Quantity of Residential Housing Units as They Impact on The Environmental Quality of Enugu, Nigeria

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Abstract- ***Availability of different types of residential housing units in appropriate proportion has been a major issue in most urban areas in Nigeria. In Enugu, the available housing units in their types have posed some environmental problems. This paper therefore examines the impacts of the primary types of residential housing units in Enugu metropolis on the environmental quality of the area. A relationship between environmental quality and types of housing units available in the study area was established, using a multiple regression model. The various environmental quality variables were reduced into a single factor score known as the 'Y" (Dependent) variable using factor analysis. Four principal types of residential housing units prevalent in the area (single tenement rooms, block of flats, bungalows and duplexes) were used as the*** X_1, X_2, X_3 ***and*** X_4 ***(independent) variables. The coefficient of determination showed that adjusted*** r^2 ***.902 in the result. This is an indication that 90.2% variation in the environmental quality can be predicted from the types of housing units. The impacts of block of flats were more pronounced than any other independent variable. The impact induced, different environmental problems including the emergence of shanties at the outskirt of the metropolis as well as within the core city. Provision of conducive environment by the government for the development of more of low- and medium-income housing units has been recommended among other measures.***

Indexed Terms- Housing, Impact, Environmental, Quality, Enugu

I. INTRODUCTION

Enugu has had its fair share in line with urban population upsurge in Nigeria and in the third world at large. The percentage urban population has continued to increase over time in Nigeria. In 1921 about 7.8% of Nigeria population lived in urban cities while 92.2% lived in rural areas. By 1963 and 1991 it rose to 19.3% and 35.3% respectively (Obienusi, 1998). Currently, it is more than 75%. This, upsurge in population of urban dwellers in Nigeria is not unconnected with oil boom of 1970s. With the large flow of petrodollars, courtesy of the crude oil boom, investments were attracted primarily in urban areas and various opportunities created in one form or the other. Consequently, many rural dwellers, particularly able-bodied young men and women migrated from rural to urban areas in search of white colar jobs.

The attendant migration of rural dwellers to urban areas made and is still making great demands on housing. It has been envisaged that supply of housing units is not actually meeting the demand. Enugu metropolis, with a population of 722, 664 people and 169, 422 housing units (NPC, 2006) shows clearly that there is deficit of housing units in the area. This deficit is basically predicated on the types of housing units available in the area, which invariably could have impact on the environment.

This study is therefore focused on examining the primary types of housing units in Enugu metropolis and how they impact on the environmental quality of the area.

II. LITERATURE REVIEW

In studying Housing Investments in the environmental quality of Enugu metropolis, Emodi (2012), classified the metropolis into three Local Government Areas and identified the types of residential housing units in each of the areas. According to him, the total number of housing units in Enugu North Local Government Area is 57, 615; made up of 21, 676 units on separate stand, 320 of traditional hut structure, 9568 units were in block of flats, 2,862 units were semi-detached, 17,569 were single room tenements, 421 units were of improved dwelling while 5,199 units were not

classified. In Enugu East Local Government Area with 64,411 housing units, 28, 439 units were on separate stand, 1,677 units were of traditional structure, 10,593 units in block of flats, 2,448 units semi-detached houses, 17,832 units in single room tenements and 293 of improvised dwelling while 3129 were not classified. Out of 47,396 housing units in Enugu South Local Government Area, 10,247 units were on separate stand, 308 of traditional hut structure, 13,599 units in block of flats, 2,440 in semi-detached units, 15,819 units in single room tenement, 606 as improvised dwelling and 4,377 units not classified.

Essentially, research finding indicated that in 2006, the total population of Enugu metropolis was 722,664 and 169,422 housing units sheltered these inhabitants (NPC, 2006, Population and Housing Census). However, with the housing deficit estimate at 1.7 million units for the nation, Nigeria (Khandi, 2011), the metropolis had and is still having its fair share of residential housing deficit.

In his study on Acute Urban Housing Shortage Amids Increasing Housing Stock in Nigeria Muoghalu, (1996) asserted that one of the boldest steps in housing provision in Nigeria was the launching of the National Housing policy. The federal Government of Nigeria was concerned about housing senior public officers. In Enugu, 108 flats developed at the Uwani Real Estate went to senior public officers as well as 537 units at Abakpa Nike Housing Estate, Leaving the private sector to fend for the ever-increasing number of the urban population.

Cendrero and Fischer (1999), in Florida, worked on the procedures for assessing the environmental quality of coastal areas for planning and management based on the identification of certain characteristics. This, they did use certain indicators including number of storms per year, and thereby proposing numerical indices of the indicators. The indices could be used for monitoring environmental change with time. The method can help to determine whether existing management and policy trends move away or towards sustainability. Again, it can facilitate the integration of scientific assessment into the process of coastal planning and management through the application of indices which give the summary of environmental characteristics in terms that should be significant to planners and managers. However, because of the peculiarities of coastal areas, it could be seen as an irony of circumstance for the procedure for assessing environmental quality in a coastal area to be generalized to every other environment.

Also, m United States of America Brasington (2005), estimated the relationship between housing price and environmental disamenities using spatial statistics to uphold the view that nearby point source pollutants depress house price. Applying the statistics, six spatial Hedonic regressions for Akron, Cincinnati, Cleveland, Columbus, Dayton and Toledo were determined. The highlight of the results showed that the implicit prices of environmental quality and related characteristics from the house price hedonics the estimate of a demand curve for environmental quality. It was also found that there was significant evidence in spatial effects in both the hedonic and demand estimations, and that environmental quality and house sizes are substitutes.

Perz (2011), studying the environmental quality of Brazilian Amazon, emphasized that deforestation is not the only issue of importance concurring changes in environmental quality of the Amazon. Three dimensions of urban environmental quality were considered. Census data and health services statistics were used. The study compared enchanters of environmental quality in urban population of Amazon in 1980 and 1991 quantitatively. Thirty-three environmental quality indicators were used. The results indicated that environmental quality in the region deteriorated during the 1980s as the production of and exposure to environmental hazards rose while resources to ward off hazards eroded, and that environmental quality was particularly poor in more rapidly growth urban centres. Consequently, this stands as a challenge for sustainable development in the Amazon.

Using Europe and America as case studies, Cendrero, Lopez et al (2003) worked on the procedure for sustainability assessment in Coastal areas based on a series of indicator and indices that reflect environmental quality. Three dimensions of environmental quality (functions, interaction and components) were taken into consideration. The procedure was developed within the ELANEM Euro-

Latin American project. The procedure offered the possibility of expressing environmental quality of the coastal areas in numerical form through the use of indices based on clear and replicable method, using indicators that can be measured or objectively determined. This method could provide a useful tool for monitoring environmental quality, thus helping to assess sustainability of existing policies and practices. Bemaver and Konbi (2004) in their study on the effect of various political variables on environmental quality took into account the effects of economic variables. Air pollution (concentration of sulfur dioxide) was used as the dependent variable. Annual observations for the years 1971-1996 from 291 observation sites located in 107 major cities in 42 countries (2,555 observations) constituted the data for sulfur dioxide concentration. Combining the environmental, economic, and political and site-specific components a statistical model was obtained. Through regression of sulfur dioxide concentrations on the explanatory variables, they obtained their results. Emerging from the result, there was indication that higher income, higher intensity of economic activity and greater trade openness contribute to lower pollution levels. The study could be useful for environmental quality monitoring. However, being an issue specific in nature, it cannot be generalized to other forms of environmental quality.

Assessing the inequality in the spatial distribution of accessibility and environmental quality in Paris metropolitan region, Palma et al (2007) asserted that local amenities are generally capitalized into housing market. Data from IAURGP GIS data base and metropolitan computations were used. The empirical analysis of the study showed that considerable inequality existed in the spatial distribution of the local amenities and social indicators. Spatial representation and Lorenz curves were used to examine the degree of inequality in these amenities. These provided evidence that some amenities were much more inequitably distributed than others. The researchers therefore obtained new insight into, how households in the Paris region trade off amenities against each other and against housing cost by estimating models at both a commune and at a grid cell level. Hence, they found that residential location choice model filled the data moderately better at the smaller scale of the grids cell compared to the commune. Thus G.I.S/EMIS could be seen to be invaluable for modem environmental studies in most counties of the world.

Majunder, Hossain and Islam, (2007) in an interesting environmental quality mapping study of Chittagong metropolis in Bangladesh, endeavoured to analyse both factual statues and perceptual pattern of the environmental quality of Chittagong Metropolitan City. The factual data were collected from various sources while the perceptual data were based on questionnaire survey of opinions of 492 respondents at the household level by City ward. The City's 40 wards were surveyed in this study using ranks of the wards by environmental groups. Thus, the study's numerous variables were classified into three: physical environment, neighbourhood environment and social environment. To determine the limit of satisfaction and dissatisfaction of the various environmental variables by respondents, satisfaction index developed by Hall, Yen and Tan was applied. It was tested against three levels of household income - high, medium and low-income groups-using Chi-Square. The study presented the crying need to address urban environmental quality resulting from high rate of urbanization and urban population in Chittagong Metropolitan City. They concluded that community people should be mobilized in such effort because people's participation is very much fruitful in improving their environmental situation.

In Turkey, Alkay (2009) carried out a study on the relationship between environmental quality level and housing sale prices in Istanbul metropolitan area. The study was carried out in two stages. In the first stage the environmental quality index was measured, using principal component analysis, after standardizing the different units of measurements with similar indicators. Relationship between the environmental quality index and housing sale prices were explored in the second stage. Correlation coefficient and square goodness of fit were used. The result indicated that the weights of dwelling indicators and satisfaction from housing environmental indicators were positive while the economic, social and accessibility indicators were negative for the casual factor that explained the environmental quality at district level in the metropolitan area. The study therefore concluded that the increasing environmental quality levels depend on the increasing quality of dwelling characteristics and

satisfaction from the housing environment. The result is useful in that it can show the overview of the environmental quality index at the district level, used by both public and private decision makers in improving the city. However, the study lacked time series data.

Besides, some studies have also been carried out in Africa as they concern the environmental quality of the area.

Alem and Martinson (2011) investigated the importance of environmental quality to the poor and what the policy makers know about it in Addis Ababa, Ethiopia. The citizens and policy makers were asked to rank the areas that they think government should focus on. The ranking areas were;

a) Better health services, education and housing
b) Creating environmental opportunity
c) Controlling price rise
d) Improved solid waste disposal
e) Improved liquid waste disposal

In their finding, although standard determinants of subjective well-being in western countries seemed to explain happiness in Addis Ababa, yet environmental quality equally played a very prominent role. Averagely, the policy makers had more long-term perspective by focusing on health, education and housing. The citizen on their part focused more on short-term issues such as controlling price rise. Hence, the government of the country went as far as introducing a strict control over prices of basic commodities, adopting the views of the citizens in this regard.

In Nigeria, different people have equally worked on environmental quality as it affects different cities or towns.

Olorunfemi (2009) studied the willingness to pay for improved environmental quality among the residents living in close proximity to two landfills in Olushoshun and Abule Egba, all in Lagos metropolis. The main instrument used in the collection of primary data was structured questionnaire. In the survey, a contingent valuation method was used, which solicited the resident's preferences through survey technique to state their willingness to pay for the benefits gained from an improvement in environmental quality (an improvement in the quality of Landfill practices). From the results, there was an indication that the presence of the landfills and the associated environmental impact was an important factor contributing to respondent's willingness to pay for environmental improvement in their neighbourhood.
Examining the housing improvement of core residential environmental quality of Ogbomosho town, Afon (1998) made use of twenty variables and identified ten environmental quality indicators. Correlation matrix was compared to determine the relationship existing between pairs of the variables. Correlation of the ten proved positive. Expressing the importance of the study, Afon advocated that it was no use for planners to impose their ideas on the public because people are better planned for when they have input into policy and programmes that will affect their present and or future.

Ekurekong and Jacobs (1998) attempted to shed some light on compliance that ensure high attachment of environmental quality in housing estate in Uyo, Akwalbom State. The study revealed that the housing estate by all indicators was deficient in facilities and service provision. The study also showed that more than 70% of the total area of the estate had been used for residential development, leaving less than 10% for the provision of facilities and services. These services were completely lacking in the estate. The analysis showed that the existing facilities were undoubtedly inadequate to support the huge population in the estate. An environmental quality unit was recommended to be established, to monitor and control quality of the environment in the estate.

Ede et al (2007) determined housing and neighbourhood quality for Yenegoa, Bayelsa State of Nigeria. The study sampled five neighbourhoods in the city to examine the problem, using questionnaires and physical observation as instruments. They looked at some of the variables that determine urban housing and neighbourhood quality as they relate to Yenegoa. The analysis made use of multiple Linear Regressions. The dependent variable (y) in the study was a composite value based on location. The statistical package for social sciences (SPSS) was used to explain the variations in the dependent variable by the independent variables. The results showed that

sanitary services among other independent variables have the greatest significance level (.99 confidence levels). The coefficient of determination was 0.1, and it was significant at 0.00 levels. Other independent variables of significance that could be taken serious included modern toilet, good drainage and open space. There was an indication that housing developers in Yenegoa did not comply with the existing regulatory measures to improve the housing and environmental quality. This, indeed, creates a gap between the present conditions and the target of various policy instruments for regulating the neighbourhood environmental quality in Nigeria. In order to address the situation, it was recommended that existing regulatory measures such as urban and regional laws, the National Housing Policy, the Urban Development Policy and the State sanitation Edict be vigorously enforced by the government. Although the study was empirically conducted, the independent variables shown were more of housing than environmental. In other words, it contained a limited number of environmental quality variables.

Others include, Olanrewaju and Fadairo (2003) who emphasized poor state of streets as a problem which does not give room for efficient evacuation of solid wastes. Okeke (2002) noted that the extensive use of temporary structures in the high-density neighbourhoods of Nigerian urban centres has constituted the fore runner of squatter settlement development in these areas. Emodi (2013) pointed out that rapid population growth among other factors have compounded urban environmental management, thereby negatively impacting surrounding environment. Umeakuka and Mba (1999) observed that blockage of storm water drainage paths in Onitsha with solid wastes which in turn induced flooding cannot enhance the quality of the area.

In 2005 Nwafor carried out a study on the recycling and re-use of urban solid waste in Enugu (Nwafor 2008). Certain studies have also been carried out and proposals advanced as to the improvement of solid waste management in Enugu metropolis. Wastlake (2008), noted the study carried out by Mequip Engineering services in 2006 “Towards integrated urban solid waste management”. The project among other things was the supervision of the construction of a sanitary Landfill for Enugu metropolis located at Ugwuaji site, 1.5 km away from Enugu, along Port Harcourt Expressway. The study and the implementation of the sanitary landfill, however, had congenital weaknesses which were aggravated by operational inappropriateness. There was no Environmental Impact Assessment study and Monitoring Programme for the Landfill site, with the result that flooding made operations in the rainy season difficult. Also, the Waste management Authority granted Emenite Ltd (industrial outfit) access to the Landfill for the disposal of industrial waste which was not provided for by the study.

III. THE STUDY AREA

Enugu metropolis, the study area is located between latitudes 6°27’N and 7°28N and longitudes 7°30E and 8°19E. The urban land area is roughly 72.8 square Kilometers with the rural environs covering an additional area of about 200 square metres. It comprises three local government areas namely, Enugu North, Enugu East and Enugu South. Enugu metropolis is in Enugu State, located in the eastern part of Nigeria and embedded in the Guinea savanna belt, which is the broadest vegetation belt in Nigeria.

The metropolis which lies on an altitude of 232.6 metres above sea level exists natural domes in the South and undulating plains forming the foothills of Udi escarpment in the North. The population has been on the increase within the metropolis in the last few decades as a result of rapid urbanization and subsequent influx of people. In 1953 the population was 63,000. This rose to 482, 977 in 1991 and by 2006, the population was put at 7,22,664 (NPC, 2006).

Enugu started as a photo-urban settlement near the mines, following the discovery of coal in the Udi hills around 1909. Iva valley and Ogbete areas which were the first areas to develop functioned primarily as coal miners’ residences. With the discovery of deep sea harbor in Port Harcourt, construction of Enugu-Port Harcourt rail line commenced in Enugu in 1914. The first freight of coal was transported from Enugu to port-Harcourt in 1916. In 1917, Enugu, attained, township status and was then referred to as Enugu Ngwo. As a result of its rapid expansion towards areas owned by mixed indigenous communities rather than towards Ngwo highlands, it was renamed Enugu in

1928. By 1939 Enugu has become the headquarters of the then Southern province. It became a regional capital and the important administrative centre in the then Eastern Region with the creation of the three regions in Nigeria in 1961. Presently, it is the capital of Enugu state of Nigeria.

The annual rainfall in the metropolis is 1247.8mm and the rainfall is mostly during the months of April through October, having July as the peak period. The annual temperature of Enugu is about 30.8°C and the variation within the season is normally less than 10°C. The relative humidity fluctuates between 40 and 80 percent. The prevailing winds are the local monsoons; the North East Trade wind and the South West Trade wind. The North East Trade wind blows from across Sahara Desert, with dry and dusty air over the area, hence resulting in dry season characterized by dusty harmattan weather. This season usually last from November to March. The South West Trade wind blows from across the Atlantic Ocean, bringing about the raining season.

IV. METHODOLOGY

In assessing the impacts of residential housing units on the environmental quality of Enugu, Metropolis, relationship between environmental quality of the area and different types of major housing units in the metropolis was established. Environmental quality variables constituted the dependent variable while types of housing units (accommodation) made up the independent variables. 21 environmental quality variables were used in the study, made up of 11 dwelling unit quality variables, 5 parcel quality variables and 5 basic residential quality variables. The variables of types of housing units include; single room tenements, block of flats, bungalows and duplexes.

Survey design was adopted. The metropolis was classified into 30 neighbourhoods, stratified into high, medium and low-density areas. From these areas' samples were selected randomly. Primary data were mainly collected using questionnaires. Direct contact method of reaching the respondents was used. Closed form was mainly used in which choices of possible answers to open questions were provided. One thousand, four hundred and forty copies of the questionnaires were used in the analysis. Besides, field tests were equally carried out to determine the air quality as well as the noise levels of the area.

Factor Analysis (Principal Component Analysis) was first used in the analysis of the data to reduce the various environmental quality variables to components. Varimax rotation was introduced to rotate constantly and to get the aggregate factor score. Then multiple linear regression was used to establish the relationship between the environmental quality of the study area and the types of housing units in the area. The environmental quality variables formed the 'Y' (Dependent) variable while single room tenements, block of flats, bungalows and duplexes constituted the 'X1', 'X_2', 'X_3', and X_4', (Independent) variables respectively.

Hypothesis was used to test the relationship between the environmental quality variables and the types of housing unit variables. The hypothesis was tested at 0.05 level of significance.

- Data Presentation and Analysis

Table 1: Component Matrix of Environmental Quality Variables

Variable	Components		
	1	2	3
Floor condition	.934	.077	.018
Wall condition	.891	.103	.-254
Window condition	.948	.004	-.117
Ceiling condition	.922	.158	-.151
Roof condition	.875	.188	-.152
Lighting	.897	.130	-.298
Structural condition	.844	.012	-.326
Landscape	.784	-.101	-.191
Nursance	.811	-.134	-.135
Condition of Drives	.827	-.322	-.0 13
Crowdedness	.435	.638	.310
Poor condition	-.924	-.034	- .022
Faircondition	.609	-.488	.254
Good condition	.820	.365	.064
Sanitary condition	.675	-.50 1	.227
Drainage	.795	-.333	.068
Neighbourhood problem	-.886	-.050	-.132

Air Quality	.612	.183	.189
Noise level	.840	-.080	.298
Waste disposal	.753	.133	.457
Domestic water source	.791	.018	.305

Extraction: Factor Analaysis

Principal component analysis has reduced the 21 environmental quality variables to 3 underlying components in table 1.

Component 1 has significant loading on 20 variables, which include; floor condition, wall condition, ceiling condition, roof condition, lighting, structural condition, landscaping, nuisance, condition of drives, poor condition, fair condition, good condition, sanitary condition, drainage, neighbourhood problems, air quality, noise level, waste disposal and sources of domestic water.

Component 2 has significant loading only on one variable which is crowdedness of the housing units, while component 3 has no significant loading on any variable.

The components were rotated, using varimax rotation to turn out three factors as in table 2.

Table 2: Varimax Rotated Component Matrix of Environment Quality Variables

Variable	FACTORS		
	Factor 1	Factor II	Factor III
Floor condition	.673	.435	.486
Wall condition	.808	-.427	-.185
Window condition	.768	.437	-.364
Ceiling condition	.789	.295	-.43 5
Roof condition	.758	.249	.425
Lighting	.867	.240	-.317
Structural condition	.835	.286	-.198
Landscape	.709	.249	-.310
Nursance	.655	-.460	-.199
Condition of Drives	.374	-.660	-.452
Crowdedness	.176	.108	.808
Poor condition	-.659	-463	-.45 5
Faircondition	.216	-.786	.100
Good condition	.491	.184	.653
Sanitary condition	-.281	-.817	.106
Drainage	.494	-.68 7	.178
Neighbourhood problem	727	-.438	-.291
Air Quality	.336	.265	.512
Noise level	.339	-.623	.304
Waste disposal	.250	.491	.700
Domestic water source	375	.483	.593

Extraction: principal component analysis

- Rotation Method: Varimax with Kaiser Normalization

Factor 1 has an eigen value of 13.889, is significantly loaded on 11 variables which are, floor condition, wall condition, window condition, ceiling condition, roof condition, lighting, structural condition, landscaping, nuisance, poor condition and neigbourhood problem. These stress primarily the variables of the environment which hinge squarely on the dwelling unit component. Hence, the underlying factor identified could be regarded as the dwelling unit impact on the environmental quality of the study area.

Factor II with an eigen value of 1.434 has significant loading on five variables; condition of drives, fair condition, sanitary condition, drainages and noise level. They constitute the most pronounced and conspicuous imprints on the adjacent structures and the parcel This entails the extent to which quality of the units and surrounding within the same vicinity are affected. The common focus within these variables is that they hinge on the parcels of the area. Consequently, the underlying factor could be identified as the parcel environmental quality.

Factor III is loaded significantly on five variables, and with an eigen value of 1.040. The variables are; crowdedness; good condition of housing units, air quality of the area, waste disposal in the area, and domestic water supply. In other words, the index appears to measure the overall quality of the exterior physical environment for this reason, it is referred to as “Basic Residential Quality”. The types of housing units available in the study area are presented in table 3.

Table 3: Types of Housing Units Available in the Study Area

Neighbourhood	Types of Housing Units in Enugu Metropolis			
Low Density	Single Tene	Block of flats	Bungalow	Duplexes
01d G.R.A	480	1242	1370	2902
New G.R.A	312	862	1920	2246
Golf	304	784	1844	2462
Republic Layout	411	864	1321	2024
Independence Layout	228	643	1889	3610
Medium Density Area				
Federal Housing	561	1201	1224	1001
Mary Land	204	3221	1021	221
City layout	1022	2412	822	924
Trans-Ekulu	602	914	1407	872
New Era-Layout	402	2864	2429	921
Aria road	506	1206	1898	934
Corridor Layout	341	2032	1311	872
Second Avenue	512	2112	1040	876
High Density Area				
Achara-Layout	1840	2664	1020	1008
Real Estate	1048	1720	1008	822
Asata Layout	2844	1248	1149	592
Ogui Layout	3211	1821	1211	508
Ogbete	3008	9420	1009	309
Abakpa	3021	2001	1142	809
State Housing	1060	1212	2021	442
Idaw River	2108	7421	810	927
Awkunanaw	7841	1420	1221	1081
Iva-Vally	3241	1210	896	499
Emene	3861	1466	1731	1001
Asata Camp	2411	228	1896	901
New Haven East	2488	2396	1644	1121
New Haven West	2081	2021	1204	980
Riverside	2442	1332	928	401
Uwani	2641	2011	1004	604

Source: Research's Field Work, 2019

V. RESULTS AND DISCUSSION

SPSS was used in the analysis of the entire data. The SPSS outputs (Regression output) are:

Model summary

Model	R	R-square	Adjusted R Square	Std the error of estimate
	.965	.937	.902	8.12142

a. Predictors: (constant) single room tenement, Block of flats, bungalow, Duplexes.

ANOVA b

Model	Sum of square	Df	Mean square	F	Sig.
1 regression	4322.401	22	128.246	18.214	0.02
Residual	682.546	27	84.346		
total	5004946	29			

a. Predictors (constant) single Room tene, Block of Flats, Bungalow, Duplexes

b. Dependent variable: aggregate score

Coefficients

	Unstandardized coefficient		Standardized coefficient		
Model	B	Std Error	Beta	tT	Sig.
1 (constant)	28.428	14.301		3.802	.058
Single room ten	-	2.544	-.164	2.201	.032
Block of Flats	2661	2.672	-.182	3.341	.024
Bungalow	-	2.331	-.144	2.411	.035
Duplexes	2832	2.122	-.126	2,342	.028
	-				
	2432				
	-				
	1727				

The result shows that there is a strong significant relationship between the residential housing units and the environmental quality in the study area. r^2 0.93 7. This shows that 93.7% of the variation in the dependent variable can be predicted from the independent variables.

The adjusted r^2 is employed, however, to generalize the findings to the population beyond the sample. Adjusted r^2=.902. This indicates that the best coefficient of determination is 90.2%. Thus, 90.2% (explained variance) of the variables is capable of predicting the value of environmental quality in the area, leaving 9.8% of the variation unexplained. This suggests that the explanatory variables could be regarded as being high.

Furthermore, P significance = 0.02 and P<0.05 significance level. Single room tenement has P significance value of 0.032, Block of Flats has 0.024, bungalow has 0.03 5 and Duplexes 0.028 which are all significant at 0.05 significant level. The standard error of estimation is 8.1242 and this is the standard deviation of the error term.

To measure the significant interactions in the relationship the coefficients of the independent variables are employed. The coefficients 'a' table indicate the relative impacts of each variable on the dependent variable. It is indeed pertinent, however, to note that block of flats variable impacts more on the environmental quality of the area than any other variable in the relationship. This suggests that most of the housing units in the study area are of block of flats. In low density areas of Enugu metropolis like old G.RA, New G.R.A, Independence layout, Republic layout and Golf, duplexes and bungalows are the dominating housing units. In medium density areas of Thinkers corner, Federal housing, Maryland, City layout, Trans-Ekulu, New Era layout Aria road, Corridor layout and Second Avenue, block of flats and bungalows feature prominently. There are more of block of flats and single tenement units in high density areas of Achara-layout, real estate, Asata layout, Ogui layout, Ogbete, Abakpa, Idaw River, Awkunanaw, Iva Valley, River side and Uwani than other types of housing units. However, it has been observed that the duplexes found mainly in the low-density areas of the metropolis are being occupied mainly by rich in the areas. The lower-class families in the areas are found mainly in the high-density areas and precisely in single tenement units. Although statistics reveal that there are housing deficits in the area, yet there are housing units lying vacant in the study area. These units are primarily detached houses and duplexes in Coal City estate which Enugu State Government developed to be sold to the masses. Most of the housing units have not been sold out because majority of the residents in the metropolis who are in need of shelter cannot afford the amount placed on them.

The different types of housing units available in the metropolis and their distributions have far reaching effects on the environmental quality of the area. Even though the number of block of flats in the metropolis is more than the number of any other housing unit in the area, this type of housing unit is not enough for the residents of the metropolis as most of them are of medium and low-income earnings. Besides, the present dwindling nature of Nigerian economy has not helped matters. For instance, it has been observed that the situation in some parts of the metropolis like Achara Layout (built up mainly in block of flats) shows that the area which hitherto used to be mainly

occupied by lower middle-class individuals as medium density area is now no longer so. Some of the residents are households that vacated their accommodation in low density areas to this area so as to be able to meet with the rental demands of the area. Also, closer observation reveals that some of the flats are being shared by two or more households. These flats were originally built to accommodate a household in each case, and the facilities/amenities provided meant to serve as such. Hence there have been increased rate of facilities/amenities breakdown in the metropolis and these could be linked to the pressure on the existing facilities and amenities.

Besides, in recent times an increasing number of shanties have been springing up at the outskirt of the metropolis. They include those of Ugbo Odoqwu, Ugbo fred, Nkpologu etc. the inhabitants of these shanties adduce that they could not cope with the rents for the dwelling units they were formerly occupying in the inner city. This, they claimed was as a result of non-availability of enough of these dwelling units. Hence, since demand outweighs supply, rents increased exorbitantly. The tenants then have decided to make do with what they could lay hands on at the suburb at cheaper rate. They resort to erecting shanties and in most cases at the peripheries of the core city. This is so because people pay little to nothing here for land acquisition as most of these shanties are erected along undulating hilly areas. The consequence of this development in the area is that top cover of the soil is being removed while erecting these shanties. Hence, there is easy run off from these hilly developed areas down to the city bringing about flooding in the core city. This is the case with Ugbo Fred and the former premises of University of Nigeria Teaching hospital, Enugu. Furthermore, under undisturbed vegetation, plants around the metropolis generate a lot of oxygen needed by residents of the metropolis and absorb excess carbondioxide given out from the area. This brings a balance in temperature. But as the vegetative parts of these hilly areas are cleared, the excess carbondioxide becomes difficult to be reabsorbed. Hence, there is imbalance in temperature, which tends to contribute a great deal to the warming of the environment within the metropolis. This is in line with views of Brezina and Schmidt (1973) who asserted that green surfaces mitigate the less desirable aspects of the urban cities, and that within their confines and beyond, they reduce the stress produced by heat, decrease the noise levels and filter out certain pollutants.

CONCLUSION

The study has revealed that there are primarily four types of housing units that are available in the residential environment of Enugu metropolis. They include; single tenement buildings, block of fiats, bungalows and duplexes. The single tenement housing units are found mainly in high density areas while duplexes are predominant in low density areas of the metropolis. However, block of flats are found in sizeable proportion in low, medium and high density areas.

Equally, shown in the study is the fact that availability of different types of residential housing units in the area tend to relate strongly with the environmental quality of Enugu metropolis. Non availability of particularly block of flats and single tenement units in adequate proportion has adversely affected the environmental quality of the area in different dimensions; leading to fast deterioration of the existing housing units and impairment of the surrounding and natural environment.

It was an irony of circumstance to observe that though the inhabitants of the metropolis are in great need of housing units, yet some houses are vacant, waiting to be occupied. These are, however, duplexes in low density areas with high price tags. This invariably indicates that inhabitants of the area who are mainly civil servants require mainly tenements and blocks of flats, the prices of which they can afford.

RECOMMENDATIONS

Since most housing developers in the study area are private developers, they do not find it very easy to source capital for housing development because of the dwindling economy, and housing development capital intensive. Thus, as residential housing units are not coming up as required in the area to meet the needs of the increasing population, the state government particularly should arise and make every frantic effort towards embarking on realistic housing projects that will effectively compliment the efforts of the private

sector. However, the site and services scheme, part of the state government effort to encourage private housing development should be seriously embarked upon to attract various categories of private developers. This will make more housing units to be available and stress and pressure on the existing units and facilities reduced. Hence, some of the inhabitants of the areas will no longer be compelled to move into the hinterland where slums are developed with the attendant health hazards. Furthermore, the situation will make housing units available the more and the tendency of two or more households sharing flat will be reduced, thereby equally reducing pressures on the existing facilities in existing housing units.

As most of the residents in the study area are of low- and medium-income earnings concerted efforts should be made towards the development of low- and medium-income houses like single tenement housing units and blocks of flats. Rather than embarking on flamboyant duplexes and detached houses that are rarely occupied or purchased by anybody. Those concerned with property development should concentrate on low-cost houses. These will be of benefits to majority of the inhabitants in the area. It will ease the accommodation problem in high and medium density areas, thereby enhancing the environmental quality of the area.

There is a strong relationship between environmental quality and the types of available housing units in the area. Therefore, to maintain good environmental quality in the area, deliberate efforts should be made to lower the costs of housing units as both private investors and owner occupiers will move in to develop. Thereby, more housing units will be made available. As these housing units are available and affordable, inhabitants of the metropolis will likely prefer, remaining in the inner city rather than moving into the hinterland, distorting the natural environment and negatively impacting on the environmental quality of the area.

Furthermore, since Enugu metropolis is still in deficit of needed housing units, the state government should re-consider its stand on total privatization of housing units belonging to the State. Such housing units should be allocated to primarily civil servants at very much subsidized rates. On the other hand, where the privatization needs to be fully implemented, it is advocated that the civil servants occupying government houses be given the right of first refusal, with adequate subsidy to enable them purchase. By so doing, housing units will be made available to those who really are in need of them and not for merchandising by politicians and their associates.

REFERENCES

[1] Afon, A. O. (1998) "Use of Residents Environmental Quality indicators in Ogbomosho Core Residential Housing Improvement" *FUTA Environmental Forum*. Vol. Xl No, 4 PP. 12-14.

[2] Alkay E., (2009) The Relationship between Environmental Quality level and Housing sale prices in the Istanbul Metropolitan Area. *Istanbul Technical University Publication*. Vol. 6 No. 1 pp 60-76.

[3] Allem, Y and P. Martinsson (2011) "How Important is Environmental Quality for the Poor and what do policy makers know about it" A study on subjective well-being in Addis Ababa" *SAE working paper services*

[4] Bemauer, T. and K. Koubi (2004) "on Political Determination of Environmental Quality" *CIS UNI/ETH. Zurich working Paper* No. 2

[5] Cendrero, A. and D.W Fischer (1999) "A procedure for, Assessing the Environmental Quality of Coastal Areas for Planning and Management" *Journal of Coastal Research*. Vol.13. No. 3 pp 6-8.

[6] Cendrero, Lopez and Adriana (2003) "indicators and indices of Environmental Quality for Sustainable Assessment in Coastal Areas" *Journal of Coastal Research, Coastal Education and coastal foundation Inc.* vol. l9No.4pp919-933.

[7] Ede, N.P, AF Ebakpa and F.C Chukwuigwe (2007) "Determination of Housing and Neighbourhood Quality for Yenegoa, Bayelsa State of Nigeria" *Journal of Nigerian Institute of Town Planners*. Vol. xx. No.1 p. 107

[8] Ekurekong, E.E. and A. Jacobs (1998) "Public Housing and Environmental perspective on Housing Development in Uyo, Akwa-Ibom

State" *FUTA Environmental Forum*. Xii. No. 6pp. 8-10

[9] Emodi, E.E. (2012) A Comparative Analysis of the Effect of Private and Public Housing Investments on Environmental Quality of Enugu Metropolis. *Sustainable Human Development* vol. 1 No.3 pp 12-28.

[10] Majunder, A.K., M.E. Hossain, E, Islam and M. Sarwa (2007) "Urban Environmental Quality Mapping. A perception study of Chittagong Metropolis Bangladesh" Kathnandu University. *Journal of Science and Technology*. Vol. 1 No. 4. Pp. 10-11.

[11] Mm of information Enugu State (2002) The History of Enugu. Retrieved 2 June, 2007 from httlen.wilipedia.orglwiki/Enugu State.

[12] National Population Commission (2006) Population and Housing census of Federal Republic of Nigeria: Housing Characteristics Vol. II No. 4 pp. 12-16.

[13] Nwafor, J.C. (2008) "Integrating Environmental Impact Assessment into Planning and Development at the Local Government and Stale Levels for Increased Revenue Generation in Good Governance. A case study of Enugu State" Paper Presented during a 3-day workshop of Centre for Environmental Management and Control (CEMAC) at Zodiac Hotel, Enugu. March 21-24.

[14] Olarenwaju, D.O and G. Fadairo (2003) "Flooding as an induced Environmental Problem. A case study of Ala River, Akure, Nigeria" *Journal of Nigerian Institute of Town Planners* vol. XVI No. 4 pp 85-95.

[15] Olorunfemi, F. B. (2009) "Willingness to Pay for Improved Environmental Quality Among residents living in close proximity to landfills in Lagos metropolis Nigeria" *Ethiopian Journal of Environmental Studies and Management*. Vol. 2. No.3 pp 2 1-22.

[16] Palma, D. and A. Anndre (2007) "Accessibility and Environmental Inequality in the Paris Housing Market" *European Transport Publication*. No. 36. pp. 4 7-74.

[17] Perz, S.A (2011) "The Quality of Urban Environment in the Brazilian Amazon" *Journal of Social Indicators Research.* Vol. 49 No. 2 pp 181-212.

[18] Umeakuka, J.M and H.C Mba (1999) "Waste Management practices. A Case Study of Anambra State" *Journal of the Nigerian institute of Town Planners* Vol. XII pp.14-25.

[19] Rhandi, M. (20111) "*Nigeria Has 1.7 Million Housing Deficit, says minister*" Nigerian News Monday 21 Nov. P.1.

[20] Muoghalu, L. N (1996) "Acute Urban Housing Shortage Amidst Increasing Housing Stock in Nigeria: A Search for causes. *Journal of Nigerian Institute of Builders* Vol. 1. p 8.