jos.

The literature review has clearly shown that open market displays of good has long been an ongoing activity in our cities which is sustained by the need for citizens to pick up or buy necessary items quickly mostly on their way home from a hectic day at work which also has some economic benefit.

The Methodology used involved gathering data through administering structured questionnaire to over 60 respondents cut across 30 complex buildings on Ahmadu Bello Way Jos randomly selected. The investigation was on their perception and opinions on how they agree or disagree on the effects of urban informal commercial activities (open market display of goods) as they impact on physical form and streetscape. All data gathered were analyzed using the CHI- SQUARE Test Analysis.

HYPOTHESES ONE

Ho: There is no significant effect on physical attributes associated with open market display of goods on the buildings and streetscape.

Hi: There is a significant effect on physical attributes associated with open market

display of goods on the buildings and streetscape

From the table above, the chi square value is 12.541 with degree of freedom 12 and P Value of 0.403. Since the P Value (0.403) is less than 0.05, we reject the null hypothesis and conclude that there is significant effect on physical attributes associated with open market display of goods on the buildings and streets.

HYPOTHESES TWO

Ho: There is no effect of open market display of goods on surrounding landscape and visual continuity of the streetscape

Hi: There is an effect of open market display of goods on surrounding landscape and visual continuity of the streetscape

From the table above, the chi square value is 15.334 with degree of freedom 12 and P Value of 0.022. Since the P Value (0.022) is less than 0.05, we reject the null hypothesis and conclude that there is an effect of open market display of goods on surrounding landscape and visual continuity of the streetscape.

RECOMMENDATIONS:

i. The research has revealed that while the activities of open market display of goods has negative effects on the streetscape, the services they render are equally beneficial to the economy, therefore any policy to be considered must be generated from a round table interaction with all stakeholders (open market display of goods sellers inclusive).

ii. There is also the need to consider and include open market display of goods in land use planning thereby making available controlled open spaces for their services.

iii. Sensitization and advocacy visits to both open market sellers and the general public will go a long way in keeping the buildings and streetscape clean, healthy, beautiful to mention a few.

iv. There is the need to consider proposals to have multi- floor buildings; seated on open column framework spaces that could likely

accommodate open market display market without having them spill onto the streets.
v. The Provision of infrastructure in terms of functional conveniences, sanitary systems and effective municipal waste management within the cities metropolis.
vi. The Government must through

community driven approach provide enabling environment through policy making and enforcement of reviewed building rules, regulation and building codes.

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OCCUPANTS' COMFORT IN RETAIL BUILDINGS: A REVIEW

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ABSTRACT

In the bid to improve occupants' thermal comfort while still minimizing energy usage, retail buildings have been undergoing transformations. New trends in retail building design can be noticed globally, from the adoption of day lighting to the incorporation of natural ventilation. It would be expected that these new trends in retail building design would attract research studies focused on users' comfort, perceptions and expectation. However, in recent years, comfort studies in retail buildings have focused mainly on Indoor Air Quality (IAQ), visual and acoustic comfort. Though, few studies have been done with in-depth evaluation of the thermal comfort conditions in retail buildings in particular. There is a need to have a compilation and review of these studies in order to encourage more studies to be done and to bring awareness to the issue of sustainability in retail buildings. This paper is thus a review of some of such studies. Relevant literature was search on popular easily assessable research databases (Google scholar, Scopus, and Science Direct.) this was done using appropriate keywords, and articles related to the Occupants' comfort in retail buildings were finally selected and reviewed for this study. Although, concerns were raised concerning the practicability of natural ventilation and other sustainable measures to achieve adequate comfort in large retail buildings, some studies have however revealed that natural ventilation has a great application potential in large retail buildings.

Keywords: indoor air quality, natural ventilation, occupants' perception, retail buildings, thermal comfort.

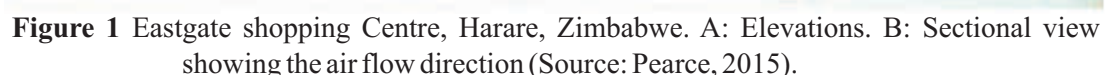
INTRODUCTION

Occupants' comfort is often associated with a building's performance in relation to its Indoor Environmental Quality (IEQ) majorly thermal comfort and the indoor air quality. A building's Indoor Environmental Quality (IEQ) performance refers to the quality of a building's environment in relation to the health and well being of those who occupy the space within it. IEQ is one of the major issues affecting the general well-being of building occupants in terms of their health and productivity (Altomonte and Schiavon, 2013; Heinzerling et al., 2013; Frontczak, 2012; Kim and de Dear, 2012; Naziatul Syima et al., 2011). Factors that determine IEQ are thermal comfort, indoor air quality, acoustic comfort and visual

comfort (Kim and de Dear, 2012a; Kim and de Dear, 2012b).

Over the years, retail building designs have evolved and have generally been designed with a similitude to the “American model” of retail design (Federico, 2008; Carrilho da Graça et al., 2012). The “American model” of retail design, according to Federico (2008) p.1, is “often artificially lit boxes, with uniform thermal environments throughout the year regardless of climatic conditions”. Furthermore, it was emphasized that this artificially created environment actually encourages energy waste and at the same time creates “thermal shocks” as opposed to providing the users with a thermally comfortable environment.

In light of these, retail buildings now take advantage of day lighting and natural ventilation in their design, thus creating a comfortable outdoor feeling for their users, and at the same time relieving the energy load needed for artificial lighting and ventilation. An example of a fully naturally ventilated and lighted retail building is the Eastgate shopping Centre, in Harare, Zimbabwe (Figure 1), a very good and famous example of biomimicry in architecture. The building was designed by Mick Pearce based on the concept of a termite hill, it has neither air-conditioning nor heating system yet remains thermally regulated all year round and uses only 10% of the energy needed by a similar conventionally cooled building (Pearce, 2015; Amal, 2014).



This particular design may not be applicable in other climatic conditions and since buildings in general are required to provide a climatically stable environment for its users/occupants, depending solely on natural ventilation in most climatic conditions might often be challenging and at times almost impossible to implement. Notwithstanding, natural ventilation is still been gently introduced in retail building designs, and what is common today is a large common space that is naturally ventilated and connecting to retail lots that are individually air conditioned (Ibiyeye, 2017 and Ibiyeye et al., 2018). This practice allows for considerable amount of energy to be saved (Huang et al., 2014; Thomas, 2014), and users are given the opportunity of moving between different climatic conditions under the same roof (Federico, 2008).

It would be expected that these new trends in retail building design would attract research studies focused on users' comfort, perceptions and expectation. However, in recent years, comfort studies in retail buildings have focused mainly on Indoor Air Quality (IAQ), visual and acoustic comfort. Though, few studies have been done with in-depth evaluation of the thermal comfort conditions in retail buildings in particular. There is a need to have a compilation and review of these studies in order to encourage more studies to be done and to bring awareness to the issue of sustainability in retail buildings, this paper is thus a review of some of such studies.

METHODOLOGY

Relevant literature was search on popular easily assessable research databases such as Google scholar, Scopus, and Science Direct. This was done using appropriate keywords, and articles related to the Occupants' comfort in retail buildings were finally selected and reviewed for this study. This review article discusses the concept of thermal comfort in general, comfort expectations under

different building ventilation modes and conditions, indoor air quality as a factor influencing occupants' comfort, and finally a review of different studies from different climatic condition on comfort studies in retail buildings' performances, expectations, and users' perception with regards to retail buildings' performance.

THERMAL COMFORT

ASHRAE (2004) p.4 defines Thermal comfort as "that condition of mind which expresses satisfaction with the thermal environment". Thermal comfort is generally influenced by two major factors, one being the environmental parameters such as air temperature, mean radiant temperature, relative humidity, and relative air velocity, and the other being the physical parameters which include clothing or thermal resistance, and activity level or metabolic rate (Fanger, 1970; Awbi, 1991; Charles, 2003; ASHRAE, 2004; Nicol, 2004).

Thermal indices in buildings

In contemporary thermal comfort research, two major approaches exist which are 1) the heat balance models based on laboratory studies and 2) the adaptive models based on field studies (Yao et al. 2009). For the first approach, the Fanger's "Comfort Equation" and the J.B. Pierce two-node model of human thermoregulation are two of the well-known and widely accepted models which use detailed experiments to predict the degree of thermal comfort of people (Hensen, 1990). The Fanger comfort equation, which has been commonly adopted and best understood, relates thermal sensation to the existence of heat balance by observing a large number of people in laboratory experiments (Fanger 1970). Fanger further established a lab-based "Predicted Mean Vote" (PMV) and "Predicted Percentage of Dissatisfied" (PPD) model (Charles, 2003; Wei et al., 2011). The PMV model uses heat balance principles to relate the six key factors (air temperature, mean radiant temperature, relative humidity, relative air velocity, clothing and metabolic rate) for thermal

comfort to the average response of people on the temperature scale of +3 (hot) +2 (warm) +1 (slightly warm) 0 (neutral) -1 (slightly cool) -2 (cool) -3 (cold). The PPD index is related to the PMV as defined in figure 2 and

it is based on the assumption that people voting +2, +3, -2, or -3 on the thermal sensation scale are dissatisfied, and the simplification that PPD is symmetric around a neutral PMV (ASHRAE, 2004).

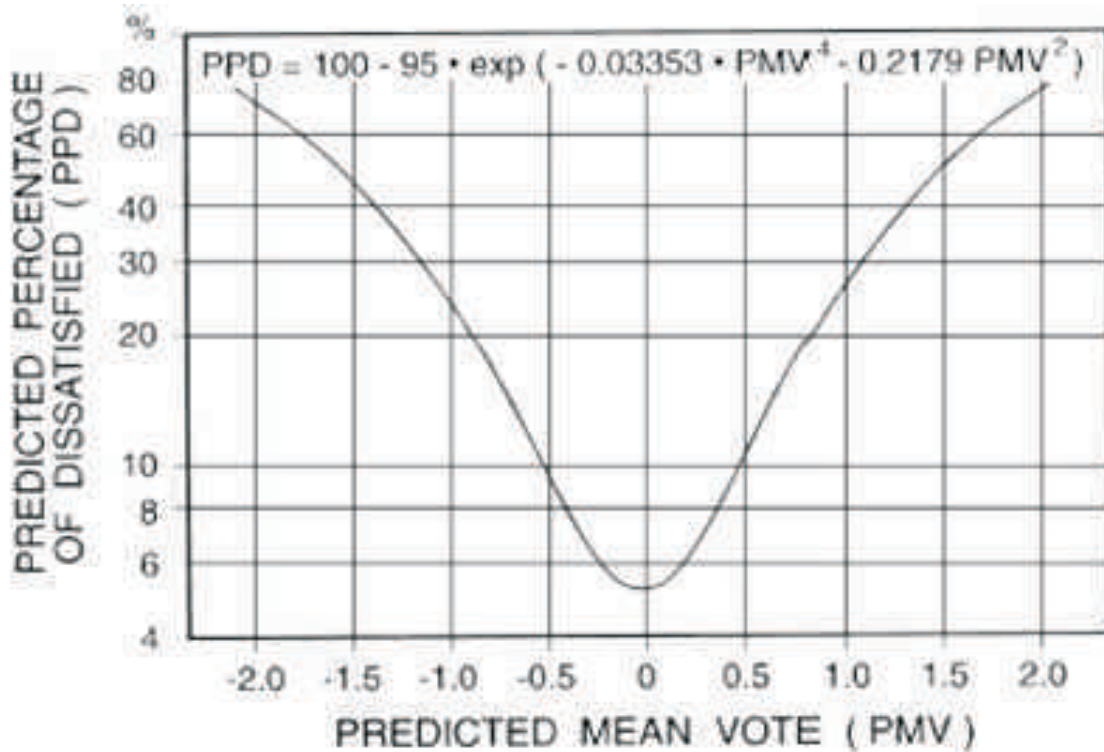


Figure 2: Predicted percentage dissatisfied (PPD) as a function of predicted mean vote (PMV). (Source, Figure 5.2.1.2: ASHRAE, 2004).

However, several studies (Humphreys, 1978; Auliciems, 1981) have reviewed the literature on thermal comfort field studies and found that PMV generally over predicted the actual neutral temperature thus concluded that preferred temperatures are variable. The adaptive model was thus introduced from the observation that humans tend to adapt to the environment that they have been used to for a long period of time. The adaptive approach, unlike the PMV model, is based on findings conducted during field studies focused on gathering information on the thermal responses of people under real circumstances (De Dear

and Brager, 1998; De Dear and Brager, 2002). In real life, many factors can contribute to human responses to the thermal environment. In the light of these, three different categories of human self-regulation to the thermal environment were revealed, and these are: physiological, psychological, and behavioural adaptations (Figure 3). The study of adaptive thermal comfort is essential for developing suitable thermal environment standards that help shape building legislation, technical requirements, and policies worldwide (Baizhan and David, 2013).

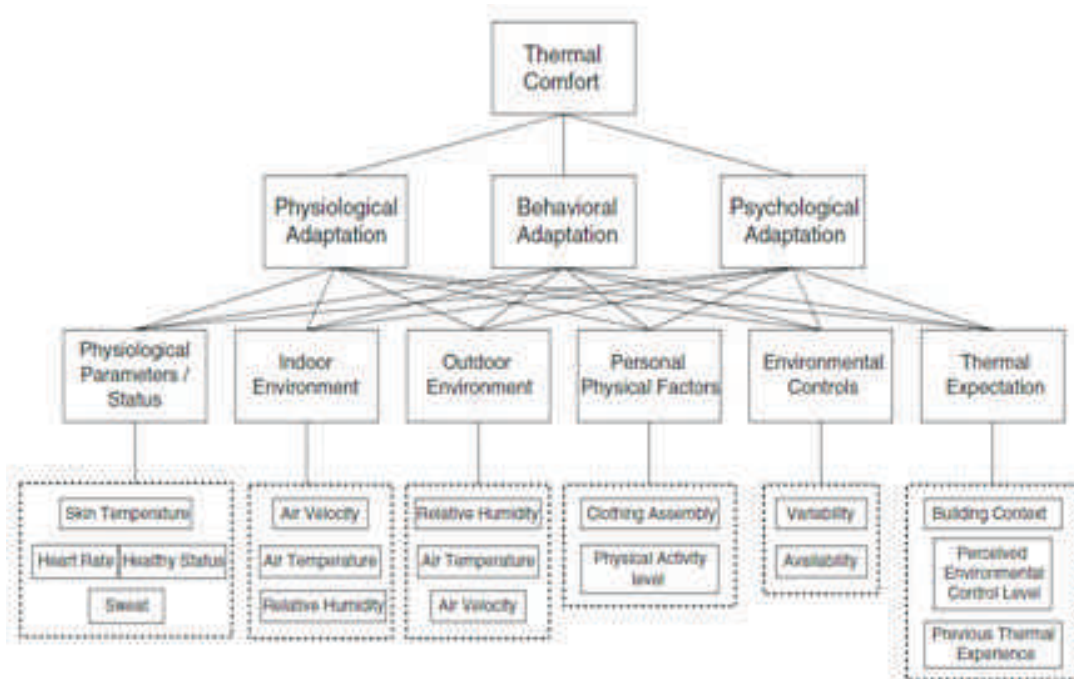


Figure 3 Analytic hierarchy process method for thermal comfort (Source, Baizhan and David, 2013 p. 293).

The PMV model was therefore revealed to have predicted thermal comfort to be below actual acceptance for warmer climates, and higher than actual acceptance for colder climates. Admittedly, Charles (2003) stated that the PMV models have been suggested by different thermal comfort studies not to be accurate in predicting the actual thermal sensation of people, mainly in field settings. Fanger's PMV, was therefore revealed to be inappropriate for thermal comfort in warmer climatic conditions and in naturally ventilated buildings by several researchers, including Nicol and Humphreys (2002); Yang and Zhang (2008); Peeters et al. (2009); Cândido et al. (2010); Wei et al. (2011); Baird and Field (2012); Eusébio et al. (2012).

In the hot-humid climate of Malaysia, a broad study by Mohd Saleh in 1989 was one of the first to suggest a comfort zone (Nugroho et al., 2007). Nguyen et al. (2012)

also proposed an adaptive model giving a full account of a study over Southeastern Asia, which could be adopted generally for hot-humid climates and in naturally ventilated buildings. Studies like Sadafi et al. (2008); Daghigh (2009); Hussein and Rahman (2009); Ismail et al. (2009); Yau et al. (2011) have also defined various comfort temperatures ranging from 22.58-30.7 °C, therefore proving that Malaysians can adapt to a higher temperature than those predicted by the Fanger's model.

Thermal comfort in naturally ventilated buildings

Field studies have shown that occupants' thermal responses in naturally ventilated spaces depend in part on the outdoor climate and may differ from thermal responses in buildings that are air-conditioned mainly due to the different thermal experiences, availability of control, changes in clothing, and shifts in occupant expectations (Nicol and Humphreys, 2002; ASHRAE, 2004;

Cândido et al. 2010; Wei et al., 2011; Baird and Field, 2012; Eusébio et al., 2012). The allowable indoor operative temperatures for naturally ventilated spaces that meet the ASHRAE comfort criteria can be determined from Figure 4; it is based on an adaptive model of thermal comfort that is derived from a global database of 21,000 measurements taken primarily in office buildings (ASHRAE, 2010). In Figure 4, two

sets of operative temperature limits are shown, the first one for 80% acceptability and the second for 90% acceptability. The 80% acceptability limits are for typical applications and will be considered when other information is not available. The 90% acceptability limits may be used when a higher standard of thermal comfort is desired (ASHRAE, 2010).

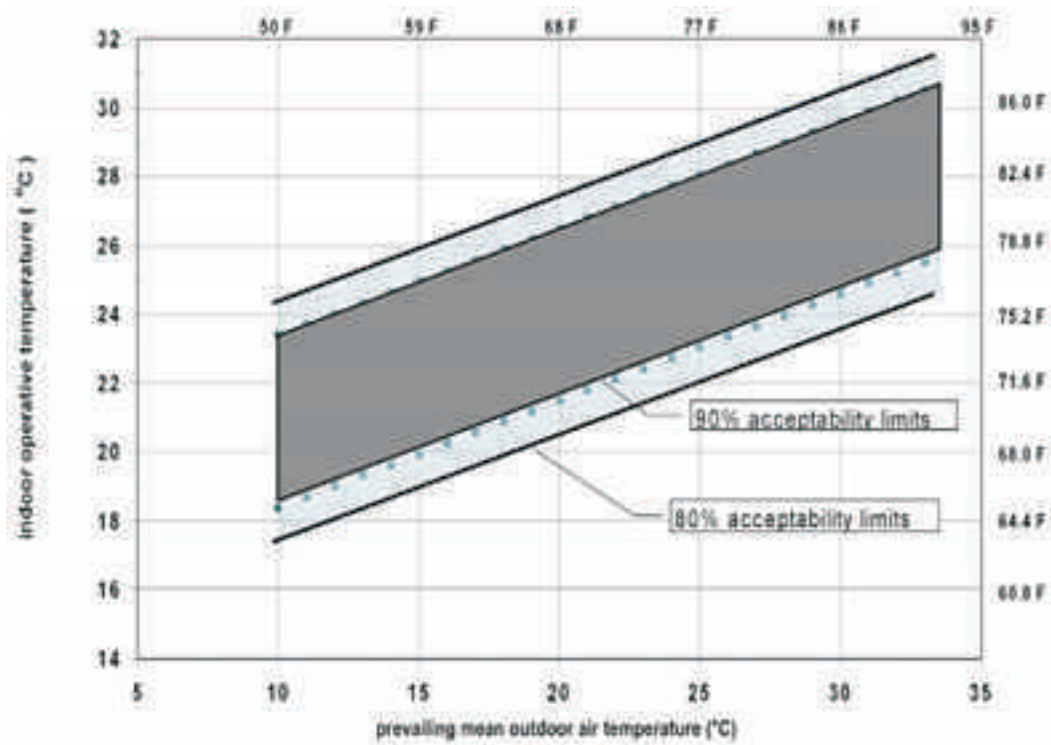


Figure 4 Acceptable operative temperature ranges for naturally conditioned spaces (Source: Figure 5.3, ASHRAE, 2010).

Thermal comfort in mixed-mode ventilated buildings

Despite numerous comfort studies on mixed-mode ventilated buildings, there is presently no comfort model specifically designed for mixed-mode ventilated spaces (Drake et al., 2010; Deuble and de Dear, 2012; Luo et al., 2014; Rupp and Ghisi, 2014). In most comfort standards, including the recent ASHRAE Standard 55-2013, the application

of the adaptive comfort model is still conservatively restricted to pure naturally ventilated spaces (Drake et al., 2010; Borgenson and Brager, 2011; Deuble and de Dear, 2012; Honnekeri et al., 2014; Luo et al., 2014). By restricting adaptive to pure naturally ventilated spaces, these standards majorly classify mixed-mode ventilated buildings as AC buildings (Luo et al., 2014). According to Luo et al. (2014), this not only

limits the operation of mixed-mode buildings to more restricted indoor thermal conditions; it also fails to maximize the energy-saving potential of these buildings.

ASHRAE 55 gives conditions for the applicability of adaptive model in certain spaces termed “naturally conditioned spaces”, such spaces according to ASHRAE 55 are those spaces where thermal conditions are controlled primarily by the occupants through the opening and closing of windows (i.e. the space must be equipped with operable windows). Furthermore, these spaces must not employ mechanical cooling for space conditioning but mechanical ventilation with unconditioned air can be utilized in these spaces. However, the unanswered question is still whether the adaptive model can be adopted for comfort study in mixed-mode ventilated spaces. In this regard, Borgenson and Brager (2011) argued that since mixed-mode ventilated buildings feature natural ventilation, the adaptive comfort can be partially applied in studying their comfort conditions.

Studies conducted on mixed-mode ventilated spaces in different building types have concluded that the adaptive comfort model can best predict comfort conditions in mixed-mode ventilated spaces especially during the natural ventilation periods (Drake et al., 2010; Borgenson and Brager, 2011; Deuble and de Dear, 2012; Honnekeri et al., 2014; Luo et al., 2014; Rupp and Ghisi, 2014). Specifically, Honnekeri et al. (2014) studied thermal performances and occupants' responses of naturally ventilated and AC ventilated zones of mixed-mode ventilated buildings separately. The study revealed the operative temperature of 23 – 29°C in the AC zones while a range of 29 – 36°C was recorded in the naturally ventilated zones. Also, the majority of occupants in both zones voted within the thermal

sensation limit of ± 1 (slightly cool to slightly warm). And what is more interesting is the fact that when the indoor temperatures in the naturally ventilated zones were very high (between 30°C – 38°C), the occupants in this zone did not feel overly warm, rather they adapted to the indoor condition through means within their control (e.g opening their windows).

Generally, it is expected that occupants of naturally ventilated zones within mixed-mode ventilated buildings would desire cooler temperatures due to their visits to the AC zones (Honnekeri et al., 2014). However, Honnekeri et al. (2014)'s study proved that occupants of naturally ventilated zones would rather adapt to the environment in which they found themselves. The study concluded that naturally ventilated zones in mixed-mode buildings can be modelled as purely naturally ventilated spaces. Also, another study by Rupp and Ghisi (2014) conducted computer simulation on two office models under hot-humid climatic condition using three comfort assessment methods (Givoni's Building Bioclimatic Chart for hot and humid climates, PMV-PDD model, and ASHRAE adaptive model). The office models were simulated as operating on changeover mixed-mode ventilation category (i.e. spaces changes over between natural ventilation and AC on a seasonal or even daily basis). The study concluded that for mixed-mode ventilated spaces in hot-humid climates, the most suitable method is the Givoni comfort model for hot and humid climates. Givoni (1976) developed his Building Bioclimatic Chart (BBCC) (Figure 5) based on an Index of Thermal Stress (I.T.S.) which he himself developed through investigating various thermal indices that affect human comfort (Givoni, 1963). The BBCC was developed to address the problems associated with the Olgyay's bioclimatic chart.

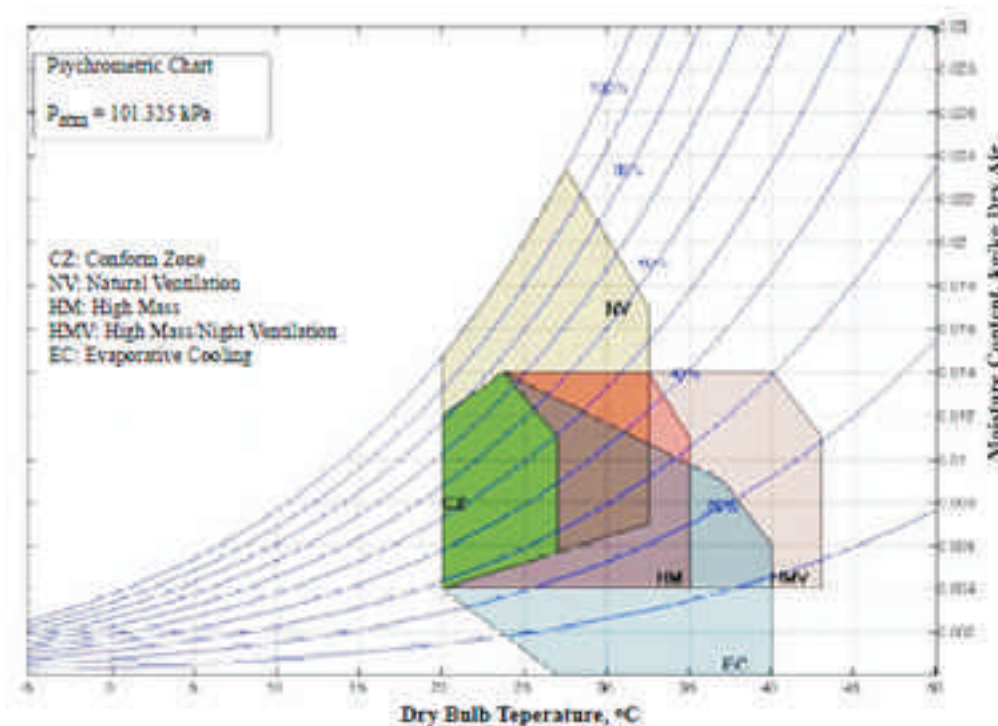


Figure 5 Typical Givoni's BBCC (Source: Al-Azri et al., 2013a)

The BBCC which was aimed at predicting the indoor conditions of buildings from the outdoor prevailing conditions, Givoni in 1992, justified the comfort boundaries for various countries with different climate conditions (Givoni, 1992). For hot-humid climates, it was argued that the combined effects of high temperature and high humidity levels reduce the dissipation of excess heat from the body and that people in this climatic zone under unconditioned space tends to adapt themselves to their thermal condition (Givoni, 1992). Therefore, the upper limits of both the accepted temperature and humidity were extended to higher levels and recommendation was also made for an increased air movement for adequate thermal comfort (Givoni, 1992). The linear relationship between the temperature amplitude and vapour pressure of the outdoor air in various regions and zones as represented on the chart are: thermal comfort, natural ventilation, high mass, high mass with night ventilation and evaporative cooling (Givoni, 1992). However, the BBCC

is mainly applicable to office and residential buildings where the heat gain through the building is at a reduced level (Al-Azri et al., 2013). The BBCC has been widely used for studies in hot-humid climate regions (Visitsak, 2007; Al-Azri et al., 2013; Al-Azri et al., 2013a; Rupp and Ghisi, 2014; Rupp and Ghisi, 2014a)

Occupants' transient thermal comfort in buildings

The conventional theory of human thermal comfort in buildings assumes steady-state conditions, however, due to the interaction between various elements of the building structure, its occupants, climatic conditions, and the HVAC system, thermal conditions in buildings are seldom steady (Hensen, 1990). Within buildings, occupants often move from one space to another; at the same time movement within the building, semi-outdoor space and the outdoor space may be necessary. Thus, when occupants transit within spaces involving apparent

temperature differences, the conventional thermal comfort theory is adopted for thermally adapted individuals e.g. the ASHREA Standard 55 may not be applicable (Parkinson et al., 2012; Wu and Mahdavi, 2014).

Many studies have been conducted to investigate the influence of temperature changes experienced during transition phases on occupants' thermal comfort (Hensen, 1990; Chun et al., 2004; Chun and Tamura, 2005; de Dear, 2011; Parkinson et al., 2012; Wu and Mahdavi, 2014; Xiong et al., 2015; Dahlan and Gital, 2016; Parkinson and de Dear, 2016). Wu and Mahdavi (2014) studied the thermal sensation and comfort evaluations of participants during difference transition stages. Subjects' thermal sensation and comfort was studied before transition, immediately after the transition, and shortly after adaptation. The results of the study suggested that the likelihood of a change in participants' thermal sensation instantly after a transition phase was generally dependable on the difference in temperature experienced in the transition spaces. Furthermore, with regards to the participants' thermal comfort, a relationship was revealed to exist between thermal comfort and the comfort temperature distances before and after the transition. Parkinson et al. (2012) went further in studying the relationship between perceived pleasures during thermal transition (alliesthesia). The findings from the study revealed that according to the thermal state of the subjects, the same change in ambient temperature was both found to be pleasant and unpleasant and this thermal pleasure experienced by the subject last for short periods and depend on the nature of the physiological change caused by the thermal transitions. Similarly, Dahlan and Gital (2016) studied the observed sensory and

affective responses resulting from the hysteresis effects experienced in transient thermal conditions. The findings from this study concluded that for people living in a hot-humid climate condition, PMV is an acceptable alternative to predict thermalsensation immediately after a down-step thermal transition.

Indoor Air Quality (IAQ)

A building's interior air quality (IAQ), as indicated by the Leadership in Energy and Environmental Design (LEED), is the most crucial factor in maintaining the safety, productivity, and wellbeing of occupants. ASHRAE defined an acceptable IAQ as the air that contains no contaminants at a harmful concentration, and where a reasonably large percentage (at least 80%) of a population exposed to this air does not show dissatisfaction. Kubba (2010) indicated the primary sources that contributed to poor IAQ to be those that release gases or particles into the air. The study further mentioned other major sources such as outdoor pollutants near the building, pollution due to poor ventilation systems, different combustion sources, and emission from building materials.

Kubba (2010) groups the sources of these contaminant into four; namely inorganic contaminants (e.g. lead and radon), contaminants generated by combustion (e.g particulate matter, CO, CO₂, SO₂), organic contaminants (e.g VOCs and Formaldehyde), and biological contaminants (e.g pests, fungus, and bacteria). In particular, the accumulation of CO₂ in a building is not only a warning in itself, but can also be used as an indicator of the build-up of other contaminants and the performance of ventilation systems. Although not perfect, CO₂ concentration levels are often taken as an indication of air quality in general.

Indoor Air Quality regulations and guidelines

A number of regulations and guidelines have been laid down and adopted for air quality in buildings, the World Health Organization standards: WHO, 1987; 2000;2010), the European standards, Limit Value for Air Quality (LVAQ), the USEPA standard, National Ambient Air Quality Standards (NAAQS) and more from other countries (Baldasano et al., 2003). ASHRAE standards: “Ventilation for Acceptable Indoor Air Quality” (ANSI/ASHRAE Standard 62.1-2007) and “Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings” (ANSI/ASHRAE Standard 62.2-2004) are all recognized standards.

The Singapore guidelines from the Singapore Institute of Environmental Epidemiology (1996) is also one of the recognized standards in Malaysia since an IAQ standard has not yet been created for residential buildings in Malaysia (Ahmed et al., 2004). By recognizing IAQ as a critical issue, the Department of Occupational Safety and Health in Malaysia (DOSH) established the Malaysian Industrial Code of Practice on Indoor Air Quality (MCPIAQ, 2005) in industries (Edimansyah et al., 2009). Consequently, MCPIAQ (2010) was approved as an improvement on MCPIAQ (2005), where the aim was to create a minimum standard as a guideline for indoor contaminants and to safeguard the health and well-being of occupants and workers (MCPIAQ, 2010; Sulaiman and Mohamed, 2011).

Indoor Air Quality studies in retail buildings

Retail buildings are prone to high contamination level, part of which is due to the fact that they are mostly located within close proximity of main roads which attracts heavy traffic and thus attracts contamination from cars' exhaust (Li et al., 2013). Also, indoor contaminant emission sources from different products and chemicals within the retail building can contribute to the high level of contamination and poor indoor air quality (Tang et al., 2005; Xu et al., 2014). Studies (Tang et al., 2005; Klinmalee et al., 2009; Li et al., 2013; Amodio et al., 2014; Xu et al., 2014) identified various contaminants which include VOCs, SO₂, NO₂, CO, CO₂, PM_{2.5}, carbonyl compounds, aromatic hydrocarbons, TVOC, Phthalates and polybrominated diphenyl ethers in different retail space in different countries. These contaminants have been revealed to affect building occupants at different degree of complications, from mild symptom such as the sick building syndrome (Aizat et al., 2009; Wong et al., 2009; Sulaiman and Mohamed, 2011) to serious complications such as negative impact on the nervous system and increase learning disabilities in children (Zhou et al., 2011; Ramírez et al., 2012; Amodio et al., 2014).

Zaatari et al. (2014), after conducting a critical review of 28 kinds of literature on IAQ in retail buildings, revealed seven most important pollutants present in retail buildings. These pollutants which include: PM_{2.5}, trichloroethylene, PM₁₀, formaldehyde, acetaldehyde, benzene, and acrolein were found to exceed the recommended limits in most of the studies. It was also revealed that ventilation measurements conducted in those studies met the required standards in most cases. Nonetheless, the recorded ventilation rates were not sufficient to keep all pollutants

below their most conservative limits. Malls don't only present ventilation issues, according to Xu et al. (2014) malls also contain a wide range of products that can emit various indoor pollutants which have been associated with serious health issues. Several studies have looked into the indoor air quality aspect of IEQ in malls to identify those pollutants that could threaten the health of both shoppers and retailers. Li et al. (2013) revealed that large shopping malls are microenvironments for formaldehyde and acetaldehyde carbonyl exposure. Carbonyl concentrations were at its highest in supermarkets, furniture store, department store and bookstore. The study was conducted on eight shopping malls in different geographical areas of Nanchang city, China.

Similarly, Klinmalee et al. (2009), Hu and Li (2015) found that $PM_{2.5}$ was the major pollutant in malls. Klinmalee et al. (2009) studied the concentration level of $PM_{2.5}$ in a Thailand mall while Hu and Li (2015)'s study was conducted in a mall in Changsha city, China during Autumn. The two studies both recorded high indoor pollutants during the weekends compared to the weekdays. This was also the case with Wai-Ming et al. (2001) after monitoring CO_2 levels in nine shopping malls in Hong Kong. Furthermore, Tao et al. (2015) and Amodio et al. (2014) studied VOCs concentration level of multi-storey shopping malls in China and Italy respectively. Their studies revealed that the highest VOC concentration was recorded in the food department during the routine cleaning.

Jiang et al. (2013) recorded very high indoor concentration levels of carbonyl compounds, aromatic hydrocarbons and TVOCs compared to an outdoor concentration level in furniture mall located in Beijing, China. The study confirmed that furniture and building furnishing materials

play an important role as major sources indoor air pollutants. Sun et al. (2015) investigated the influence of IAQ and thermal comfort performance on users exposure to SBS in two malls in Tianjin, China, users' perception were also sourced through a questionnaire survey. It was found that formaldehyde concentration level exceeded the Chinese National Indoor Air Quality Standard and the study revealed that serious SBS symptoms were reported by the users, therefore, high formaldehyde concentration in malls should be of great health effect concern.

COMFORT STUDIES IN RETAIL BUILDINGS.

Acoustic comfort in retail buildings

Acoustic factor plays a significant role in the overall physical comfort in retail buildings with large atrium spaces e.g. malls (Chen and Kang, 2004). After studying acoustic comfort of three (3) atriums in three main malls in the UK, Chen and Kang (2004) concluded that the sound pressure level was affected by the number of customers, space features of the atrium, as well as background music. In summary, the study revealed that though retailers are more tolerant in terms of communication comfort than customers, all users (shoppers and retailers) feel more satisfied with the communication quality than with the overall acoustic comfort. Similarly, Meng and Kang (2013) conducted both objective and subjective measurement in six shopping malls in Harbin City, China, to determine the influence of social and behavioural characteristics of shoppers on their evaluation of subjective loudness and acoustic comfort. The analysis of social characteristics revealed that evaluation of subjective loudness is influenced by income and occupation, while for behavioural characteristics; the evaluation of subjective loudness is influenced by the reason for visit, the frequency of visit, and length of stay.

However, Della Crociata *et al.* (2013) argued that acoustic comfort satisfaction is indeed influenced by other factors such as sources of acoustic annoyance. Meng and Kang (2013) concluded that their findings can contribute to a better understanding of the acoustic environment in shopping malls, and are also useful for the establishment of acoustic comfort prediction models. In addition, Omar (2012) studied the role of natural light in determining individual's performance in interior spaces of shopping malls. The study revealed that IEQ must be enhanced to achieve a sustainable interior space and to successfully integrate energy efficiency. Omar (2012) further stated that shopping malls have the potential of reducing electrical energy consumption for illumination by using the new strategies of providing natural lighting.

Thermal comfort in retail buildings

In recent years, IEQ studies in retail buildings have focused mainly on IAQ, visual and acoustic comfort. A few number of studies with an in-depth evaluation of the thermal comfort conditions in retail buildings are Chow and Fung (1995) and Chun and Tamura (1998). These two studies are quite old has recent literature with an in-depth analysis of thermal comfort conditions in retail buildings can hardly be found. A recent study by Karyono *et al.* (2015) however, looked into thermal comfort in a naturally ventilated market compared to a naturally ventilated cathedral and museum in Jakarta, Indonesia. The study revealed a similar comfort temperature in users of all three buildings; however, the spread of the users' comfort range in the three buildings was significantly different. Carrilho da Graça *et al.* (2012) also presented results from thermal and airflow simulation of an existing naturally ventilated shopping mall in Lisbon, Portugal. The simulation was carried out on the present natural ventilation system design in order to address winter

thermal comfort problems. The simulation results shows that the natural ventilation system design was able to successfully addresses the mall's winter discomfort problem.

Chow and Fung (1995)'s study was particularly on air-conditioned malls in Hong Kong. Three key thermal comfort parameters (indoor air temperature, relative humidity, and air speed) were measured in the occupied zone and subjective evaluation was acquired from shoppers. A limitation of the study is the relatively small number of respondents used, only 5-15 respondents were interviewed in each 84 malls considered in the study. Also, no continuous physical measurement was done; only 4 measurement points were allocated in each mall for taken spot measurement. The results revealed that the shoppers prefer high air speed and they are more comfortable with a mean air temperature of 20-24°C, mean relative air humidity of 50-65% and mean air speed of 0.2-0.4 m/s. Chun and Tamura (1998)'s study on the other hand, was focused on the comparison of thermal environment and human responses in underground shopping malls and departmental stores in Japan. The result revealed an unstable thermal condition and unstable users' psychological evaluation in the underground shopping mall compared to the department store. Also, the neutral temperature recorded in the underground shopping mall becomes colder in winter compared to the department store. It was concluded that the difference in the neutral temperature recorded was due to the fact that the temperature range in winter is very different between the two buildings. Eleven (11) respondents were used for the whole study.

Few studies conducted in shopping malls actually put all IEQ factors into consideration. Example includes studies by

Della Crociata et al. (2012), Zhao et al. (2015), Martellotta et al. (2016). For all these studies, both subjective and objective measurement were done on all IEQ factors (thermal comfort, IAQ, visual and acoustic comfort). Della Crociata et al. (2012) discuss the suitability of a proposed data collection method called “on-site measurement procedure” to assess IEQ perception in hypermarket workers. The “On-site measurement procedure” involves allocating a specific fixed location within the retail space for respondents to stay while filling out the questionnaire. While respondents were attending to the questionnaire, the physical measurement was conducted simultaneously within the same location. At the end of the study, they were able to prove that their method of data collection showed minor predictable biases and it is effective in environmental studies as it minimizes interference with workers' activities.

Zhao et al. (2015) studied occupant perceptions and health outcome in 14 retail buildings in Texas and Pennsylvania with the aim of understanding employees' perception of all indoor environmental parameters. The study revealed that the employees' responses had a high correlation with the measured parameters and the air exchange rate is the most influential parameter that affects employees' perceptions and a health outcome. Martellotta *et al.* (2016) used different statistical analysis to the interaction between users' satisfaction and different IEQ contributing factors in a retail building located in Southern Italy. By employing the Kano's satisfaction model, the study revealed that thermal comfort and IAQ were considered “basic factors” (i.e. they cause negative effect on satisfaction when they underperform) while acoustic comfort was considered a “bonus factor” (i.e. cause extreme satisfaction when it performs well but does not cause dissatisfaction when it

underperform). At the end of the study, the visual and thermal comfort showed a linear relation with overall satisfaction, therefore, proved to have the highest impact on users' satisfaction.

All the above reviewed literature with the exception of Martellotta et al. (2016), did not consider the occupants/users' satisfaction with regards to the studied buildings overall performance in their studies. Furthermore, the effects of the studied IEQ factors on the overall performance satisfaction level were neglected as well. Although Martellotta et al. (2016) included the evaluation of users' overall satisfaction in their study, the shoppers were not included among the users that were studied. Also, another study by John et al. (2016) did include both retailers and shoppers in their study, their evaluation of users' overall satisfaction with regards to the studied mall was not based on IEQ. The study was focused on users' perception of location, use, aesthetics and security of a mall located in Porto Alegre, Brazil.

Ibiyeye (2017) and Ibiyeye *et al.* (2018) however, did an extensive study on thermal performance of mixed-mode ventilated shopping malls in hot-humid climatic region. Occupants' thermal perception (both shoppers' and retailers') and IEQ performance was investigated in two mixed-mode ventilated malls selected based on their design concept ('open' and 'enclosed'). Both subjective and objective measurements were carried out in accordance with the ASHRAE performance measurement protocol for commercial buildings. Five IEQ factors (indoor air temperature, operative temperature, relative humidity, air speed, and carbon dioxide concentration level) were evaluated in the two malls. The results revealed that both malls fell below the ASHRAE comfort requirement but majority of the occupants still found the indoor

thermal performance acceptable despite the high indoor air temperature recorded. For both malls, high air speed and low humidity level were recorded. However, higher air movement was still preferred by the occupants while the recorded mean carbon dioxide (CO₂) concentration was within the recommended level. The 'open' concept mixed-mode ventilated mall proved superior compared to the 'enclosed' concept by providing a more thermally tolerance indoor environment for its occupants. Ibiyeye (2017) went further to compare the performances of the two mixed-mode ventilated malls with a fully air-conditioned one. Results revealed that for indoor temperature, the air-conditioned ventilated mall performed better than the two mixed-mode ventilated malls. Yet, thermal acceptance in all three malls was high. However, for air speed and CO₂ concentration, the two mixed-mode ventilated malls performed better than the air-conditioned ventilated mall.

CONCLUSION

This paper has reviewed some of the major studies relating to thermal comfort, acoustic comfort and indoor air quality and how these factors affect building occupants and their perception of their buildings' performance. This paper further reviewed and discusses relevant literature on how adopted ventilation modes in different building types affect occupants' comfort and their perception most especially retail buildings under different climatic conditions. The following conclusions can be drawn from this review:

1. Occupants of any building types desire adequate comfort so much so that occupants displays varying adaptive features (such as opening of windows, reducing the layers of clothing worn, making use of assisted ventilation devices e.g. fan, stepping outside of the uncomfortable space, etc.) whenever the indoor space fails to deliver the expected level of comfort.
2. Ventilation modes adopted within a building affect occupants' comfort and expectations. Though retail buildings have been known for their controlled indoor environment, but retail buildings are now taking advantage of natural ventilation and day lighting to improve comfort within their indoor spaces.
3. Although, concerns have been raised concerning the practicability of natural ventilation to achieve adequate comfort in large retail buildings such as shopping malls, some studies have however revealed that natural ventilation has a great application potential in large retail buildings.
4. Occupants' thermal responses in naturally ventilated spaces depend in part on the outdoor climate and may differ from thermal responses in buildings that are air-conditioned mainly due to the different thermal experiences, availability of control, changes in clothing, and shifts in occupant expectations.

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SPATIAL DIFFERENTIATION IN SOURCING FACILITIES OF RESIDENTIAL BUILDINGS IN AKURE, NIGERIA

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ABSTRACT

This study focuses on the spatial differentiation in sourcing of facilities in residential buildings of Akure Township, Nigeria. The sample size of 1,326 respondents was distributed in the proportion of 665; 464; and 199 for the core, transition and peripheral zones respectively. A total of 955 representing 72.02% out of the total 1,326 questionnaires administered were retrieved and used for analysis. Twenty field assistants were employed to administer the questionnaire in three months. Findings revealed that 67.0% of the respondents used both generators and national grid as their source of electricity, and 16.6% used generator as the only source of electricity. The prevailing energy source for cooking in the study area is Gas/kerosene stove. At the core, affordability of the available resources showed that, 23.2% ascribed to not affordable and other categories of affordability accounted for 76.8%. At the transitional zone, not affordable accounted for 28.0% and affordable 72.0 percent. Most inhabitants of the city depend on water supply from hand-dug wells. The study recommends stable supply of electricity, the use of gas at affordable price, construction of boreholes and public taps just to mention a few to remediate the lapses detected.

Keywords: Facilities, Residential, Electricity, Affordability and Water supply.

INTRODUCTION

Housing is seen to include the neighborhood, facilities, infrastructures and the totality of the environment as it affects and or influences the lives and wellbeing of the occupants. It is the process of providing functional shelter in proper setting in a neighborhood supported by sustainable maintenance of the built environment for the day - to - day living and activities of individuals and families within the community (Federal Republic of Nigeria, 2006). Housing therefore, goes beyond ordinary building structures to mean functional unit in a good neighborhood, properly maintained, equipped with the basic facilities in which the occupier would live comfortably (Gabriel, 2017).

Spatial differentiation is the distinctions among the residential zones with special

focus on sources of basic facilities in the residential buildings. This socio-spatial variation of the urban area may result from institutional principles of social organization, or may be the outcome of individual or collective actions, deliberate or not (Grafmeyer, 1994; cited in Veronique, 2004 and Gabriel, 2017). Although, the rapid physical development witnessed by the State has been a boost to its economy, Akure also had to grapple with an array of environmental challenges arising from its growth which could be described as astonishing (Aribigbola, 2008).

Some of the environmental challenges the state has to grapple with include; overcrowding and unplanned human settlement aggravation. The movement of people to Akure town increases the pressure on existing facilities in housing, schools and health centres leading to

congestion and mushrooming of unplanned settlements. These are most noticeable in areas such as Isolo, Oke-Ijebu, Oritagun, Oke-Aro, Isinkan, Odo-Ikoyi, Oke-Emeso, Idi-Agba and Ijoka. Another key challenge is sprawl development arising from rapid population growth. The fact that the area witnesses an unprecedented population growth in the last decade with no corresponding development on infrastructure and housing has led to the development of housing sprawl in some parts of the city center (Aribigbola, 2008). Furthermore, the study analyses the spatial differentiation in sourcing of facilities in residential buildings of Akure, Nigeria. This was achieved by investigating, electricity source, type of energy source for cooking, reason for the choice of energy source, affordability, sources of domestic water of the respondents across the residential zones in the study area. In addition, recommendations were offered to solve the identified problems across the study area.

Concept of Spatial Residential Density

Residential Density is used as a measurement of the spatial concentration of populations. There are a number of definitions of residential density within urban areas. Definitions used in the analysis of settlement densities in Sydney's urban areas range from site density to metropolitan density. National State of the Environment report, defines the concept as the area of land within urban centres designated for 'residential land use' divided by total population resident in those centres. High densities are located near activity centers and along public transport routes to maximize access and convenience to services. Predominantly medium density development locate in areas of high amenity, which may coincide with activity centers or neighbourhood parks, such as open space corridors, nature reserves, lake/water side, as well as in close proximity to public transport routes. The remaining residential areas are often allocated to lower density housing, with the lowest density located at the fringes of an estate bordering non-urban areas (Cardew,

1996 and CSIRO, 2008).

The spatial residential density differentia of the study area shows that more of the low income groups live in the high density area (75%) while more of the higher income groups are found at the low density neighbourhood. This means that the poorer residents are more in the high density area where overcrowding, poor ventilation and lack of basic amenities form the norm rather than exceptions. The situation only improves as we move to the fringes where we have more of the affluent and elite (Ogunleye, 2011). Other distinguishing attributes between the residential densities include household size, type of building, size of plots, age of building, nature of access road and drainage systems among others.

Concentric Zone Model

The Burgess Urban Land Use Model postulated in 1925 presented a descriptive urban land use model, which divided cities in a set of concentric circles expanding from the downtown to the suburbs. This representation was built from Burgess' observations of a number of American cities, notably Chicago, for which he provided empirical evidence. The model assumes a relationship between the socio-economic status (mainly income) of households and the distance from the Central Business District (CBD) (see Fig. 1). The farther away from the CBD, the better the quality of housing but the longer the commuting time. Thus, accessing better housing is done at the expense of longer commuting times and costs. According to this '*monocentric*' model, a large city is divided into five concentric zones as follows:

1. The CBD: The centre which is the central business district.
2. The transition zone of mixed residential and commercial uses or the zone of transition.
3. Low-class housing: Working class residential homes (inner suburbs), in later decades called inner city or zone of independent working men's home.

4. Middle-Class housing: Better quality middle-class homes (Outer Suburbs) or zone of better housing.

5. High Class housing: Finally, zone 5 is the outermost ring in the concentric zone model. It is an upper class neighbourhood, made up of expensive houses where the richest citizens of the city live. It also includes the Commuters zone, and also

cost of commuting is highest in this zone. Prior to mass diffusion of the automobile (1930s), most of these settlements were located next to rail stations. According to Burgess, urban growth is a process of expansion and reconversion of land uses, with a tendency of each inner zone to expand in the outer zone.

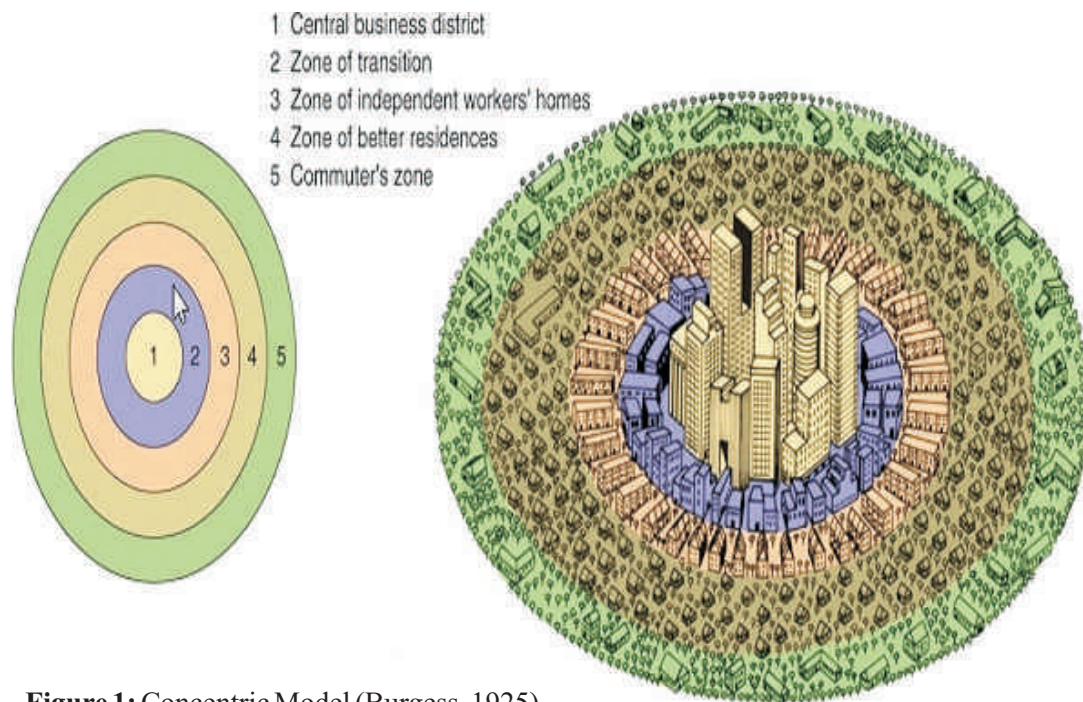


Figure 1: Concentric Model (Burgess, 1925).

Pearson Prentice Hall, Inc., 2015.

Criticisms

The model has been challenged by many contemporary urban geographers. First, the model does not work well with cities outside the United States, in particular with those developed under different historical contexts. Even in the United States, because of changes such as advancement in transportation and information technology and transformation in global economy, cities are no longer organized with clear "zones". It describes the peculiar American geography, where the inner city is poor while suburbs are wealthy; the converse is the norm elsewhere.

- i) It assumes an isotropic plane - an even, unchanging landscape.

Physical features - land may restrict growth of certain sectors; hills and water features may make some locations unusually desirable for residential purposes.

- ii) Commuter villages defy the theory, being a distant part of the commuter zone.
- iii) Decentralization of shops, manufacturing industry and entertainment.
- iv) Urban regeneration and gentrification - more expensive property can be found in formerly 'low class' housing areas.
- v) Many new housing estates were

- built on the edges of cities in Britain.
- vi) It does not address local urban politics and forces of globalization.
- vii) The model does not fit polycentric cities, for example Stoke-on-Trent

Considering the tenets of the land use models, the Burgess' concentric model is considered useful and relevant to this study, which was adapted to illustrate the pattern of residential densities in Akure. This formed the basement framework for this study. The zonal arrangement was transformed into three concentric zones, which represent the core, transition and peripheral zones that were used as Data Enumeration Areas (DEAs) for the purpose of data collection for this study.

METHODOLOGY

Study Area

The study area is Akure, a Nigerian city, which like other traditional Yoruba towns in the country, has been in existence long before the advent of British colonial rule, modern planning standards and practices. The city is located within Ondo State in the South Western part of Nigeria and one of the 36 states of Nigeria. It lies approximately on latitudes $7^{\circ} 05'$ and $8^{\circ} 00'$ North of the Equator and longitude $5^{\circ} 45'$ East and longitude $6^{\circ} 00'$ East of the Greenwich Meridian at an altitude of 370m above sea level. Akure is a medium-sized urban centre

that became the provincial headquarters of old Ondo province in 1939. It also became the capital city of Ondo State and a Local Government Headquarters in 1979. These dual political roles of Akure have since acted as impetus to the influx of people into the city (Olujimi & Olamiju, 2011; Gabriel, 2017; Gabriel & Fasakin, 2017, Gabriel, 2020).

Akure is located approximately 700 kilometers South West of Abuja, the Federal Capital of Nigeria and about 350 kilometers to Lagos, the former capital of Nigeria. It is located within the tropical rain forest region of Nigeria where rainfall is high throughout the year. The increased relative political influence of Akure as a state capital since 1976 has greatly promoted its rapid growth and socio-economic activities resulting in its spatial expansion from an area of about 16 square kilometers in 1980 to about 30 square kilometers in 2000. The 1991 national population census however, puts the population of Akure at 239,124 and its population in 2006 was 353,211 (National Population Commission, 2006). Using a growth rate of 3.18 percent to project the population for 2019, the city was estimated to have 530,626 people using a formula for projection, $P_t = P_o (1+r)^n$.

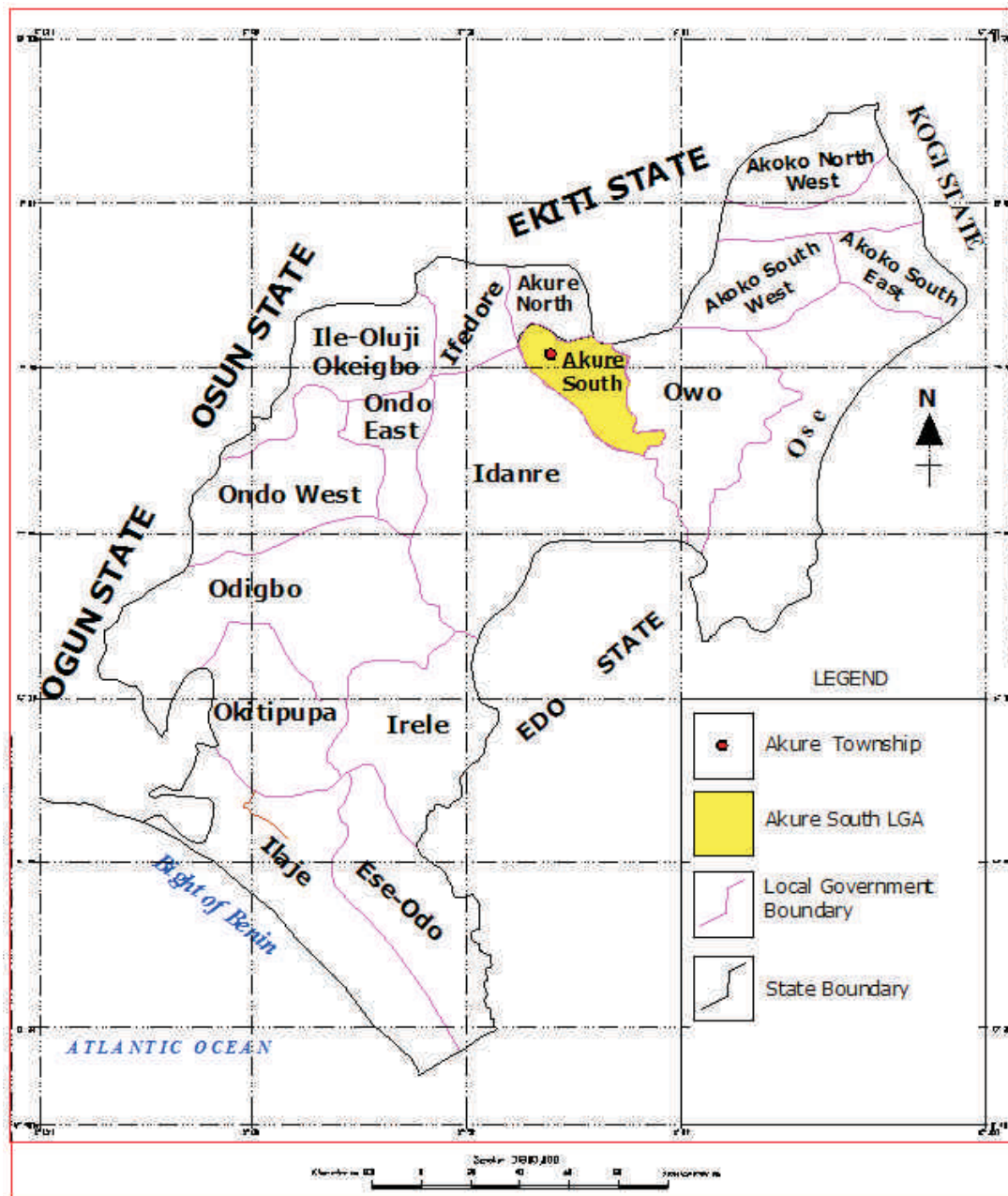


Fig. 1: Map of Nigeria Showing the Study Area in its Regional Setting

Source: Ondo State Ministry of Lands and Survey (2019).

Primary data for the study were generated from the administration of a structured questionnaire. The questionnaire focused on household heads or any adult living in the buildings within the study area. It investigated among other things; electricity source, type of energy source for cooking, reason for the choice of energy source, affordability, source of water of the

respondents across the residential zones in the study area. Secondary data were obtained from the Ministry of Lands and Housing, Ondo State Development and Property Corporation, Ministry of Physical Planning and Survey Department in Ministry of Works Akure, Ondo State, while property maps were obtained from the National Population Commission among others.

The population of Akure according to the 2006 population census was 353,211 (NPC, 2006). This was projected to 2019 using 3.18% annual growth rate officially determined by the National Population Commission. The city was estimated to have

530,626 people. The total number of buildings in Akure was calculated to be 18,950 using the following formula, where ppf and hpb are persons per family and households per building (Gabriel, 2017).

$$\frac{\text{Current Population Figure}}{7(\text{ppf}) \times 4(\text{hpb})} = \frac{530,626}{28} = 18,950 \text{ buildings}$$

A sample size of 7% was used for questionnaire administration that gave 1,326 respondents. This proportion was reasonable given the homogeneity characterizing the study area which includes, form and age of buildings, physical conditions of housing units, condition of neighbourhood infrastructure and respondents personal profile among others. Using the table of random numbers, 24 Enumeration Areas (EAs) were selected on the ratio of 50:35:15 for the core; transition and peripheral zones from the 2006 EAs from the National Population Commission (Rotowa, 2014; and Gabriel, 2017). Twelve (12) EAs were sampled for the core; 9 for the transition zone; and 3 for the peripheral zone. The sample size of 1,326 respondents was distributed in the proportion of 663; 464; and 199 for the core, transition and peripheral zones respectively. A total of 955 representing 72.02% out of the total 1,326 questionnaires administered were retrieved and used for analysis. The selection of twenty-four (24) EAs was reasonable, when earlier studies were considered that utilized EAs. For instance, the Federal Ministry of Health [Nigeria], 2003 used two EAs per Local Government; and the National Population Commission [Nigeria], used the same number of EAs for 2008 National Demographic and Health Survey. Twenty field assistants were employed to administer the questionnaire in three months. Tables were used to present, interpret and discuss research findings through SPSS version 21 and Microsoft Excel 2013.

RESULTS AND DISCUSSION

Electricity Source

Results of electricity source in the residential zones of the study area are shown in table 1.

Findings revealed that 67.0 percent of the respondents in the study area use generator and national grid as their sources of electricity. Those that use generator as their sole means of electricity had 16.6 percent and those that depend on national grid had 15.6 percent. Inverter / national grid and others had 0.4 percent each. Spatially, at the core, generator and national grid as sources of electricity had 79.1 percent, transition 68.9 percent and periphery 36.7 percent. Generator as the source of electricity solely, at the core 10.0 percent, transition 16.3 percent and periphery 40.8 percent.

In addition, the findings revealed that majority of the inhabitants in the study area use generator and national grid as their main sources of electricity. According to Abdullahi, Timothy and Adekunle (2017), electricity is one of the main drivers of development; it has a major impact on every aspect of our socioeconomic life. It is used in residential buildings, commercial buildings, and industrial buildings. The source of electricity in most Nigeria residential buildings is through the National Grid. However, the findings of the study revealed that, a reasonable number of the respondents in the study area complained of unpredictable supply of electricity from the national grid. This result concurs with the findings of Olujimi (2010) which reveals that all the sampled tenants in these residential zones complained of erratic supply of electricity. Therefore, it can be deduced that because of unreliable supply of electricity from the National Grid, residents have decided to adopt alternatives sources.

Table 1: Electricity Source

Electricity Source	Zone	Core		Transition		Periphery		Total (Study Area)	
		Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)
Generator only		47	10.0	56	16.3	58	40.8	159	16.6
National Grid only		48	10.2	50	14.8	29	20.0	149	15.6
Generator and national grid		374	79.1	234	68.9	52	36.7	639	67.0
Inverter and national grid		0	0	0	0	4	2.5	4	.4
Others		3	.7	0	0	0	0	4	.4
Total		472	100.0	340	100.0	143	100.0	955	100.0

Source: Author's Fieldwork, 2019.

Hours of Electricity Supplied/Day (National Grid)

Findings on table 2 show the number of hours that electricity is supplied to residential buildings by the national grid across the different residential zones in the study area. The results revealed that 77.6 percent of the buildings in the study area had less than six hours of electricity supply by the national grid per day. Only 19.5 percent had 6 to 10 hours and 2.9 percent above ten hours per day. It was observed that those at the transitional zone in the study area had better hours of supply of electricity by national grid than those at core and periphery. The

findings concurred with findings of Nwachukwu, Ezedinma, & Jiburum (2014) that revealed that, electricity supply in this country has been erratic and epileptic thus resulting in frequent power outages that have impaired economic growth and development. The residential, commercial and industrial electricity consumption accounted respectively for 51.3, 26.7 and 22 percent of total electricity consumption. Similarly, Abdullahi, Timothy and Adekunle, (2017) opined that, the supply of electricity to the residential sector and other sectors at large is getting declined; this can be attributed to the increase in population and drastic decrease in electricity generation.

Table 2: Hours of Electricity Supplied/Day

Hours of Electricity Supplied/Day	Zone	Core		Transition		Periphery		Total (Study Area)	
		Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)
Zero hour		7	1.4	0	0	0	0	7	0.7
1 - 5 hours		384	81.3	273	80.3	76	53.3	734	76.9
6 - 10 hours		68	14.5	53	15.6	67	46.7	186	19.5
11 - 15 hours		13	2.8	14	4.2	0	0	28	2.9
Total		472	100.0	340	100.0	143	100.0	955	100.0

Source: Author's Fieldwork, 2019.

Average Monthly Bill

Table 3 shows the results of average monthly bill paid by the residents for consumption of electricity from the national grid in the study area. The findings revealed that 76.2 percent of the respondents in the study area pay more than N1, 500 per month on the

average. Spatially, the findings revealed the average monthly bill of more than N1, 500 as, at the core, 72.3 percent, transition 78.5 percent and periphery 84.1 percent. It is inferred from the results that the average monthly bill is not commensurate with the number of hours supplied.

Table 3: Average Monthly Bill

Average Monthly Bill	Core		Transition		Periphery		Total (Study Area)	
	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)
Less than N500	4	.9	0	0	0	0	4	.5
N500 - N1000	46	10.9	14	4.8	11	9.2	71	8.5
N1,001 - N1,500	67	15.9	48	16.6	8	6.7	123	14.8
More than N1,500	305	72.3	227	78.5	101	84.1	633	76.2
Total	472	100.0	340	100.0	143	100.0	955	100.0

Source: Author's Fieldwork, 2019.

3.4 Type of Energy Source

The type of energy source used for domestic cooking was examined across the core, transition and periphery of the study area. The study showed that at the periphery, 45.0 percent of the type of the energy source was kerosene stove, followed by 29.2 percent Gas/kerosene. At the transition, Gas/kerosene accounted for 56.1 percent, followed by gas with 20.1%, and while at the core, Gas/kerosene accounted for 70.1 percent followed by firewood 15.6 percent. It was generally observed that the use of charcoal or electricity as energy source for cooking is minimal across the residential densities. Some respondents attributed the low percentage for the use of electricity to the fact that it is prone to fire outbreak that could be devastating. On the other hand, the reason for low percentage for charcoal was attributed to the fact that it was not decent to be used in this present age among other.

Furthermore, results revealed that, at the city core, exposure to smoke is evident among the households, this result agrees with the finding of Olukolajo, et al. (2013) which revealed that 58.58% of the household

at the core area of Akure depends on firewood and charcoal as energy for cooking. Where kitchen facilities are non-existent, some cook in the corridor, passage or even within their bedrooms. This increases the health risk among the residents. However, this research has revealed that there is decrease on the use of firewood as the main source for cooking in the study area. The prevailing energy source for cooking is Gas supported occasionally by the Kerosene stove when Gas finishes. However, Gas only accounted for 10.5% and Kerosene stove only 9.9%, therefore reducing the health risk among the inhabitants in the study area.

Sogbon, Olugbamila, Akinrimade and Oloketuyi (2017), showed that, firewood is the prevalent source of fuel for cooking in the study area; however, this study revealed that the predominant source of energy for cooking currently is Gas supported occasionally by kerosene stove in the study area. This implies that if this positive trend is maintained and improved upon, vegetation in the study area would be conserved to a reasonable and appreciable degree.

Table 4: Type of Energy Source (Cooking)

Zone Type of Energy Source	Core		Transition		Periphery		Total (Study Area)	
	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)
Firewood only	66	15.6	18	6.2	5	4.2	89	10.7
Charcoal only	14	3.3	12	4.2	2	1.7	28	3.4
Kerosene stove only	15	3.6	13	4.5	54	45.0	82	9.9
Electricity only	21	5.0	26	9.0	5	4.2	52	6.3
Gas only	10	2.4	58	20.1	19	15.8	87	10.5
Gas and Kerosene stove	296	70.1	162	56.1	35	29.2	493	59.3
Total	472	100.0	340	100.0	143	100.0	955	100.0

Source: Author's Fieldwork, 2019.

Reason for Choice of Energy Source

The reason for the choice of energy source in the different residential densities in the study area is shown on table 5. The reason for choice of energy source at the core revealed that cheapness accounted for 46.2 percent and convenience 42.9 percent. Similarly, at the transitional zone, cheapness 34.9 percent and convenience 24.2 percent while at the periphery, convenience accounted for 40.0 percent and fastness 26.7 percent as the reason for

choice of energy source. Safety and cleanness that appeared decent had 9.4 percent and 3.4 percent respectively in the study area. However, it can be inferred from the following reasons, convenience, fastness and cleanness that the inhabitants of the study area living within the periphery had better education, more resourceful, well informed and better standard of living among others compared to each of the other zones.

Table 5: Reason for Choice of Energy Source

Zone Reason for Choice of Energy Source	Core		Transition		Periphery		Total (Study Area)	
	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)
Cheapness	218	46.2	119	34.9	33	23.3	372	39.0
Convenience	203	42.9	82	24.2	57	40.0	344	36.0
Fastness	13	2.8	68	20.1	39	26.7	117	12.3
Safety	38	8.1	52	15.2	0	0	90	9.4
Cleanness	0	0	19	5.5	14	10.0	32	3.4
Total	472	100.0	340	100.0	143	100.0	955	100.0

Source: Author's Fieldwork, 2019.

Affordability of Energy Source

Findings show the different levels of affordability of the identified energy sources across the core, transition and periphery of the study area. At the core, affordability of the available resources showed that 23.2 percent not affordable and different

categories of affordability accounted for 76.8 percent while at the transition, not affordable accounted for 28.0 percent and affordable 72.0 percent. However, at the periphery, not affordable had 13.3 percent and affordable 86.7 percent of the respondents.

Table 6: Affordability of Energy Source

Zone Affordability	Core		Transition		Periphery		Total (Study Area)	
	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)
Not affordable	98	23.2	81	28.0	16	13.3	195	23.5
Fairly affordable	221	52.4	135	46.7	52	43.4	408	49.1
Affordable	62	14.7	62	21.5	40	33.3	164	19.7
Very affordable	41	9.7	11	3.8	12	10.0	64	7.7
Total	472	100.0	340	100.0	143	100.0	955	100.0

Source: Author's Fieldwork, 2019.

3.7 Type of Energy Source Utilized by Reason for the Choice of Energy Source

The results of cross tabulation of type of energy source utilized and reason for the choice of energy source in the entire study area are revealed in table 7. The analysis of energy source and reason for the choice of energy source revealed that for firewood, cheapness accounted for 66.7% and safety

21.2%; for charcoal, cheapness had 61.5% and fastness 23.1% as reasons for choice of energy; for kerosene stove, cheapness accounted for 35.2%, convenience 33.8% and fastness 31.0%; for electricity, convenience accounted for 44.7% and cheapness 29.8%; for gas, fastness accounted for 44.4% and cleanness 25.9%; for Gas/Kerosene, cheapness accounted for 42.4% and convenience 45.9%.

Table 7: Energy Source by Reason for Choice of Energy Source

Energy Source	Reason for the choice of energy source					Total
	Cheapness	Convenience	Fastness	Safety	Cleanness	
Firewood	52	0	12	16	0	80
Charcoal	24	12	10	2	0	48
Kerosene stove	33	33	27	0	0	93
Electricity	22	30	0	13	0	65
Gas	16	25	53	10	29	133
Gas/Kerosene	225	244	22	45	0	536
Total	372	344	124	86	29	955

Source: Author's Fieldwork, 2019.

3.8 Chi-Square Tests

The chi-square test of significance was used to test the difference in the type of energy source utilized and reason for the choice of energy source across the residential zones in Akure. The null hypothesis: there is no significant difference between type of energy source utilized and reason for the choice of energy source across the residential zones in the study area. The result shows that there was a significant difference between

type of energy source utilized and reason for the choice of energy source by the residents across the residential zones of the study area ($\chi^2 = 470.91, P < 0.01$). The X Asymp. Sig. is less than 0.05. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted which says that there is significant difference between type of energy source utilized and reason for the choice of energy source across the residential zones of Akure.

Table 8: Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	470.909	20	.000
Likelihood Ratio	414.619	20	.000
Linear-by-Linear Association	43.041	1	.000
N of Valid Cases	955		

Source: Author's Fieldwork, 2019.

Sources of Domestic Water

Investigation revealed the sources of some improved and unimproved sources of domestic water in the study area as shown in table 9. Considering the entire study area, unimproved sources of domestic water had 84.8 percent and 3.0 percent for well and vending respectively, while improved sources had 1.9 percent and 10.2 percent for public tap and borehole correspondingly. Similarly, at the core, unimproved source had 86.7 percent and improved 13.2 percent; transition unimproved 89.0 percent and improved 11.1 percent; and at the periphery, unimproved 89.2 percent and improved 10.8 percent. Section 127 (a): Water Supply, “the well shall be situated as not to be liable to contamination or pollution by a stream, drainage water, latrine or refuse or waste water” (Ondo State Building and Sub-division Regulations 1984).

It was revealed that the activity of vending as a source of domestic water reduces from the core to the periphery. However, the location of well within the house or compound influences the level of safety of such water. It was observed that at the core area most of the hand-dug wells are located within the septic field. Furthermore, most of these wells are located in unkempt surroundings, without cover and water from these wells are used raw without treatment. This condition does not guarantee adequate supply of quality water in the area. This result concurs with the findings of Owuoye and Omole (2012) which reveal that hand-dug well had % 85.7% at the core area of Akure and wells 65.7% in the entire study area (Aribigbola, 2010). The implication of this is that majority of residents of the city depends on water supply from unsafe sources thereby lowering the quality of housing in the city.

Table 9: Source of water

Source of Water	Core		Transition		Periphery		Total (Study Area)	
	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)	Freq.	Percent (%)
Public tap	10	2.1	7	2.1	1	.8	18	1.9
Well	388	82.2	295	86.9	128	89.2	810	84.8
Vending	21	4.5	7	2.1	0	0	29	3.0
Borehole	53	11.1	31	9.0	14	10.0	98	10.2
Total	472	100.0	340	100.0	143	100.0	955	100.0

Source: Author's Fieldwork, 2019.

Conclusion and Recommendation

This paper investigates spatial differentiation in sourcing of facilities in residential buildings at the core, transitional and residential zones. The study reveals that majority of the inhabitants in the study area use generator and national grid as their main sources of electricity. The inhabitants at the transitional zone had better hours of supply of electricity by national grid than those at core and periphery, although, the average monthly bill is not commensurate with the number of hours supplied. The prevailing energy source for cooking is Gas/Kerosene stove. The reason for choice of energy source at the core revealed that cheapness accounted for 46.2% and convenience 42.9%; transition zone, cheapness 34.9% and convenience 24.2 percent. Safety and

cleanness that appeared decent had 9.4 percent and 3.4 percent respectively in the entire study area.

Furthermore, at the periphery, the respondent who said that the source of energy is not affordable had 13.3% and affordable 86.7 percent. Source of domestic water revealed that majority of residents of the city depends on water supply from unsafe sources thereby lowering the quality of housing in the city. Consequently, this paper recommends stable supply of electricity from the national grid / solar system, prepaid metres for all the inhabitants, encourage the use of gas at affordable price, construction of boreholes and public taps among others across the residential zones of the study area.

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WOMEN FARMERS AND THE CHALLENGES OF FOOD-CROP FARMING IN GIREI, ADAMAWA STATE, NIGERIA: A GEOGRAPHICAL PERSPECTIVE

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ABSTRACT

Agriculture is the main economic activity in many rural communities and women who make up the majority of the rural dwellers play a focal role in the sector. Despite the efforts aimed at promoting women's rights, some researches have shown that women are still marginalized and have less access to productive resources needed for effective agricultural production. This study therefore evaluates the challenges facing women farmers in Girei Local Government Area of Adamawa state. The data for the study were obtained from primary source, through administration of 300 copies of structured questionnaire using systematic random sampling methods. Simple frequency distribution in form of cross tabulation using SPSS 20.0 was used to analyze the data. The study revealed that the major challenges facing women farmers includes, difficulty in accessing land, difficulty in accessing credit facilities, limited access to agricultural inputs and long distance to extension training sites. It was also observed that, low level of education and low usage of fertilizer have lowered their output and effected their active participation in agricultural production. Against this background, it was recommended that, extension services and timely deliverance of credit facilities should be made priority by the government authorities and extended to the women farmers in Girei local government area. In addition, new advancement in agricultural technology should be made available to women farmers and cooperative society formulation should also be encouraged.

Key-words: Women, Farmers, Challenges, Food-crop

INTRODUCTION

Agriculture contributes immensely to the African economy in various ways; namely, in the provision of food for the increasing population; supply of raw materials to a growing industrial sector; a major source of employment; generation of foreign exchange earnings; and, provision of a market for the products of the industrial sector among others (Nchuchuwe and Adejuwon., 2012). Women play vital roles in agricultural production in all parts of the world. In Nigeria, they are actively involved in farming activities. Women constitute

about 60-80% of the labour in such farming activities as planting, weeding, transportation, processing, marketing and storage of products, they also account for two-thirds of food crops produced in Nigeria (United Nations, 2011). Women farmers contribute immensely to national agricultural output, maintenance of the environment and family food security. The involvement of women in agriculture in Nigeria has attracted much attention in recent years their role cannot be overemphasized (Brown et al, 2011). According to the United Nations

findings (2016) four of ten agricultural workers in the world are women. According to the Federal Ministry of Agriculture and Rural development, in 2008, women accounted for 75% of the farming population in Nigeria, working as farm managers and suppliers of labour. Though, women constitute a large portion of the farming population, women their possibilities in agriculture are hindered by formal and traditional rules. Hence the extent of women involvement in agricultural production varies across ethnic groups in Nigeria. In Adamawa State where subsistence farming is predominant with primary method of crop production, women perform nearly all tasks associated with subsistence food production.

According to Castillo (2012), being engaged in agriculture is therefore, not necessarily a choice on rural women, but is often a consequence of lack of alternatives. Banji and Okunade (2011), noted that women are found working all the year-round producing food crops, while men perform only replanting tasks that occupy a small part of the agricultural year. The International Labour Organization (ILO., 2009) estimated that 78% of women in Africa are active in agricultural production compared to only 64% of the men. Ayioko (2016) noted that; African women, especially Nigerians, cater for about 60-80% of agricultural products and Farid et al. (2012) noted that over 90 percent of economical active women engage in one form or other of agricultural production they have account for about 70% of food production, 100% of those who process basic food stuffs and 90% in marketing agricultural produce. Furthermore, Damisa and Yohanna (2007) and Bhat *et al.*, (2012) reported that uneducated and the poor were the ones

mostly involved in agriculture but barely involved in decision-making. Generally, women have been found to contribute immensely to food security in Nigeria but these women were owned only 1% of farm assets leading to the marginalization and tradition, such challenges are the bottlenecks to women farmers. It is against this background that two objectives were set;

- i. To examine the influence of women's socioeconomic characteristics on their farming activities and output
- ii. To examine the constraint/factors affecting women farming activities and output

Study Area

Girei is located between latitude 9°32'16" to latitude 9°32'49" North and longitude 12°32'16" to longitude 12°44'16" East of Greenwich meridian as shown in Figure 1. The total landmass of the area is about 2,186sq.km. Girei is bordered by Song in the north, Fufere in the east, River Benue to the south and Demsa in the west; (Adamu, 2019). The population of Girei is approximately 129,995 people (NPC 2007). The general topography or relief profile is characterized by a gentle undulating flood plain, rising between 154.2m to 213.4m above the Benue River bed (Opeloye and Dio, 2009). Soil distribution in the area is in orderly pattern relative to the geology, land forms, climates, relief and the natural vegetation of the area. The relative distribution of soils varies from places to place, with ferruginous tropical soils, ferralitic soils, vertisols, hydromorphic soils, and rock debris found in different parts of the area. Around the River Benue it contains fluvial soil (aluvium) and a mixture of sand-loamy soils (rigosols) (Ray, 2020). The

climate is made up of distinct dry and wet season with temperature, precipitation and humidity varying with seasons. The wet or rainy season is between May and October. It is characterized by single maxima in August. The area has an average of 62 rainy days

while the average annual rainfall recorded in the area is 972mm (Adebayo, 2020). The dry season is between December and March. The period is characterized by dry, dusty, and hazy north east trade winds that blow over the area from Sahara-desert.

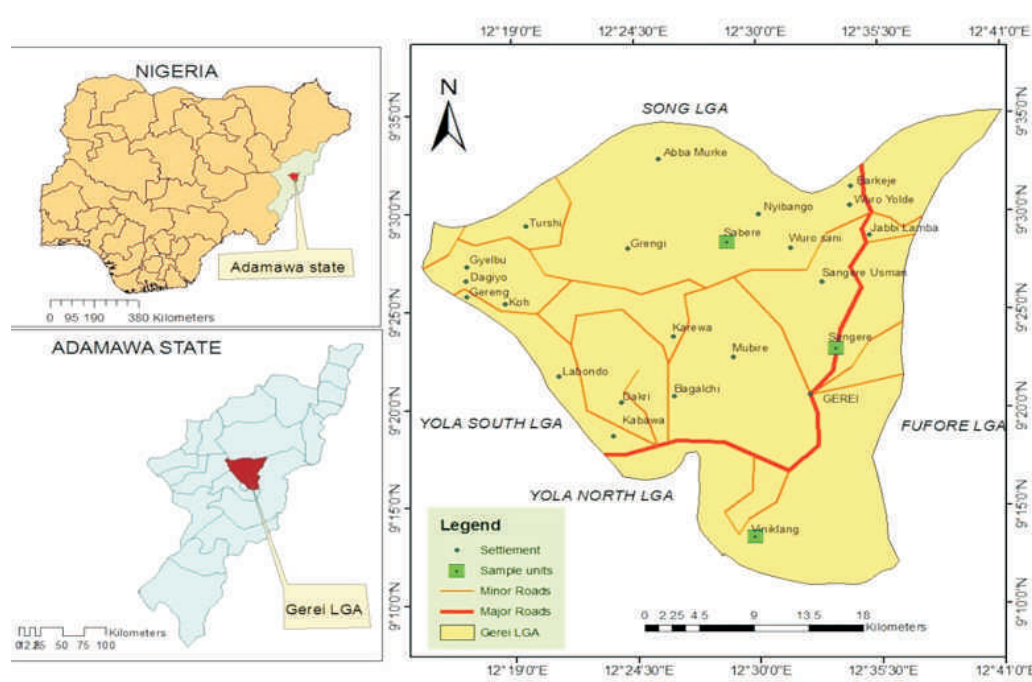


Figure1: Map of the study area
Source: Zemba, Tukur and Ezra (2020)

METHODOLOGY

The study used primary source of information. The primary source involved administration of 300copies of structured questionnaire as well as conducting interview. These methods were used to generate information on the challenges that impede smooth agricultural operation by the women farmers. Purposive and systematic random sampling techniques which is suitable and appeared to be the best option for sampling in this study were used. The number of towns selected for questionnaire

administration was based on purposive sampling method, simply because the number of population of the towns differs greatly. The first household sampled was selected randomly in each of the town while systematic sampling was used to select every fourth household in a town for the subsequent sampling. Data collected, were subjected to descriptive statistical analysis using SPSS version 20.0. The descriptive statistics includes frequency counts in percentages where results are presented in tables.

RESULTS AND DISCUSSION

Effects of Socioeconomic characteristics of women on farming activities and output

Table 1: Influence of Socioeconomic characteristics of women on agricultural Activities

		Factors constrain participation in farming						
		Time Constrain	Water Shortage	No own Land	Financial Constraint	Limited Agricultural Input	Distance Extension training sites	Total
Marital status	Single	0	0	11	2	19	13	45
	Married	2	1	21	20	31	18	93
	Divorce	2	0	18	20	15	9	64
	Widow	0	3	15	13	10	7	48
Total		4	4	65	55	75	47	250
Education status	Primary	1	0	17	17	16	13	64
	Secondary	1	4	16	24	31	11	87
	Tertiary	0	0	4	1	3	5	13
	No formal	2	0	28	13	25	18	86
Total		4	4	65	55	75	47	250
Dependents	None	0	0	9	3	8	6	26
	1 to 5	3	2	29	38	28	16	116
	6 to 10	1	1	24	12	22	15	75
	>10	0	1	3	2	17	10	33
Total		4	4	65	55	75	47	250
Years in farming	< 1 year	0	0	8	3	4	7	22
	1-5 years	0	0	12	13	24	8	57
	6-10 years	1	1	27	18	29	19	95
	> 10 years	3	3	18	21	18	13	76
Total		4	4	65	55	75	47	250

Source: Field work (2020)

Table 2: Influence of Socioeconomic characteristics of women on agricultural output

		Factors affecting output				
		Agricultural				Total
		Finance	Land	Input	Labor	
Marital status	Single	16	7	18	4	45
	Married	36	13	37	7	93
	Divorce	13	9	34	8	64
	Widow	12	3	30	3	48
Total		77	32	119	22	250
Education status	Primary	19	5	30	10	64
	Secondary	22	15	44	6	87
	Tertiary	4	1	6	2	13
	No formal	32	11	39	4	86
Total		77	32	119	22	250
Dependents	None	5	2	18	1	26
	1 to 5	40	22	48	6	116
	6 to 10	25	5	34	11	75
	>10	7	3	19	4	33
Total		77	32	119	22	250
Years in farming	< 1 year	7	4	11	0	22
	1-5 years	14	6	32	5	57
	6-10 years	35	10	41	9	95
	> 10 years	21	12	35	8	76
Total		77	32	119	22	250

Source: Field work (2020)

Table 1 and 2 shows the influence of women's socioeconomic characteristics on farming participation and the output obtained from the farming activities. Based on the results obtained, it was clear that, limited agricultural input and land ownership are the key challenges to women who engage in agricultural activities. It was observed based on the marital status of the respondents that majority of the married women were the farmers, with highest respondents in terms of limited agricultural input, while majority of the divorce admitted that finance is their major challenge. This result clearly

explained that majority of the respondents who are engaged in farming in the area are married women and their major challenge is limited agricultural input for their farming operation. It was also observed that majority of the women have only secondary school background, while followed by those that have no formal education background. Following the result presented, it is clear and evident that only few women farmers are educated and these affect their agricultural practices and output as also documented by Farid *et al.*, (2012).

Constraints of women Participation in farming activities and output

Table 3: Factors constraining women participation in farming

		Factors constraining participation in farming						
		Time Constrain	Water Shortage	No own Land	Financial Constrain t	Limited Agricultura l Input	Distance Extension training sites	Total
Type of farming	Subsistence	3	1	42	20	29	12	107
	Commercial	0	0	8	12	19	15	54
	Irrigation	0	1	7	8	12	6	34
	Mixed	1	2	8	15	15	14	55
Total		4	4	65	55	75	47	250
Obtaining Land	Buy	0	1	6	5	7	5	24
	Rent	1	0	28	21	34	27	111
	Relatives	2	2	23	24	30	13	94
	Group own	1	1	8	5	4	2	21
Total		4	4	65	55	75	47	250
Received Farming Inputs	Yes	1	2	25	12	21	20	81
	No	3	2	40	43	54	27	169
	Total	4	4	65	55	75	47	250
Inputs received	Seed	3	3	26	24	36	24	116
	Fertilizer	0	0	5	10	6	2	23
	Farm tools	0	0	0	0	2	2	4
	Pesticide	1	1	34	21	31	19	107
Total		4	4	65	55	75	47	250
Difficultie s	Yes	3	4	55	44	58	35	199
	No	1	0	10	11	17	12	51
Total		4	4	65	55	75	47	250
Effects of Extension Services	Improved output	4	4	59	46	69	38	220
	Decrease output	0	0	6	9	6	9	30
Total		4	4	65	55	75	47	250

Source: Field work (2020)

Table 4: Factors affecting farm output

		Factors affecting output				
		Agricultural				
		Finance	Land	Input	Labor	Total
Type of Farming	Subsistence	30	15	47	15	107
	Commercial	9	11	32	2	54
	Irrigation	15	4	13	2	34
	Mixed	23	2	27	3	55
Total		77	32	119	22	250
Obtaining Land	Buy	7	3	11	3	24
	Rent	36	14	52	9	111
	Relatives	30	13	44	7	94
	Group own	4	2	12	3	21
Total		77	32	119	22	250
Received Farming Inputs	Yes	24	8	40	9	81
	No	53	24	79	13	169
Total		77	32	119	22	250
Inputs Received	Seed	36	16	54	10	116
	Fertilizer	8	4	7	4	23
	Farm tools	0	0	4	0	4
	Pesticide	33	12	54	8	107
Total		77	32	119	22	250
Difficulties	Yes	60	29	91	19	199
	No	17	3	28	3	51
Total		77	32	119	22	250
Effects of Extension Services	Improved output	71	24	105	20	220
	Decrease output	6	8	14	2	30
	Total	77	32	119	22	250

Source: Field work (2020)

Table 3 and 4 presents the constraint/factors affecting women participation in farming activities and farm output. Result of the study revealed that majority of the women farmers who practice subsistence farming are faced with the challenges of landownership in which most of them have no access to land for crop cultivation. Following this fact, it is clear that land tenure is a challenge to women in their farming operation. This result agreed with the

findings of Drafor Amenyah and Puplampu (2013) and Paula (2019). The role of agricultural extension is another issue identified to be a challenge to women farmers, it was observed based on the information collected that, accessing extension services for new ideas and assistance is a big challenge to the farmers which denied them with technological idea that will help them in their farming operation which also concurred with the view of Baba

et al., (2015). Following the result presented, it is clear that, agricultural extension services is no longer in existence in the study area which entails that, women farmers are lacking some basic and vital information on how to handle and make proper use of agricultural inputs such as fertilizer, herbicides, insecticides among others. It also denied the women farmers the opportunities to have access to new developments and technological advancements in the field of modern agriculture thereby forcing them to rely on the old farming methods, hence affecting their farm output and subsequently producing at subsistence level.

Results of the farmer's constraint also revealed that, limited agricultural inputs, water shortages, lack of capital, difficulty in accessing land and distant extension sites were the other factors affecting women's participation in agricultural production. It was observed that, the shortages of water are highly associated with the effects of climate change and changing season which lead to the late rainy season and early onset of the rainy season in the study area while access to capital is associated to the high interest rate and untimely deliverance of the agricultural loans. The combination of all these challenges coupled with the lip service from the government side have impeded the agricultural viability in the study area as also documented by (Ekong., 2011); Paula (2019).

CONCLUSION

In respect to the results of this study, it is concluded that, factors such as unavailability of credit facilities, insufficient farming inputs, water shortages, distant extension

sites and lack of ready market are the major constraints affecting full participation of women in farming. In view of these research findings, it is therefore concluded that addressing women's agricultural needs and improving their access to agricultural productive resources could result in effective participation of women in agriculture and meaningful agricultural production.

Recommendations

Below are the recommendations made

- i. Extension services should be enhanced and made a priority to increase the level of women training in agricultural production.
- ii. Government authorities, non-governmental organizations, farmer's cooperative organizations and other agricultural allied development partners should take an inventory of women farmers and train Women in Agriculture (WIA) on the appropriate use of insecticides for the control of weeds, pests and diseases. It should conduct research and source new technologies that are affordable and geared towards drudgery reduction in the sector.
- iii. Government should make farm inputs available and ensure time deliverance and distribute directly to the farmers to avoid the shady practices of middlemen.
- iv. Government should look into laws of land tenure and tradition placed on land acquisition and use to reduce gender gap and encourage women participation in agriculture.

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