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Evaluation of Residents' Perception of Design and Construction Factors of Public Housing Estates in Awka and Onitsha, Nigeria

Eni, Chikadibia Michael (Arc., Dr.)
Department of Architectural-Technology, Federal Polytechnic, Oko. P.M.B. 021, Aguata, Anambra State, Nigeria chikaeni@yahoo.com Tel: 2348035494871
chikaeni@gmail.com Tel: 2348027076815

Abstract
This study evaluated the occupants' perception of design and construction factors of fourteen public housing estates in Awka and Onitsha cities in Anambra State, Nigeria. The specific objectives were to identify and describe the public housing estates in these cities and to determine the perception of the occupants of the housing estates in the two cities on the design and construction of these public housing estates. A null hypothesis: There is no significant relationship between occupants' perception on the design and construction of public housing in their various locations was formulated and tested. The theoretical basis of this study was hinged on Adams' Equity Theory (Balancing Inputs and Outputs) because it focused on determining whether the distribution of housing resources was fair to both relational partners (Occupants in Awka and Onitsha cities). This study utilized a survey research design in the collection of data. The universe of study consisted of 2,805 occupants comprising mainly households, and 2,805 housing units, 1,032 in Awka city and 1,773 in Onitsha city. The sample size of 30% (842) was used as derived from Taro Yamani technique. A stratified random sampling of these disparate public housing estates based on their proportion to population was studied. A 20-item structured questionnaire on design and construction (QPH) was developed. This instrument was face and content validated. Cronbach Alpha Technique index was used for reliability test which gave a value of 0.90. The data were obtained by pulling all positive responses for each group of occupants (Awka or Onitsha) as positive responses and as negative responses and their proportions obtained and filled below pooled observations (counts). Undecided responses were left as neutral. Complete responses were 797 comprising 299 occupants in Awka and 498 occupants in Onitsha. The research questions were processed using percentages, means, chi-square, Contingency Table Analysis (CTA) and one way Categorical data analysis of variance (CATANOVA), while the hypotheses were tested by proportion of difference using Z-test. The major finding of the study was (1). That the proportion of occupants in Awka responding positively to design and construction factors of public housing is higher than the proportion responding positively in Onitsha. Hence, the inference is that occupants in Awka perceived this dimension of public housing more positively than occupants in Onitsha. This difference between the two cities needs to be addressed in order to validate the Adam's equity requirements in the built environment**.** Also flexibility in design and construction of theses public housing estates suited the occupants as they were part of the design and construction processes.
Key terms: Evaluation, perception public housing, Nigeria

Introduction

The United Nations estimates that there are over 100 million homeless people who are forced to live with no shelter at all (Buddenhagen, 2003) and over 1 billion people worldwide who are inadequately housed (UNCHR, 2001, Buddenhagen, 2003 and Cronley, 2010). A UN-Habitat (2009) estimate had indicated that more than one billion of the world's city residents live in low quality housing, mostly in the sprawling slums and squatter settlements in developing nations. In Lagos, many homeless people live *"as homes"* under public bridges and flyovers on the high ways (Ehingbeti, 2008). More recent United Nations study put the overall Nigerian housing deficit at 17 million units while Nigeria National Bureau of Statistics estimated between 12 and 14 million housing units. As of 2009, there was a deficit of 16 million housing units in Nigerian urban centres (Kolawale, 2009).

The above statistics are evidence of the difficulty governments have in guaranteeing access to housing for their citizens. However, as part of government's effort to provide suitable and adequate shelter for the citizenry, she went into public housing provision initiative (Akeju, 2007 and Obeng-Odoom, 2009). Public housing is usually owned and operated by the government although some public housing projects are managed by subcontracted private agencies. Public Housing is housing financed, constructed and allocated by the state, usually for persons in low income category. Sometimes it is referred to as affordable housing. Public housing is generally kept at affordable rent levels or financial assistance given on low-interest loans or credit (Buddenhagen, 2003 and Sengupta and Sharma, 2008). It is indeed regrettable that in Nigeria despite the fact that the 1999 Constitution Section 16(3) (d) under "*Fundamental Objectives of State Policy*" compels the Nigerian State "to provide suitable and adequate shelter for all citizens" (Federal Republic of Government, 1999). The attainment of such a goal is still unrealizable.

In many states of the Federation different public housing schemes abound ranging from low-cost, middle-class and upper-class housing projects. These were meant to cushion the effect of dearth of housing (Obeng-Odoom, 2009 and Eni, 2014). However, Muoghalu (1986 and 1989) stressed that government is attracted to public housing because of its visibility and the money accruing from contracts and politicians can point with pride at the highly visible, public-aided housing projects as a measure of their concern for people and their social accomplishment.

A look at some public housing projects has revealed that a number of them has suffered from such weaknesses as ineffective waste disposal management and other forms of environmental degradation, such as poor public utilities and infrastructural back up, lack of social institutions such as health and educational institutions and other social amenities, prevalence of crime, destitution and prostitution (Arimoro et al, 2009). Conversely, a number of them have been built to high standard thereby making them highly competitive by prospective homeowners and tenants. It may be recalled that some of the available estates have survived for years and have become nerve-centres of some towns and cities where they are located (Okpala, 1982a and Eni 2014). There is no doubt, that in the absence of these estates, the accommodation problem of the citizenry would have worsened. This situation now called for appraisal of government's effort in providing affordable and habitable public housing with good design criteria and construction attributes (Ademiluyi and Raji, 2008). To this end, the issue of providing, improving and sustaining design and construction contents of public housing became a crucial issue. It was the above scenario that led to the articulation of the problem of this research.

Problem of this study

The main problem of this study is that public housing delivery in Awka and Onitsha cities seem to have a multiplicity of housing design styles and construction methods. Different interpretations were given to blueprints for development unlike the usual monolithic housing use which followed master plan zoning, where there was usually uniformity of design and construction criteria (Nuefert, 2012). Some public housing catered exclusively for the low income group, while in some public housing estates, a variety of income groups were lumped together with varying design and construction options. This is in contrast to what obtained in most public housing estates and there is need to investigate if this flexibility in design and construction methods which increased densities encouraged mix uses and changed urban land use form made for improvement of public housing estate delivery.

Frame of reference

To tackle the assessment of this public housing provisioning factor, a frame of reference that identified it were established inform of **an aim and objectives**. The specific objectives were to:

I). Identify and describe the public housing estates in Awka and Onitsha cities,

II). determine the perception of the occupants of the housing estates in Awka and Onitsha on the design and construction of their public housing.

A null hypothesis: There is no significant relationship between occupants' perception on the design and construction of public housing in their various locations was formulated and tested.

Theoretical Framework and Review of literature

The theoretical perspective of this study was hinged on the proposal of Adam's Equity theory because it focused on determining whether the distribution of housing resources was fair to both relational partners (Occupants in Awka and Onitsha cities). Equity Theory acknowledged that subtle and variable factors affected an employee's or an occupant's assessment and perception of their relationship with their work/ public housing estate and their employer/ housing provider.

The system composed of inputs, throughputs and outputs, which illustrated a generic framework for design and construction using Adam's equity theory.

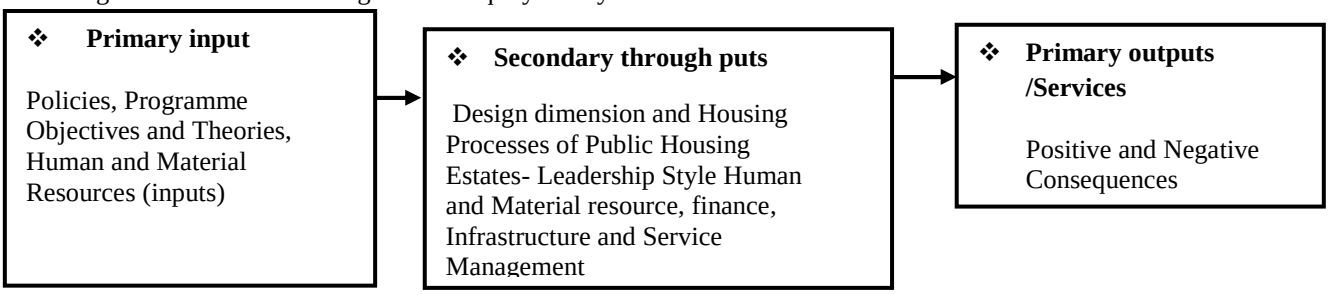

Fig. 1. Framework for Design and Construction of Public Housing

This assessed the balance or imbalance that currently exists between the public housing occupant's inputs and outputs, as follows:

Outputs typically include: rewards (such as homeownership or rental) intangibles that typically include: recognition, reputation, sense of achievement, sense of advancement/growth and tenure security, while the inputs that a participant contributes to a relationship can be either assets – entitling him/her to rewards – or liabilities - entitling him/her to costs. The entitlement to rewards or costs ascribed to each input varies depending on the relational setting.

Further Outputs are defined as the positive and negative consequences that an individual perceives a participant has incurred as a consequence of his/her relationship with another. When the ratio of inputs to outcomes is close, then the occupant should have much satisfaction with their housing.

From fig. 1 above the various physical criteria, such as the design parameters and the construction quality serve as inputs into public housing. Throughputs viewed as human activities constitute processes that interplay and exacerbate the physical parameters as positive and negative consequences were not considered.

Housing delivery strategies relate to activities, events, processes or functions engaged in the transformation of housing policies, programme objectives and theories, human and material resources (inputs) into housing units and services (outputs). These include different approaches used in realising programme objectives as well as the participants and resources involved in public housing provisioning. Participants in this milieu represent the organisational structure for public housing provision. They comprise public and private organizations involved in public housing provisioning whose actions influence the input, process, output and outcomes of public housing activities. Lusthaus et al., (1995) and Lusthaus et al., (2002) indicated that organizational performance in product and service delivery is influenced by organisational capacity and the external environment. Therefore, organizational capacity describes the ability of organizations to successfully use their skills and resources to provide goods and services and in this circumstance design and construction of public housing. However the internal organizational (intervening) factors that influence organizational capacity such as leadership style, human and material resource, finance, infrastructure, service management, and housing project process management central in the assessment of organisational capacity were ignored as basically the housing providers were the same for both cities.

In this regard, Equity theory proposes that individuals who perceive themselves as either under-rewarded or over-rewarded will experience distress, and that this distress leads to efforts to restore equity within the relationship. It focused on determining whether the distribution of resources is fair to both relational partners. Equity is measured by comparing the **ratios** of contributions and benefits of each person within the relationship. Adam's equity theory was employed in this study because it made research findings meaningful and generalizable. It also established orderly connections between observations and facts and aided prediction and control of situations. In terms of the usage of Adam's equity theory in this study, it can be seen that as a research tool, which framework has some merits. First, it incorporated both theoretical and philosophical perspectives into the investigatory process, and thus, linked all aspects of research including problem statement, aim, objectives, literature review, methodology, data collection and analysis as well as the interpretation of findings. Secondly, the framework lent itself to the use of both quantitative and qualitative research strategies as well as multiple data gathering instruments. Thirdly, the framework allowed for the investigation of the input, process, output and outcome of some components of public housing programmes. Where multiple public housing estates delivery is used in a programme, it assisted in assessing and comparing the outcomes of the different estates.

Eni, 1997 and Wikipedia 2014 posited that architects plan, design and review the construction of buildings and structures for the use of people. It is the professional duties of the architects to produce building design. According to Ruskin (1986), Eni, (2000) and Eni, (2014) the need for housing design is to ensure not only a good production of the drawing, but also to guarantee its functional and structural integrity and provide a guide for carrying out the actual construction/development, so as to achieve optimum comfort for human habitation and functional requirements of other usages. The need and importance of housing design before eventual construction cannot be over emphasized. The truth, however, is that the design stage provides opportunity for cost reduction in housing, It is relatively cheaper to correct, redesign and change design criteria on a piece of paper than during construction (Eni, 2000 and Eni, 2014). Fourteen studies relating to the design and construction of public housing were reviewed. In a heuristic study previously done by Oladapo, in 1993, Jiboye (2008) used co-relational research method and found out the need for technocrats to identify appropriate design criteria and to use them as inputs to housing design and development. He advised that the tasks confronting architects, planners, policy makers and all those concerned with providing housing, to identify the factors which determine adequate and satisfactory housing. Similarly, Jiboye, (2010) employed a conceptual model and found the need to consider relevant factors of the environment, dwelling and management in housing design and development. He systematically surveyed 1,232 (10%) households out of a total of 12,323 households in six randomly selected public housing states in Lagos. This followed the study by Onibokun, (1973) and Muogahlu, (1984a). Globally, some research findings and recommendations seem to support these findings. Kellekc et al (2005) found that housing design and construction were important determinants of users'

satisfaction and environmental quality in Turkey in his study "Determinants of Users' Satisfaction and Environmental Quality: Sample of Istanbul Metropolis".

So and Leung (2004) found that the Chinese consider design and construction (appearance) of their housing a very important issue in housing satisfaction. They employed survey research technique in surveying the attitudes of Chinese towards buildings in three Chinese cities: Hong Kong, Shanghai and Taipei. They found that attractiveness of design contributed to housing satisfaction. In the same vein Amerigo et al (1990) established that appearance of council housing contributes towards housing satisfaction in the UK, while using survey research to assess residential satisfaction in council housing there. Djebarni et al (2000) found that public housing is better assessed through users' assessments as against designers' opinions. They employed survey research technique to assess satisfaction level within neighbourhoods in low-income public housing in Yemen. Anantharajan (1983) used survey research method and found out, in a research conducted in randomly sampled public housing in Miami Florida that those end users point of view is important in the evaluation of their housing perception and recommends the evaluation of residential development through users' ratings and rankings of both design and environmental attributes and in Nigeria. Onibokun (1973) who studied Onatario, Canada used survey research method and found that a dwelling that is adequate from the physical or design point of view may not necessarily be adequate or satisfactory from the users' point of view and recommended the use of subjective criteria of resident satisfaction with public housing. Diogun (1989) studied "Housing Problems in Nigeria: Low-Income Housing survey" and found that government's direct involvement in housing development and delivery has been on the increase and advised against it and suggested that government should be seen as a regulator and setter of standards, while Muoghalu (1984b) used survey research method in an empirical study of two public housing estates in Enugu. It was found that a critical mass of occupants felt dissatisfied with the design and construction of their housing units and suggested the need to combine objective criteria with subjective indicators of resident satisfaction with public housing. Oladapo (2006) employed co-relational research approach, which showed that tenants satisfaction could be measured by housing attributes such as the function and physical adequacy of the dwelling, quality and adequacy of social and community facilities, the nature and effectiveness of official policies and personnel attitudes, convenience for living, the condition and maintenance of the home environment, maintenance of the dwelling facilities, privacy, territoriality and neighbourhood security among other variables and recommends that tenants satisfaction should be measured by housing attributes such as the functional and physical adequacy of the dwelling, quality and adequacy of social and community facilities. His findings tallied with those of Muoghalu, (1984a). Technically speaking, Fletcher (1961) contends that architects plan, design and review the construction of buildings and structures for the use of people. A good building should satisfy the three principles of *firmitatis, utilitatis, venustatis*, which translate roughly to - Durability - it should stand up robustly and remain in good condition. Utility - it should be useful and function well for the people using it. Beauty - it should delight people and raise their spirits.

The Nigerian architect has come under intense criticisms. Nigerian architects have been accused of over-designing. According to Muoghalu (1984a) what appeals to technocrats will not necessarily appeal to consumers. It is obvious that he was advocating inclusion of, and enlistment of residents' co-operation in design, as well as in environmental management. According to Michelson (1968) most people do not want what architects want. Most researchers such as Jiboye (2008 and 2010); Kellekc, et al (2005); So and Leung, (2004) and Anantharajan (1983) recommend the appraisal of residential development through users' ratings and rankings of the design and construction attributes, while Onibukun, (1973) states that though a dwelling unit may be adequate from the physical or design point of view, it may not necessarily be adequate or satisfactory from the users' point of view. Wikipedia (2014) posited that part of the architectural profession and also some non-architects feel that architecture has not been a personal philosophical or aesthetic pursuit by individuals; rather it had to consider everyday needs of people and use technology to give a liveable environment.

Study Area: The study area, Awka and Onitsha cities are located in Anambra State of Nigeria. Anambra State was created on 27th August, 1991. Its name is derived from 'Oma Mbala' now known as Anambra River, a tributary of the famous River Niger.

Fig. 1 Relative position of Nigeria in the world map
Source: Wikipedia, the Free Encyclopedia, 2014.

Fig. 2: Location of Anambra State in Nigeria.

Source: Adapted from Wikipedia, the Free Encyclopaedia, 2014.

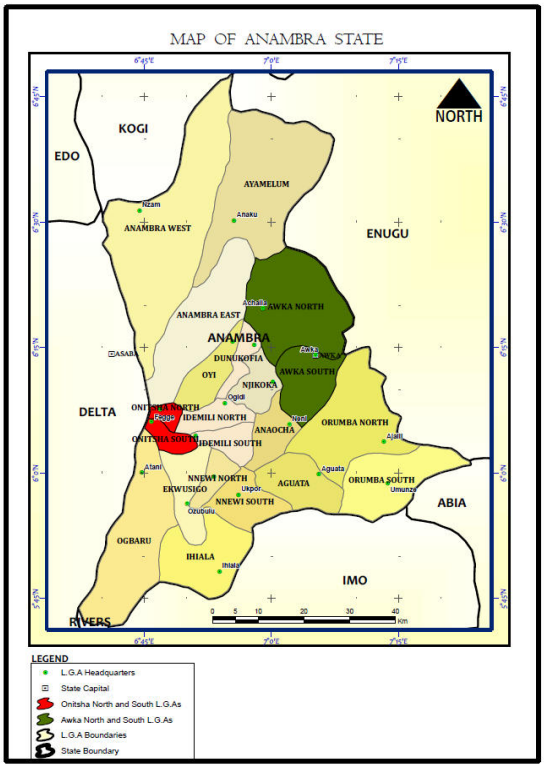

Fig. 3: Map of Anambra State Showing the Study Area.
Source: Adapted from Nwabu, (2010) Google Maps.

Awka City

Awka became the capital of Anambra state after it was carved out of the old Anambra State in 1991. Awka South had a population of 189,045 persons and Awka North 112 had 6,080 persons (National Population

Commission, 2006). This figure is considered doubtful because Awka town had grown from a population of 11,243 in 1953, 40,725 in 1963, and 70,568 in 1978 to 141,262 in 1983. The surprise is that the population of Awka town as at the National Census conducted in 1991 stood at 58, 225. This is made up of 28,335 males and 29,890 females (National Population Commission, 1991). However, the extrapolation of census figures of 1953, 1963, 1978, 1983 and 2006 put the population of Awka town at approximately 90,573 for the year ended 2007 and **375, 000** persons in 2010.

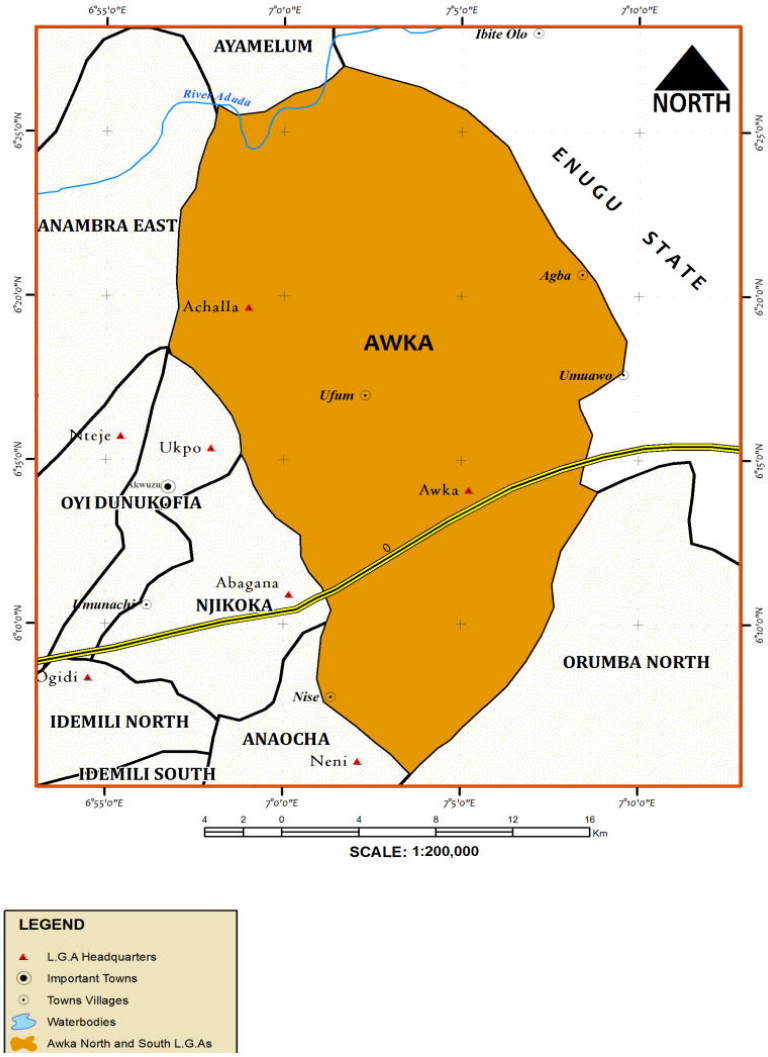

Fig. 4: Map of Awka Metropolis showing the neighbouring towns
Source: EVM GIS Laboratory, NAU, 2014.

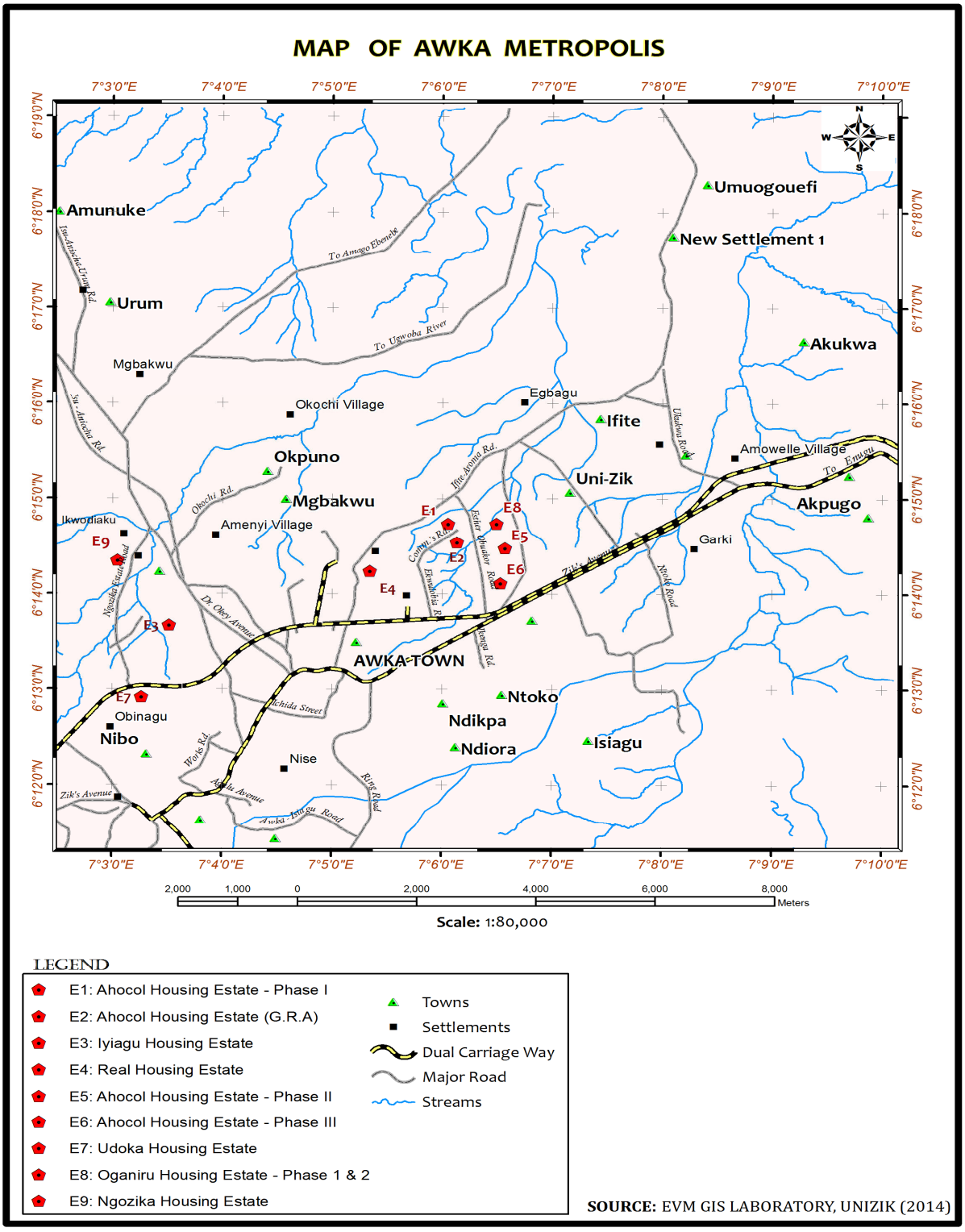

Fig. 5: Street Map of Awka Metropolis viewing Public Housing Estates.
Source: Environmental Mgt GIS Lab NAU, 2014.

.Onitsha City:

Onitsha is located on the western part of the State and on the eastern bank of the River Niger and situated between Latitudes 6°.09' N and7.03'N and Longitudes 6°.45' E and 6°.50'E with an estimated land area of 104sq.km (Onitsha Town Planning Authority, 1998). It has nine (9) residential wards or quarters such, Otu,

Fegge, Okpoko, GRA, Woliwo, Odakpu, Awada, Inland Town, Omagba and its peri-urban communities(See fig. 3.6). Onitsha had an estimated population of 511,000 with a metropolitan population of 1,003,000 (Minahan, 2002). The population of Onitsha is not well reflected in the Nigerian census figures because the traders migrated to their bases, neighbouring villages and states during census events reducing the official figures. Even the population of the town 623,274 in 2006 is contested (National Population Commission, 2006). This includes the population of the legal city of Onitsha and its peri-urban communities. However, the United Nations' Habitat has rated Onitsha among the world's fastest growing cities (*Daily Sun*, 2010, p 5). In terms of geology, relief and drainage, Onitsha lies on the Niger Anambra flood plain underlain by Nanka sands. The relief shows a general westward trend towards the River Niger; although local variations of relief exist in some parts of the town (Orajiaka, 1975 and Ofomata, 1975). According to Azikiwe, (1930), Igbos call it N'Idu Ado N'Idu. The city was founded in 1550. The indigenous people of Onitsha are primarily of Igbo ethnicity. Anioma people (an Igbo subgroup), and settlers from the Kingdom of Benin are believed to have settled in Onitsha in the 16th century, which was originally called Ado N'Idu (Azikiwe, 1930). It soon became capital of an Igbo Kingdom (Nipost Postcode Map, 2009). Eze Aroli was the first Obi of Onitsha, the monarch of the city (Azikiwe, 1930). In 1884, Onitsha became part of a British protectorate. The British colonial government and Christian missionaries penetrated most of Igboland to set up their administration, schools and churches through the river port at Onitsha.

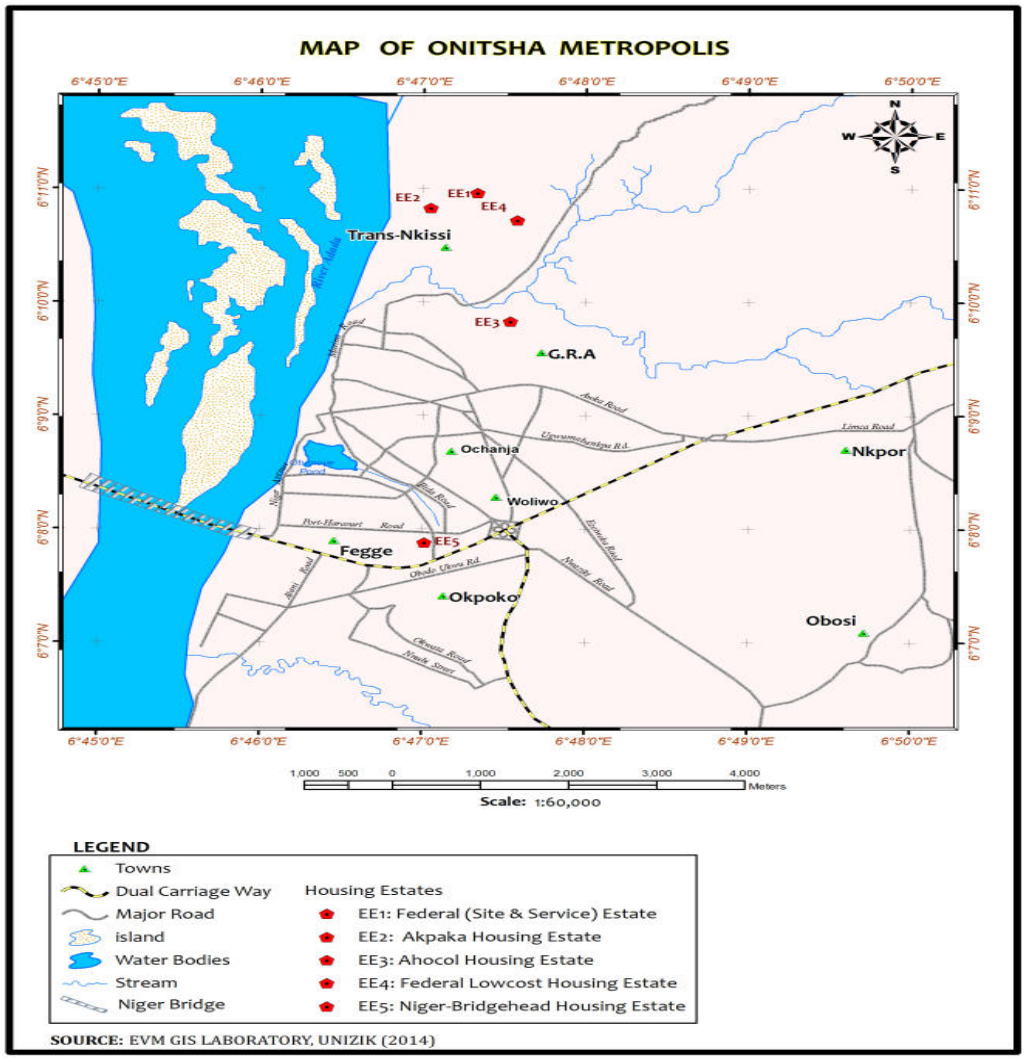

Fig. 6: Map of Onitsha Metropolis showing Public Housing Estates
Source: EVM GIS Laboratory, NAU, 2014.

The United Nations' Habitat has conversely rated Onitsha among the world's fastest growing cities (*Daily Sun*, 2010, p 5). In terms of geology, relief and drainage, Onitsha lies on the Niger Anambra flood plain underlain by Nanka sands. The relief shows a general westward trend towards the River Niger; although local variations of relief exist in some parts of the town (Orajiaka, 1975 and Ofomata, 1975). According to Azikiwe,

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The British colonial government and Christian missionaries penetrated most of Igboland to set up their administration, schools and churches through the river port at Onitsha. In the mid 1850s, Onitsha became an important trading port for the Royal Niger Company following the abolition of slavery and with the development of the steam engine when Europeans were able to move into the hinterland. Trade in palm kernels and palm oil which was going on along the coast of the Bight of Biafra since the 12th century was now moved upwards and other cash crops also boomed around this river port in the 1800s. Migrants from the hinterland of Igboland were drawn to the emerging town as did the British traders who settled there in Onitsha, and coordinated the palm oil and cash crops trade. In 1965, the River Niger Bridge was built across the Niger River to replace the ferry crossing. Onitsha is a commercial centre and a river port on the eastern bank of the Niger River in Anambra State, southeastern Nigeria (Muoghalu, 1983).

Method of Data Collection

A 20-item structured questionnaire on design and construction of public housing (QPH) was developed. Section A had open-ended questions or unstructured responses on demographics which elicited from respondents why they chose a particular scale, it tapped preliminary / personal information on respondents' and was analysed using percentages such as gender, age, occupation, marital status, educational qualifications of respondents and section B which focused on design/ construction of public housing estates and had multiple-choice structured 5-point Likert Scale questions of possible responses from which respondents chose as appropriate. This represented a 5-point Likert rating scale in which respondents indicated the extent to which they considered the listed variables in the buildings affordable and habitable for occupants. The mid-point was 3 and this implied that any result significantly different from this mean value was assumed to be either positive or negative. The universe of study consisted of 2,805 respondents comprising mainly households, and secondly, 2,805 house units, comprising 1,032 in Awka town and 1,773 in Onitsha town. The sample size of 30% consisted of 842 housewives. Women were used as primary respondents in each household because they interact with the housing environment more than men. A stratified random sampling of these fourteen disparate public housing estates was studied. This instrument was face and content validated. Cronbach Alpha Technique index was used for reliability test which gave a value of 0.90. This technique was pre-tested on a sample of 30 respondents/residents of another housing estate. Out of a total of 842 respondents, 797 responded representing 94.7% complete responses. A stratified random sampling of these public housing estates, were studied as shown in Tables 1 and 2 below: A simple random sampling was then drawn from housing units in each stratum.

Table 1: Distribution of Public Housing Population and Sample Size in Awka

	Name of Estate									**Housing Units**
Parameters	**Iyiagu**	**Real**	**Udoka**	**Ngozika**	**Ahocol(GRA)**	**Ahocol(1)**	**Ahocol(2)**	**Ahocol (3)**	**Oganiru**	**Total**
Population	**94**	**90**	**500**	**25**	**8**	**27**	**34**	**174**	**80**	**1032**
Sample size	**28**	**27**	**150**	**8**	**2**	**8**	**10**	**52**	**24**	**310**
Awka town percentage	**9.03%**	**8.70%**	**48.40%**	**2.60%**	**0.65%**	**2.60%**	**3.22%**	**16.80%**	**7.75%**	**100%**
Overall percentage	**3.32%**	**3.20%**	**17.81%**	**0.95%**	**0.24%**	**0.95%**	**1.88%**	**6.18%**	**2.85%**	**36.82%**

In order to achieve the stated objectives and to test the hypotheses of the study, the hypotheses were tested at 0.05 level of significance using Chi Square because it fitted the analysis of the data available in this study for these clear reasons: 1. the data were discrete in nature and 2. The data were cross-classified by two classifying factors: Town (Awka and Onitsha) and responses (SA, AG, UN, DI and SD or VLH, LH, MH, BH and NH).

Table 2: Distribution of Public Housing Population and Sample Size in Onitsha

	Name of Estate					Housing Units
Parameters	**Fed. Trans Nkissi**	**Niger Bridge**	**Fed. Low Cost**	**Akpaka**	**Ahocol(GRA)**	**Total**
Population	**1177**	**554**	**15**	**17**	**10**	**1773**
Sample size	**353**	**166**	**5**	**5**	**3**	**532**
Onitsha town percentage	**66.35%**	**31.20%**	**0.94%**	**0.94%**	**0.56%**	**100%**
Overall Percentage	**41.92%**	**19.71%**	**0.60%**	**0.60%**	**0.36%**	**100%**

Finally appropriate statistical tools were used to completely analyse the data for this research, which met the scope and nature of data and still were able to answer the research questions. Six research questions and one null hypothesis were formulated and tested. The research questions were processed using percentages, means, chi-square, Contingency Table Analysis (CTA) and one way Categorical data analysis of variance (CATANOVA), while the hypotheses were tested by proportion of difference using Z-test.

A two –way (r- c) contingency was used. Consider the r x c table below where r = number of rows and c = number of columns.

n_{ij} is the observed counts or frequency of objects/subjects/elements/items etc cross-classified by the ith level of the first variable of classification and the jth level of the second variable of classification ni. (i=1, 2…ϒ) is the marginal total of all the elements classified by the first variable of classification = n_j is the marginal total of all the elements in the jth level of the second variable of classification . Finally n… is the total of all the elements in the table.

Table 3: Contingency Table Analysis (CTA) Data format

Levels of First Variable of Classification	**Levels of second variable of classification**					
	1	**2**	**3**	**…j…**	**C**	**Total $n_{i..}$**
1	n_{11}	n_{12}	n_{13}	…n_{1j}…	n_{1c}	n_1
2	n_{21}	n_{22}	n_{23}	…n_{2j}…	n_{2c}	$n_{2.}$
3	n_{31}	n_{32}	n_{33}	…n_{3j}…	n_{3c}	$n_{3.}$
:	:	:	:	:	:	:
I	n_{i1}	n_{i2}	n_{i3}	n_y	n_{ic}	n_i
:	:	:	:	:	:	:
ϒ	$D_{ϒ1}$	$D_{ϒ2}$	$D_{ϒ3}$	…$n_{ϒj}$...	$n_{ϒc}$	$n_ϒ$
Totals n_j	$n._1$	$n._2$	$n._3$	…$n._{j...}$	n.c	n…

Under the number hypothesis of independence,

$$P_{ij} = P_{ij} \times P_j = \frac{n_{i.}}{n} \times \frac{n_j}{n\ldots}$$

The corresponding expected frequency, e_{ij}, under the null hypothesis, H_O, is then obtained by multiplying P_{ij} by the total frequency n.ij that is 1.

$$e_{ij} = np_{ij} \times n_{oo} = \left(\frac{n_{i.}}{n} \times \frac{n_j}{n\ldots}\right)$$

$$\therefore e_{ij} = \frac{n_{i.}}{n} \times \frac{P_{.j}}{n\ldots}$$

If we represent observed counts (frequency) by Oij such that Oji= nij, other entries unaltered, the test statistics

$$\chi^2 = \sum_{ij}\frac{(O_{ij}-e_{ij})^2}{e_{ij}}$$

follows chi-square distribution with (ϒ -1) (c – 1) degrees of freedom when the null hypothesis of independence is true.

If the calculated χ^2 is equal to, or greater than, the tabulated critical value then $\chi^2_{1\ \alpha}$, (r -1) (c – 1), the null hypothesis of independence is rejected at the α level of significance; otherwise the null hypothesis is accepted. Source: (Oyeka, 1996; pp. 361-362).

Table 4: Catanova Data Format

Factor level of Classes	Responses				
	1	2		J	n_i
1	n_{11}	n_{12}	▪▪▪	n_{1j}	n_i
2	n_{21}	n_{22}	▪▪▪	n_{2j}	n_2
. . .	. . .	. . .	... … …	. . .	. . .
J	n_{j1}	n_{j2}	▪▪▪	n_{ij}	n_i
n.j	$n._1$	$n._2$		$n._j$	n..

Table 5: One way CATANOVA

SV	Df	SS	T-statistic
Row or factor level	I-1	RSS	χ^2=RSS(n-1)(I-1) TSS
Within Row	n-I	WSS	
Total	n-1	TSS	

If the null hypothesis of independence is true, the test statistics follows χ^2 1- ∝, (I-1) (J-1) and the null hypothesis is rejected is $\chi^2_{cal} \leq \chi^2_{tab}$

RSS $= \sum \frac{nij^2}{nj} - \frac{nij^2}{n}$

$= Cj - C_i$

TSS $= n - \sum \frac{n^2}{n}$

$= n - C_i$

WSS = TSS - RSS = $n-C_{\hat{Y}}$

*Source: (Arua *et al*, 2000; pp. 406 – 411).

Assumptions of CATANOVA

1. Independence: The level or class acts independently. That is nij and n_2j are statistically independent ∀i ≠ j[1]
2. Distribution : The response, n_{ij}, is approximately distributed as binomial with mean equal to n_{ij} and variance equal to $n\lambda_{ij}$ and if we consider n_{ij} to be fixed (non – random) $n_{ij} = \sum$
3. (n_{ij}, n_{2j},…, n_{ij}) is approximately distributed as multi-nomial with parameter (λ_{ij}, λ_{ij}, ..., λ_{ij}) and $n_{.j}$.

TSS = WSS + RSS

With respective degrees of freedom

n-1 = n-1 + I - 1

TSS (SSt) = Total sum of square

WSS (SSw) = sum of squares, within Group

RSS (SSb) =Row sum of squares or sum of squares, between Group.

Test of Difference between Two Population Proportions

To test the null hypothesis, Ho, that two population proportions λ_1 and λ_2 are equal against and of the alternatives. They are not equal, one is less than or greater than the other. $\lambda_{1\ is}$ the population proportion for group 1 and λ_2 is the population proportion for group II. If P_1 and P_2 are sample proportion for group 1 and II respectively, P_1-P_2 is approximately normally distributed with μp_1-p_2 = λ_1- λ_2 and standard deviation.

$$¡p_1 - p_2 = \frac{\lambda 1\sqrt{1-\lambda 1} \quad +\lambda 2(1-\lambda 2)}{n1 \qquad n2}$$

But λ_1 and λ_2 are often unknown. Thus, they are estimated by P_1 and P_2 such that

$$¡p_1 - p_2 = \frac{\sqrt{p_1(1-p_1)} + p_2(1-p_2)}{n_1 \qquad n_2}$$

Therefore,

$$\frac{(p_1 - p_2) - (\lambda_1 - \lambda_2)}{\sqrt{p_1(1-p_1)} + p_2(1-p_2)}$$
$$n_1 \qquad n_2$$

which has approximately unit normal distribution. For a one-sided test Ho: is rejected at the $\propto$ level of significance, if /-Ƶ / > Ƶ, - α

Data Presentation and Analyses

The analyses of the preliminary or background information yielded the following findings:

- 97.5% (777) of the respondents are females, while only 2.5% are males.
- the ages of most of the respondents is as follows ; 40.02%(319) aged 20-30 years , 7.41%(59) were between 31 and 40 years of age, 49.44%(313) were between 41-50 years , while 3.13% (25) of the respondents were above 50.
- that civil servants constituted 56.33% (449) of all respondents, while non-civil service respondents made up of traders, self-employed professionals and artisans constituted 43.67% (3 48).
- out of the 797 respondents, 90.58 %(722) were married, 5.27 %(42) were unmarried, while 4.15% (33) did not disclose their marital status.
- 3.13 %(25) of the respondents had School Certificate, 9.41 %(75) had National Diploma, 57.34% (457) possessed HND/ B. Sc. / B.A, 26.86 %(214) had M. Sc. / M. A. / Post Graduate Diploma, while only 3.26 %(26) had Ph. D degrees.

While answering the research questions in Section B produced the following findings;

1. To identify and describe public housing in Awka and Onitsha cities.

A total of fourteen public housing estates were identified. Awka has nine while Onitsha boasts of five major public housing estates; the Niger Bridge-Head Housing Estate along Port Harcourt Road, Fegge owned by Anambra State and the Federal (Sites and Services) Housing Estate at Trans-Nkissi popularly known as "3-3".There is also Akpaka Housing Estate, Onitsha, State-owned housing at 3-3 spontaneously and linearly developing along Abatete Drive and Presidential Drive beside the Federal (Sites and Services) Housing Estate. Federal Low Cost Housing Estate, Trans- Nkissi, Onitsha built in1990 and Ahocol Housing Estate Niger Drive GRA, Onitsha. It must be recalled that Awka and Onitsha cities are selected for this study out of the seven urban areas recognized by the Anambra State Government namely; Awka, Onitsha, Nnewi, Ihiala, Ekwulobia, Otuocha and Ogidi. Only these two cities (Onitsha and Awka) have developed public housing estates.
Below is the enumeration of public housing estates in the state with the dates of commencement:

Table 6: Showing Public Housing Estates in Awka and Onitsha Cities

AWKA CITY		
S/No	**Names and Descriptions of Studied Public Housing Estates**	**Year of Establishment**
1.	**AHOCOL (Inner City Layout) Housing Estate (otherwise called the GRA), Amaenyi, Awka.**	**1990**
2.	**AHOCOL (Think Home) Housing Estate Phase 1 (or Ahocol 1), Awka**	**(1991)**
3.	**Iyiagu Housing Estate, Awka**	**1992**
4.	**Real Housing Estate, Awka**	**1992**
5.	**AHOCOL (Think Home) Housing Estate Phase 1 Extension (or Ahocol 2), Awka.**	**1993**
6.	**AHOCOL (Think Home) Housing Estate Phase 2 (or Ahocol 3), Awka**	**1995-2014**
7.	**Udoka Housing Estate, Obinagu, Awka**	**1996**
8.	**Oganiru Housing Estate Phases1&2 Awka**	**2005**
9.	**Ngozika Housing Estate, Ikwodiaku, Awka**	**2006**
ONITSHA CITY		
S/No	**Names and Descriptions of Studied Public Housing Estates**	**Year of Establishment**
10.	**Niger Bridge-head Housing Estate, Fegge, Onitsha**	**1980.**
11.	**Federal Low Cost Housing Estate, Trans- Nkissi Onitsha**	**1985**
12.	**AHOCOL Housing Estate, Niger Drive, GRA, Onitsha**	**1990**
13.	**. Federal (Site and Services) Housing Estate, Trans-Nkissi (or 33), Onitsha**	**1992.**
14.	**Akpaka Housing Estate, Onitsha**	**2008**

The research questions on the following; spacious rooms, window, burglary protections, door burglary protections, roofing pattern, poor block work, nature of materials and attractive of building design were answered below.

Table 7 shows that the null hypothesis Ho was rejected because there is relationship between location and response. This is because P-value is less than α at 4 df and 0.05 level of significance (α) thus the conclusion is that there is difference in their response pattern, either Awka or Onitsha occupants responded more positively or negatively to design and construction of public housing. As chi-square does not show the direction of the difference analyses of mean of occupants' responses on design and construction of public housing are analysed using CATANOVA in order to show direction.

Table 7: Occupants' Responses on Design and Construction Factors of Public Housing

Serial No.	Responses	χ^2 cal	DF	P-Value	Level of Significance(α)	Decision
13.	**Building Design**	**28.271**	**4**	**0.00**	**0.050**	**Reject**
14.	**Nature of Materials**	**104.422**	**4**	**0.00**	**0.050**	**Reject**
15.	**Block Work**	**79.085**	**4**	**0.00**	**0.050**	**Reject**
16.	**Roofing Pattern**	**48.166**	**4**	**0.00**	**0.050**	**Reject**
17.	**Door Burglary Protections**	**78.786**	**4**	**0.00**	**0.050**	**Reject**
18.	**Window Burglary Protections**	**101.402**	**4**	**0.00**	**0.050**	**Reject**
19.	**Community Facilities**	**78.268**	**4**	**0.00**	**0.050**	**Reject**
20.	**Rooms**	**84.709**	**4**	**0.00**	**0.050**	**Reject**

Significant at 0.05 level of confidence

Table 7 shows that the null hypothesis Ho was rejected because there is relationship between location and response. This is because P-value is less than α at 4 df and 0.05 level of significance (α) thus the conclusion is that there is difference in their response pattern, either Awka or Onitsha occupants responded more positively or negatively to design and construction of public housing. As chi-square does not show the direction of the difference analyses of mean of occupants' responses on design and construction of public housing are analysed using CATANOVA in order to show direction.

Analysis of Average Response of Occupants on Design and Construction:

To analyse average response of occupants on design and construction, the data was obtained by averaging (mean) of responses in questions 13 to 20 in the QPH. Categorical analysis of variance (CATANOVA) was the statistical method used because it is designed to analyse variability especially for two-way cross classified categorical data of towns and responses.

Table 8: Analysis of Occupants Location and Perception on Design and Construction of Public Housing

Location	SA	AG	UN	ID	SA	Total
Awka	64	92	113	17	14	299
Onitsha	183	71	179	64	1	498
Total	**247**	**163**	**292**	**81**	**15**	**797**

TSS = 373.656
RSS = 32.403
WSS = 341.253
χ^2_{cal} = 274.725
$\chi^2_{0.95,4}$ = 9.488

From Table 8, Ho: (No association between occupants' perception on design and construction of building and location of respondents is rejected because χ^2_{cal} (274.725) is greater than critical table value of $\chi^2_{0.95,4}$ (9.488) It seems safe to conclude that association exists between location of respondent and respondents' perception on design and construction of buildings in public housing estates. Therefore, the inference drawn is than occupants in one location were more satisfied with the design and construction of the buildings in public housing estates that occupants in the other location. Having established that there was difference, there was need to test the difference between proportions.

Test of Difference between Proportions

The data on design and construction was obtained by pooling all positive responses (SA and AG) for each category of occupants (Awka or Onitsha) as positive response and all negative response (ID and SD) as negative response and their proportions obtained and filled below as pooled observations (counts). Undecided responses were left as neutral.

Table 9: Test of Difference between Proportions in Design and Construction Factors

Location/Response	Positive	Neutral	Negative	Total
Awka	156	113	31	299
Proportion (Awka)	0.522	0.378	0.104	1
Onitsha	254	179	65	498
Proportion (Onitsha)	0.470	0.409	0.120	1

/Ƶcal/ = 1.425
Ho: = $R_1 \leq \lambda_2$ Vs H1: $\lambda_1 > \lambda_2$
Ƶ 0.05 = 1.64

The hypothesis that the proportion of occupants responding positively to design and construction of public housing in Awka is at most equal to the proportion responding positively in Onitsha is rejected because /Ƶcal/ (1.425) is less than Ƶ 0.05 (1.64). Thus, the conclusion is that the proportion of occupants in Awka responding positively to design and construction of public housing was higher than the proportion responding positive in Onitsha. Hence, the inference drawn was that occupants in Awka were more satisfied with design and construction of public housing estates than occupants in Onitsha. Most of the buildings in Awka are of recent construction with modern roof patterns, appearance.

Discussion

The occupants' comments reflected on the quality of construction, building materials and block work as perceived by respondents. Respondents argue that construction of public housing was shoddy in that quack contractors and amateurs were employed in their construction and that they used substandard building materials especially the prototype initially constructed by the housing providers. They also asserted that compliance monitoring supervisors were either negligent or casual in the supervision of such projects.

They are reflective of the respondents' perception on the aesthetic appeal of both the design and construction of public housing. They were of the view that the building materials used in the estates especially by owner-occupiers were of superior quality, and also that the roofing patterns/materials can withstand the test of time.

Ebong (1983), identified aesthetics, ornamentation, sanitation, drainage, age of building, access to basic housing facilities, installation of burglary proof and gadgets, spatial adequacy, noise level within neighbourhood, sewage and waste disposal, air pollution and ease of movement among others, as relevant quality determinants in housing.

The older public housing design built by the housing providers was unacceptable to the occupants but this changed when people were provided with serviced plots to build according to their taste the design became acceptable to occupants. This perception of the occupants (consumers) of public housing can only be a reaction that they do not want what the Staff of ASHDC/AHOCOL want or are providing for them. It was Davidoff, (1965) and Webber (1969), who argued that after technical (objective) indicators have been met, the residual and often decisive evidence is formed by the preferences, values and needs of the consumers. The officials charged with the responsibility of public housing planning, designing, constructing and administration need this kind of information system which monitors the community as a dynamic system which sustains improvement. The findings on research question one is in line with the recommendation of Turner (1976) who strongly promoted the idea of urban residents being given more room by government to organize housing provision for themselves. It is therefore suggested that even though the present housing policy is hinged on market economics that the housing providers should continue to provide serviced plots and to regulate building standards in line with the prescribed planning law.

Conclusions and Recommendation

The major findings of this study were: (1). that the proportion of occupants in Awka responding positively to design and construction of public housing is higher than the proportion responding positively in Onitsha. Hence, the deduction drawn is that occupants in Awka were more satisfied with design and construction of public housing estates than occupants in Onitsha.

As the philosophical basis of this study is on equity and social justice in housing environment or built environment, this study surveyed the ratio of contributions (inputs) and rewards/benefits/ costs (output). The idea is to have the rewards (outcomes) directly related with the quality and quantity of the occupants contributions (inputs) in the spirit of egalitarianism in the distribution of housing resources and freedom to build. This guaranteed equity in built environment as most people do not want what architects want. If both occupants of Awka and Onitsha public housing estates were possibly rewarded alike, it would help the occupants realize that the organizations were just, attentive, and appreciative. In conclusion the flexibility in design and construction of public housing estates broke monolithic housing estates and achieved scale and speed in public housing estates provision as occupants were free to increase densities and have mix uses within affordable and habitable levels and by so doing explained the actual input and expected outcomes of housing programmes. This research have implications for the re-planning and reorganizing the agencies and public housing providers in the hope that such a checklist would provide planners with requisite information upon which sustained improvement could be effected in public housing in Nigeria to the satisfaction of occupants and also the National Housing Policy will find fresh ideas and input in the reformulation of the policy as to satisfy the housing requirements of occupants of public housing estates. This study concentrated on a specific group of people (occupants of public housing) and not occupants of private housing. Therefore, this study should be replicated for private housing in other townsand cities in Anambra State and Nigeria.

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