

## Article

# Exploring the Severity of Factors Influencing Sustainable Affordable Housing Choice: Evidence from Abuja, Nigeria

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**Abstract:** It is a shared global experience that a house which is already expensive will become even more costly. This experience is partly because housing supply has always failed to satisfy demand. In many developing countries, the issues of affordable housing supply center on shortage and poor distribution. Recent studies on this subject reveal that distribution-related problems can be addressed through choice reconciliations. Therefore, understanding how housing affordability problems affect housing choice enables a broader interpretation of the issue. Thus, critical in housing policy making and implementation, as well as towards sustainable development/delivery of affordable housing programs. In Nigeria, housing choice has never been investigated, neither has it been studied within the framework of sustainability. It is not a common strategy to incorporate sustainability into the concept of affordable housing choice. However, integrating sustainability into the concept of affordable housing choice allows for the introduction of wide-ranging and broader criteria such as environmental and social factors, which are routinely neglected in housing choice literature. Therefore, this study aims at filling this literature gap by identifying the determinants of sustainable affordable housing choice (SAHC) in the study area. The purpose is to establish the severity of the identified factors based on respondents' perception and discuss the agreement levels amongst the three respondent groups. Regarding this, a comprehensive list of 43 different factors contributing to SAHC were determined through a systematic literature review. Based on which a survey of 83 affordable housing applicants, 102 and 69 residents of affordable housing estate and shantytown respectively, was performed. Through statistical analysis, results reveal that the factors affecting SAHC cuts across economic, social and environmental dimensions. Also, there is an agreement (correlation) by each group and the overall ranking of all participants. The tests confidence level for all inferential statistics was 95%, which implies 0.05 level of significance. These figures indicate that the data were obtained from the same population and points to the relatedness of factors identified. Using principal component analysis (PCA), the 43 different factors were narrowed down to seven. The study findings show that "Housing price in relation to income" and "rental price in relation to income" are the most severe factors with relatively high overall scoring, which is consistent with similar studies in this domain. However, it was uncovered that respondents placed high priorities on other non-economic factors like security (safety), housing location and building type. The study presents an interesting topic, usually unexplored in the field of decisions and public policy. It argues that at present, the housing affordability concerns and affordable housing choice determinants in the study area cannot be restrictedly defined in economic terms. Our findings build on previous studies and reiterate the need to consider a broader view towards affordable housing problem. It offers salient information to stakeholders and real estate companies, which could aid sustainable development/delivery of housing projects that are affordable.

**Keywords:** Nigeria; housing policy; affordable housing; housing choice; sustainable housing development

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## 1. Introduction

Housing is required to provide comfort, safety, satisfaction, experience, and convenience for its occupants. Hence, it is one of the essential social conditions which define the living standard of a country's citizens. If the housing quality is adequate and available, the citizens and government will spend less on health care, crime prevention, recreation, and pollution; leading to increased productivity and prosperity [1,2]. However, due to rapid rates of urbanization reported worldwide [3], housing supply has always failed to satisfy demand [4]. Therefore, exploring the reasons why households pay or choose what they pay for housing, would help to sustain housing delivery [5], which can eliminate or reduce artificial restrictions [1] and prevent housing abandonment [6]. A clear understanding of the households' choice will offer new insight towards addressing the challenges of housing shortages and poor distribution. According to Olanrewaju & Woon, [1], the most likely problem triggering the imbalance between the demand and supply of affordable housing, is the inability to reconcile households choice and supply.

Several factors are responsible for the poor delivery of affordable housing, but studies have demonstrated that unsold properties and abandoned houses are due to choice [1,6]. Households apply choice factors to define their housing demand. Housing choice is a topic of interest amongst researchers of diverse disciplines and has been studied from different theoretical perspectives [7]. For instance, economists focus primarily on housing prices and how housing costs determine the choice between owning and renting. Sociologists and geographers study the housing choices individual households make and examining housing distribution in a given population. They focus on socioeconomic and demographic aspects, dwelling, and the neighborhood features that influence housing choice [8,9].

Demand for affordable housing has been essentially evaluated in financial terms, but affordable housing concerns have progressed beyond mere economic concepts, to wider issues of social wellbeing and sustainability [10]. However, it is uncommon to address affordable housing demand concerns within the ambit of sustainability [11]. Regarding this, Sirgy, et al. [12] recommended that further studies on housing choice determinants should be improved by incorporating wide-ranging criteria like socio-psychological factors, amongst others. Several studies have examined housing choice from other perspectives, like uncertainties and lifestyles, but none has discussed housing choice within the sustainability framework. However, integrating sustainability into the concept of housing choice allows for the introduction of wide-ranging and broader variables such as environmental factors, which are routinely neglected in housing choice literature. For instance, AERØ [13] explored why residents chose a particular dwelling type in Denmark by referring to lifestyle variables and personal tradition. Jansen [14] found that lifestyle variables exact strong influence on housing choices of medium and high-income Dutch households. It is given that individual lifestyle variables influence their choice of housing, but this influence is little when compared with those of their socio-demographic characteristics.

In Nigeria, affordable housing choice has never been studied, nor investigated in academic literature. Therefore this study aims to fill this gap in housing choice literature by identifying within the framework of sustainability the determinants of sustainable affordable housing choice in Abuja, Nigeria. The study investigates sustainable affordable housing from the perspective of housing choice and identifies a set of factors that strongly influence it. The purpose is to establish the severity of the identified factors and rank them based on the respondent's opinion. This study is concerned with the change of residence in a national context and the process through which urban residents find and choose a particular dwelling to live-in in an urban setting. The research objectives are (1) To discuss the relationship between the identified factors. (2) To study the agreement levels in the opinions of the three respondent groups, that is; To determine if the general opinion of the three groups agrees with the opinion of each group. Specifically, if there is an agreement between affordable housing applicants'

opinion and the overall opinion of all the parties. If also there is an agreement between affordable housing estate residents' opinion and the overall opinion of all the groups, and if there is an agreement between the opinion of residents of shanty towns' and the overall opinion of all the groups? (4) Lastly, to develop a framework for achieving SAHC in the study area.

Based on the main research question, what are the factors that determine urban residents' choice of affordable housing? From this, the following two sub-questions emerge: (1) What is the extent of the relationship and interplay between the identified factors? (2) Is there an agreement between affordable housing applicants' opinion and the overall opinion of all the groups, affordable housing estate residents' opinion, and overall opinion of all the groups and residents of shanty towns' opinion and the overall opinion of all the groups? This research is guided by the postulation that Null Hypothesis (Ho): There is no agreement between the opinions of the three respondent groups.

The answers to these sub-questions and the analysis of the hypothetical statement will provide answers to basic policy questions such as (1) how do households choose their present houses? And (2) how can housing choice determinants be categorized? It will also provide a clear understanding of the numerous factors that should be considered in developing strategies for controlling cost escalations in affordable housing programs, which would resultantly lower the cost of affordable housing and the costs associated with living in an affordable housing estate (non-housing cost). Furthermore, it would help improve the performance of affordable housing programs through the deployment of a comprehensive framework for understanding the role and significance of sustainability for enhanced affordable housing delivery in Nigeria. Also, it would help suggest sustainable solutions which would aid, housing authorities, government agencies, real estate companies and stakeholders in the design of affordable housing programs. This exploratory research was designed using Abuja, Nigeria, as a case study. Abuja is the capital of Nigeria; currently, low and medium-income residents find it extremely difficult to afford decent and adequate housing. Many reside in both squatter housing settings and former squatter housing settings, upgraded through urban transformation projects and improvement plans [15]. It is hoped that this research will inspire future studies into establishing a broader concept of affordable housing choice that is better aligned with sustainability.

This paper makes three contributes to the existing literature. First, the study presents a comprehensive technique that takes into account all factors affecting affordable housing choices in Nigeria and the interplay between them. Secondly, it serves as a guide to the focus areas to be considered in policy development aimed at improving locations of affordable housing programs. Third, prior studies addressed only factors affecting housing price/cost, not a choice, except for [1]. This research is the first study to identify and discuss the factors influencing affordable housing choice in Nigeria. It is the first to take a larger sample size. Previous studies in Nigeria investigated housing tenure choice and not affordable housing choice. The study findings will be useful to real estate companies, developers, and policy makers in improving the delivery of affordable housing.

The rest of this study is structured accordingly; Section 2 discusses the theoretical framework of the study. Section 3 explains the study methodology and the research protocol. Section 4 deals with the research results in accordance with the research questions, objectives, and hypotheses. Section 5 discusses the study findings. Section 6 presents research limitations, implications as well as the research agenda for future studies.. Section 7 presents the conclusion and study recommendations.

## 2. Literature Review

### 2.1. Urban Housing Situation in Nigeria

Recent studies have estimated that 200 million urban households in Asia, Latin America, and Africa are ill-housed, and Nigeria experiences the biggest numbers of households living in substandard housing [16]. Several studies demonstrated that there is a profound inadequacy in the housing circumstances of Nigerians. Housing demand in Nigeria outweighs supply [17], and research evidence shows that 85% of the urban residents spend more than 40% of their income on house rent [18,19].

The housing conditions of the low-income segment, who, by the way, make up the vast majority of the population in Nigeria, have not shown any substantial improvement over the past decades [15,20]. The rate of expansion in public services and infrastructure of cities in Nigeria is low when compared with the rapidly growing population, which results in great strain on urban facilities (e.g., Public housing estates) and immediate collapse on many occasions [21]. Studies have demonstrated that poor housing, as well as housing dissatisfaction of urban residents, has serious adverse effects on the health and the built environment [22,23], resulting in delinquency, poor health, stress, maladjustment and pathological conditions amongst urban residents [24], and some times social and even political unrest [25].

#### Federal Government intervention on urban housing problems

A total of 618,498 housing units was intended for construction in the different public housing programs nationwide between 1960 and 2015. However, 85,812 of such housing units were constructed, which is 14% of the total planned housing units, as illustrated in (Table 1). This lowly implementation level demonstrates governments' lack of commitment in addressing urban housing problems, as well as the number of housing units proposed in the various public housing programs it initiated between 1960 and 2010 fall far below the targeted number. The resulting implication of this failure is that an estimated 70% of Nigeria's 60 million urban dwellers reside in shantytowns [26]. However, to address this awful housing situation nationwide, an estimated 700,000 housing units are required annually [27].

According to UN-Habitat [28] report on Nigeria, while focusing on affordable housing provision and supply, stated that previous public housing policies and schemes were designed to enable medium and low-income earners increased access to decent housing at affordable rates. The 2002 New National Housing and Urban Development Policy (NNHUDP), as cited in [29], advocates that on no account should any household be expected to pay above 20 percent of their monthly income on housing. However, many studies have demonstrated clearly that previous public housing schemes in Nigeria failed to assist the targeted population [30], largely because of the high cost of housing units provided [31]. Resultantly, many studies have argued that the challenges in accessing housing inputs such as land [32], finance and building materials [31,33]; in addition to the burden of providing infrastructure [15], were also responsible for the cost escalation of public housing units beyond the grabs of an average household in the country [28–30]).

**Table 1.** Federal Government Housing Programs and implementation level in Nigeria (1960–2019).

PERIOD	PROGRAM	IMPLEMENTATION/PERCENTAGE
1971–1974	To construct 61,000 housing units.	500 Housing units were constructed, representing less than 1% of the planned units.
1975–1980	To construct 59,000 'low-cost' housing units nationwide.	7080 housing units were constructed, representing 12% of the planned units.
1981–1985	To construct 202,000 'low-cost' housing units nationwide.	30,000 housing units were constructed, representing less than 15% of the planned units.
1986–1999	Phase 1: To construct 160,000 housing units, for the low-income segment.	Phase 1: 47,234 housing units were constructed, representing about 23.6% of the planned units.
	Phase 2: To construct 20,000 housing units, nationwide.	Phase 2: Interrupted by the military coup in 1983
1999–2010	To construct 121,000 housing units on Site- and-Services housing program	5500 housing units were constructed, representing less than 5% of planned units.

Table 1. Cont.

PERIOD	PROGRAM	IMPLEMENTATION/PERCENTAGE
2011–2015	To construct 10,271 housing units via the Public-Private Partnership (PPP) arrangements in different PPP housing programs nationwide.	2000 serviced plots through the PPP site and service in Ikorodu, Lagos. 4440 housing units completed in Abuja, Port Harcourt, Akure, and Abeokuta, through PPP.
	To construct additional 500 housing units in the Presidential Mandate Housing Program nationwide	The Presidential Mandate Housing Scheme was not implemented in many states. 100 housing units were constructed in Ogun State, representing 20% of the planned units.
2015–2019	Phase 1: To provide 40 blocks of housing units, nationwide; leading to the potential delivery of 12 flats per block and 480 flats per state, subsequently providing 17,760 flats nationwide.	Yet to kick start

Source: Adopted from [17,27,28,32,34–36].

The Federal Government of Nigeria's housing policy stipulates that interested citizens should have access to safe, decent, and healthy accommodation at an affordable cost. However, as part of the government's effort to provide adequate and suitable shelter for the citizenry, they went into subsidized housing provision initiatives [37]. These types of housing are government-owned and operated, although subcontracted private agencies manage some. They are funded, constructed and allocated by the state, usually for the low-income populace. Affordable housing provision has remained top on the agenda of the Nigerian government. However, there is a deficit of 17 million housing units in Nigerian urban centers [38]. To date, millions of urban poor reside in inadequate housing despite a host of government interventions, because of shortages and poor distribution. A clear understanding of the household's choice will offer new insight into these problems. According to Olanrewaju & woon, [1], the most likely problem triggering the imbalance between the demand and supply of affordable housing is the inability to reconcile households choice and supply.

## 2.2. Housing Choice: Meaning and Definition

Housing choice is actions households take when deciding on their choice of house. These decisions borders on house type, tenure, neighborhood, and location as well as housing size [39]. It deals with the main reason for moving and neighborhood stability. Given that the housing choice governs the homebuyer and/or renter behaviors, it is arguably an effective approach to explain/reduce the mismatch between the supply and demand of housing. Housing choice plays a central role in understanding the household position/condition in housing affordability with regards to renting and/or purchasing [40]. In this context, the problem of housing affordability in relation to housing choice is perceived through the perspective of purchasing; due to the framework of the right to housing. It is upon the government to guarantee this enjoyment right for households.

In Nigeria, housing developments are initiated devoid of user analysis. However, user analysis should be the first point of call in formulating functional space and specification [41]. Further neglect of this analysis would mean that the size of overhang, poor distribution, vacancy rate, and the number of unsold properties will continue to rise, in addition to further shrinking of property transactions. Brown & King, [42] opined that the major purpose of extending choice is for the empowerment of users of public services. It was observed that housing preference is often mistaken in housing literature to mean housing choice, although both terms are similar but are never the same.

### 2.2.1. Distinction between the Housing Choice and Housing Preference

Prior studies focused principally on preference to illustrate housing market's performance. These existing studies were centered on preference and occasionally on satisfaction. Resulting in the dearth of research examining the motive behind homebuyers and homeowners' choice of housing. Although it is essential to determine homebuyers' preferences, it is equally important to reverse this



trend by examining housing choice. Housing preference refers to the relative attractiveness of an object, whereas home choice refers to the actual behavior of the property buyer [43]. Fundamentally, housing preference centers on the dislike and like of choice of housing associated with a selection between alternatives, but choice behavior usually is not associated with preference.

According to Zinas & Jusan, [44], preferences and choices are constant dynamic operations in any given society, which reflect people's behavioral dynamism. Preference and choice, although similar, are different. However, in housing literature, it is usually used as a synonym or as a close relative [44,45]. Preference describes individuals like or dislike [46,47]. In preference, little or no attempt is made to investigate the reason behind consumers like/dislike of a given item, but merely to explain these dislikes and likes [47]. However, making a choice entails choosing between alternatives whereby the alternative with the utmost opportunity cost is selected. These alternatives are weighed against some consistent indicators [48]; which, according to Olanrewaju & woon, [1] are the determinants.

Choice is based on the need and demand but does nothing to show if the consumers like it [44]. For example, preference does not suggest the existence of alternatives. Olanrewaju & woon, [1] consumers may be satisfied with or prefer a good/service, with or without the existences of alternatives. Therefore, choice is the description of consumers' attitude and behavior, according to Sirgy et al. [12].

The law of demand states that as the price of the goods/services increases, the consumption rate falls [49]. Thus, choice determines price rather than preference [46,47,50]. Choice remains the key explanatory index upon which prices of houses are determined. However, the distinction between choice and preference is complicated, since their indicators are some worth alike [43]. In housing, choice will always reflect the combined influence of preference, regulation, market condition, and availability, as well as external and internal personal factors like social class and lifestyle [43]. Housing preference usually does not highlight choice behavior [51].

The exploratory study reported in this paper seeks to address affordable housing choice determinants from the prism of sustainability.

### 2.2.2. Concept of Sustainable Affordable Housing Choice

Recent research evidence points to the low level of awareness of the sustainable development concept [52]. In affordable housing programs, sustainable development implies achieving a better quality of life via efficient use of resources, which ensures continued social progress while maintaining stable economic growth and environmental care [53]. Sustainable development in affordable housing sets to accomplish the following three major goals: social, environmental and economic goals. Integrating sustainability and affordability into housing often referred to as sustainable affordable housing, is housing that satisfies the demand and needs of the present generation without compromising future generations' ability to meet their housing demands and needs [11,51,54]. In general, sustainable affordable housing is housing that is designed and constructed in compliance with sustainability requirements [10,11,55]. Like any consumer, affordable housing buyers/renters suffer many challenges in making decisions on their choice. Affordable housing gap is widened as a result of income distribution/imbalance.

Therefore, the aim of the concept of sustainable affordable housing choice (SAHC) as illustrated in Figure 1, entails explaining how and what influences the sustainable affordable housing demand from economic, social, and environmental perspectives. Economic viability alone cannot eliminate the risk of housing abandonment. Rather, other sustainability concerns must be considered like transportation route/cost, location, housing design, neighborhood settings, and employment opportunities, amongst other multitudinal issues. The SAHC concept integrates other factors that are derived from the concepts of affordable housing, sustainable housing, social housing, and sustainable communities. It then draws a closer link between environmental sustainability and social justice and connects the peoples' wellbeing with environmental well being. In other words, SAHC can be described as the combined ability to select and choose a house (either for renting or outright purchase) at a minimal cost, in a safe

environment that enables healthy living, and covers other sustainable aspects which relate to more fundamental concepts in, among other areas, of micro-economics and social policy.

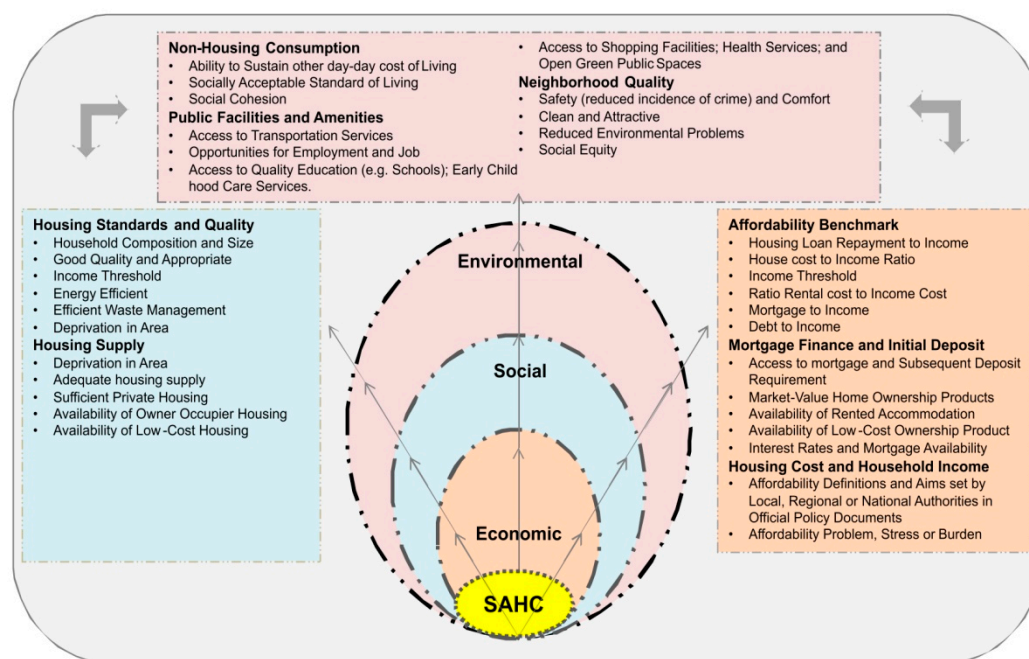


Figure 1. Evolving concept of sustainable affordable housing choice (SAHC).

An extended review of housing literature reveals an abundance of studies identifying several factors/determinants that influence housing preference [12], demand [17], and satisfaction [24,56]. However, just a limited number of studies discussed affordable housing choice (just [1]). There is a dearth of studies exploring the factors influencing affordable housing choice within the framework of sustainability. The factors that determine/examine housing satisfaction, preference and demand, including income, housing quality, policies, market conditions, and location, also influence affordable housing choice.

Homebuyers/ renters' choice change as/when/if the determinants change. As given in economic principles of affordability [57], affordable housing choice is controlled by the home buyer or renter behavior [52]. Presumably, a reliable option to reduce/explain the mismatch between housing supply-demand relationship.

### 3. Methodology

#### 3.1. Identifying the Factors Influencing Sustainable Affordable Housing Choice

It is pertinent to identify factors that contribute to sustainable affordable housing choice because there is a dearth of studies on this subject, and some fail to provide a comprehensive list. For instance, in examining young Malaysians housing affordability problems, Zyed et al. [40] highlighted housing choice as a critical problem, but no analysis or further clarification was provided. Similarly, Olanrewaju & woon [1] study neglected household income in relation to rental cost and housing price, which are considered significant determinants of affordable housing demand [55]. In addition, the cost of transportation in relation to household income was ignored in the factors identified by their research. Furthermore, a recent study by Ghazali et al. [52] only considered price and functional utility (tangible) and symbolic, emotional, cultural, and social (intangible) as factors affecting housing choice. Thus, neglecting the important role environmental concerns play on housing choice decisions of residents.

Therefore, there is a need to explore and investigate the determinants for some reasons holistically. It will shrink the shortage that appears as a result of poor distributions, hence increasing the funds

available to households. Sufficient distribution would help developers and estate companies maximize profits. The government can employ the information provided in this study to enhance the provision of adequate infrastructure. Current home-occupiers will also consider the same determinants to remain or renew their tenancy or mortgage. Lastly, it will satisfy early-career researchers' need for a quick reference to a comprehensive list of affordable housing choice determinants.

Hence, to identify key factors contributing to sustainable affordable housing choice, an extensive review of peer-reviewed articles in highly ranked journals was undertaken. As a result a holistic set of factors relevant to sustainable affordable housing choice was identified (Table 2). Followed by questionnaire design, which was pilot surveyed and administered to urban low and medium-income residents and affordable housing applicants in Abuja, Nigeria. Before the questionnaire design, a pilot survey was performed on the potential list of sustainability performance factors (SPF) for SAHC. The reason for this process was to test the comprehensiveness and the significance of the possible SPF. One affordable housing district was used in the pilot study comprising low and medium-income earners, who had experienced or experiencing housing affordability stress. The respondents were asked to evaluate if the list of factors contained an adequate number of performance factors and if other potential key performance factors may be included or expunged from the list. Three factors were added under the social sustainability factors through the pilot survey, as shown in Table 2. The completeness and relevance of the criteria were finalized and confirmed after the pilot study.

**Table 2.** A comprehensive list of factors contributing to sustainable affordable housing choice with selected references.

Category	Factors	Reference
Economic sustainability Social Sustainability Environmental sustainability	House price in relation to income (ESF01)	[54,55]
	Availability of mortgages and interest rates (ESF03)	[57]
	Rental cost in relation to income (ESF04)	[54,55]
	Energy bill in relation to income (ESF02)	[10,58]
	Transportation cost in relation to income (ESF05)	[10,58]
	Employment opportunities (ESF06)	[59]
	Taxation and Subsidy influences (ESF07)	[4]
	Household income level (ESF08)	[1,8]
	Tenure Security (ESF09)	[2,55]
	Accessibility (SSF01)	[1,14]
	Type of building, e.g., Apartments, condominiums, semi-detached, etc. (SSF02)	[2,4,60]
	Housing quality/Adequacy (e.g., Meeting decent home standards (SSF03)	[6,61]
	Safety/Security (reduced incidence of crime) (SSF04)	[62,63]
	Minimized social segregation (SSF05)	[Pilot Survey]
	Car parking spaces (SSF06)	[Pilot Survey]
	Presence of lift or elevator (SSF07)	[14,64]
	Suitability/ Type of architectural design (SSF08)	[63,65]
	Access to recreational facilities, e.g., Parks, green open spaces (SSF09)	[66,67]
	Effective maintenance and management of properties (SSF10)	[55,60]
	Household size (SSF11)	[Pilot Survey]
	Unit Size (SSF12)	[68]
	Clean and Attractive (SSF13)	[69]
	Number of bedrooms (SSF14)	[70]
	Number of bathrooms (SSF15)	[58,71]
	Housing location, e.g., City, countryside, etc. (SSF16)	[63,65]
	Access to recreational/Leisure facilities (SSF17)	[61]
	Access to health facilities (SSF18)	[72]



Table 2. Cont.

Category	Factors	Reference
<b>Economic sustainability</b> <b>Social Sustainability</b> <b>Environmental sustainability</b>	Access to religious places, e.g., Temple, mosque, church, etc. (SSF19)	[73]
	Access to educational center e.g., School, tuition center, etc. (SSF20)	[74]
	Access to child daycare centers (SSF21)	[1]
	Location of shopping mall or market (SSF22)	[1,73]
	Availability of public transportation (SSF23)	[1]
	Availability of power supply (Electricity) (SSF24)	[1]
	Pipe borne water (SSF25)	[73]
	Major and Minor access road (SSF26)	[62,65]
	Air quality (ENSF01)	[62,75]
	Efficient waste management (ENSF02)	[76,77]
	Use of appropriate materials (ENSF03)	[1,4]
	Thermal comfort, e.g., presence of heating and cooling system (ENSF04)	[66]
	Energy efficiency (ENSF05)	[78,79]
	Noise pollution (ENSF06)	[78,79]
	Water pollution (ENSF07)	[1]
	Lighting quality, e.g., Daylighting (ENSF08)	[1]

### 3.2. Data Collection

A total of 254 questionnaires was administered to a random sample of 83 affordable housing applicants, 102 affordable housing residents, and 69 residents of a shantytown. Data collection was carried out through an online survey. This strategy was chosen to ensure high response rates, as the sample size was small and also to ensure that respondents understood the intent of the researcher. The online distribution of the survey was preferred because it ensures that participants have some level of education or enlightenment. This assertion is congruent with Hayles [80] study, which found that to increase the uptake of sustainable affordable housing, consumers must first be educated, because unless consumers are aware of the benefits, they may not make demands for it. Maximum care was exercised, not bias the responses of the respondents. There were three main parts of the questionnaire. The first part was an introduction to explain the purpose of the survey. The second part contained general information, questions including name, income range, and housing experience. The third part included the factors affecting the choice of affordable housing.

### 3.3. Sampling Technique

The convenience sampling technique was used for the collection of primary data. In convenience sampling, the survey administration is targeted at willing, available, and accessible respondents [81]. This technique is suitable where adequate information on population size lacks e.g., Nigeria. Therefore, findings drawn may not be generalizable; however, using bigger respondents, the findings can be representative [81]. The case study utilizes data gathered from online questionnaire surveys carried out between March and August of 2019, focusing on urban residents and applicants of affordable housing. Housing experiences of affordable housing applicants and residents of a shantytown can provide clues on how low-income groups choose their housing or behave when confronted with high housing costs. Therefore, obtaining the views of eligible applicants and occupants of affordable housing schemes portend salient information on the severity of the factors apposite to sustainable affordable housing choice. By comparison, the residents of affordable housing estates, are perceived as direct beneficiaries of affordable housing schemes. Hence their housing experiences can shed light on how housing policies shape housing outcomes.

### 3.4. Measure of Severity

Using a severity index, the severity of factors influencing affordable housing choice was calculated. For each question in the second part of the questionnaire, the severity levels of the factors influencing SAHC were distributed in six. The respondents were asked to rate the effect of the factors on determining their choice of affordable housing by choosing one of six degrees of agreement alternatives, and these were: extremely severe, very severe, severe, somehow severe, not severe, and no comments. The responses were drawn from affordable housing applicants, affordable housing estate residents and residents of a shantytown in direct response to the questionnaire. The severity of the identified factors was measured by the level of importance and ranked according to the severity index for affordable housing applicants, affordable housing estate residents, and residents of shantytown as well as the combination of all respondents. This severity index revealed the severity of the three categories (economic, social, and environmental) of the 43 identified factors influencing SAHC. The severity index has also been applied in affordability literature (see [82]).

### 3.5. Analytical Tools and Techniques Used in this Study

Some steps need to be undertaken to determine the choice of analytical tools and techniques for data analysis, as shown in Figure 2. First, to test if there are significant statistical differences among the groups in comparison, it is imperative to determine then whether the data follows a normal (Gaussian) distribution. If the data follows a normal distribution pattern, then the appropriate technique for statistical analysis is parametric tests (e.g., paired t-test). If otherwise, then the data is not normally distributed. Hence distribution-free methods, or less powerful non-parametric tests, should be employed in order to maintain the accuracy and validity of the data (Pallant, 2005 as cited in [55]). Furthermore, classifying variables according to their scale or level of measurement is another crucial step. According to Mulliner & Maliene, [55], there are some statistical analyses that suites data that are measured at certain measurement scales (i.e., ordinal, nominal, ratio, or interval). Also, the appropriate technique for statistical analysis depends on another criterion—the number of groups considered in the comparison (two or more than two).

Nature of the Data	Parametric vs. non-Parametric	Number of Groups	Required Test
Ordinal scale of measurement	Non-parametric test required	Comparing differences between 2 groups	Mann Whitney U test
Data is not normally distributed		Comparing differences between 3 or more groups	Kendall's W Test
Independent groups			

**Figure 2.** Overview of appropriate analytical steps required in this research. (Source: Adopted from [55]).

In line with the data collected for this research and the steps itemized above, the following statistical tests and analytical steps were considered appropriate for the questionnaire survey analysis and were performed using IBM SPSS Statistics 25 package:

- Descriptive Statistics (mean and standard deviation): They are brief descriptive coefficients that summarize a given data set, which can be used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures, through simple

graphics analysis or tables. They form the basis of virtually every quantitative analysis of data. Descriptive statistics is not the same as inductive statistics, in that rather than using the data to learn about the population that the sample of data is thought to represent, descriptive statistics aim to summarize a sample.

- (b) Normality Test—One-Sample Kolmogorov-Smirnov (K-S) Test: In the one-sample case, the distribution considered under the null hypothesis may be continuous, purely discrete, or mixed. K-S test was used to check if the data are normally distributed. The test was performed on the data and each variable produced a significance value of  $p < 0.05$ , an indication that other statistical analyses needed to understand how the variables differ must be non-parametric.
- (c) Test of Concordance (Kendall's W Test): This was used to determine the association flanked by two or more variables measured in (or transformed to) ranks. It was also used to determine the association between such variables and was again used to access the agreement among rankers. Kendall's W ranges from 0 (no agreement) to 1 (complete agreement). If the test statistic W is 1, then all the survey respondents have been unanimous, and each respondent has assigned the same order to the list of concerns. If W is 0, then there is no overall trend of agreement among the respondents, and their responses may be regarded as essentially random. Intermediate values of W indicate a greater or lesser degree of unanimity among the various responses.

### 3.5.1. Descriptive Statistics

Principal Component Method of Factor Analysis (PCA): The key concept of factor analysis is that multiple observed variables have similar patterns of responses because they are all associated with a latent (i.e., not directly measured) variable. PCA is a veritable tool for investigating variable relationships for complex concepts, as is the case of the subject under discussion. It was used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors.

The study employed the weighted mean fractional ranking criteria to determine severe sustainability factors (SF) affecting affordable housing choice in the area. The weighted mean was computed as:

$$\bar{x} = \frac{\sum_{i=1}^n w_i x_i}{\sum_{i=1}^n w_i} \quad (1)$$

where,  $w_i$  is the weight of the  $i$ th cell;  $\sum w_i = n$  = sample size of the study.

### 3.5.2. Normality Test- One-Sample Kolmogorov-Smirnov (K-S) Test

One sample Kolmogorov-Smirnov (K-S) test for large sample data was used to ascertain whether the data series follows normal distribution provided evidence of disagreement. Therefore, nonparametric tests were adopted in this study.

### 3.5.3. Test of Concordance (Kendall's W Test)

The Kendall's W test of concordance was used to estimate the level of agreement (otherwise degree of consistency in opinions) among the three groups (Affordable Housing Applicants, Residents of Affordable Housing, and Residents of Shantytown). The analysis was performed on the top 30 severe factors affecting the decision of respondents in making affordable housing choice in the area. The decision rule is stated below as;

Decision rule: Reject  $H_0$  (no agreement between the groups) for P-values less than or equal to 0.05 (i.e.,  $p \leq 0.05$ ); otherwise, do not reject.

Computation of Kendall's W Test of Concordance.

In the computation of Kendall's  $W$  test statistic, the researcher employed the upper and lower forms of equations such that  $S$  or  $S'$  is computed first from the row-marginal sums of ranks  $R_i$  received by the factors; though both yield same result.

$$S = \sum_{i=1}^n (R - \bar{R})^2 \text{ or } S' = \sum_{i=1}^n R_i^2 = SSR \quad (2)$$

where,  $S$  is a sum-of-squares statistic over the row sums of ranks  $R_i$ ,  $\bar{R}$  is the mean of the  $R_i$  values (where  $R$  stands for Ranks),  $SSR$  is the sum of squares of  $R_i$  values,  $S'$  is the transpose of  $S$ . Hence, Kendall's  $W$  statistic can be obtained from either of the following formulas:

$$W = \frac{12S}{p^2(n^3 - n) - pT} \frac{12S' - 3p^2n(n+1)^2}{p^2(n^3 - n) - pT} \quad (3)$$

where,  $n$  is the number of factors,  $p$  the number of groups of respondents.  $T$  is a correction factor for tied rank.  $0 \leq W \leq 1$ ; this implies that the values of  $W$  ranges from 0 to 1.

$T$  is computed as:

$$T = \sum_{k=1}^m (t_k^3 - t_k) \quad (4)$$

In which  $t_k$  is the number of tied ranks in each ( $k$ ) of  $m$  groups of ties. The sum is computed over all groups of ties found in all  $p$  columns (groups) of the data table.

### 3.5.4. Factor Analysis

The principal component method of factor analysis was used to extract the most severe factors affecting affordable housing choice in the study area. The operational equation of the factor analysis is given by:

$$\begin{aligned} P_1 &= a_{11}X_1 + a_{12}X_2 + \dots + a_{1k}X_k \\ &\quad a_{??} \ a_{??} \ a_{??} \ a_{??} \ a_{??} \\ P_k &= a_{k1}X_1 + a_{k2}X_2 + \dots + a_{kk}X_k \end{aligned} \quad (5)$$

Equation (5) is the mathematical basis for factor analysis. The  $X$ 's in the equation are the component scores of  $P_i$ 's called the principal components. The  $a_{ij}$ 's are the factor loadings worked out in such a way that the extracted components satisfy two conditions: (i) the principal component are uncorrelated (orthogonal); and (ii) the first principal component ( $P_1$ ) has the maximum variance, the second principal component ( $P_2$ ) has the next maximum variance and so on. The tests confidence level for all inferential statistics was 95%, which implies 0.05 level of significance.

## 4. Results

### 4.1. Respondents Socioeconomic Characteristics

Descriptive statistics (mean and standard deviation) were used to extract the key factors through the opinion ranking of the respondents. The result is as presented in Table 3. As shown in Table 3, the socio-demographic characteristics of the respondents showed that there are more males than females in the study (67.7% as against 32.3%). The result also shows that most of the respondents are married (81.9%). The academic qualifications of the respondents are clustered around Ph.D., M.Sc/MBA and B.Sc/HND degrees. This result indicates that the respondents have a good educational background. The result from the nature of jobs of the respondents indicates that about 48% of them have a permanent job, 20.5% have a temporal job while 16.1% and 15.4% are unemployed and retired, respectively. From the survey result, it was also ascertained that the respondents have poor salary status as about 59.1% earn between N50,000–N100,000 per month while 36.6% earn above N400,000 in a month.

**Table 3.** Socio-economic characteristics of the Respondents.

Variable	Frequency (N = 254)	Percentage (%)
Gender		
Male	172	67.7
Female	82	32.3
Marital Status		
Married	208	81.9
Unmarried	46	18.1
Educational Qualification		
Diploma	18	7.1
B.Sc./HND	70	27.6
M.Sc./MBA	57	22.4
Ph.D.	78	30.7
Others (specify)	31	12.2
Nature of Job		
Temporary	52	20.5
Permanent	122	48.0
Unemployed	41	16.1
Retirement	39	15.4
Family Income		
Below N100,000	11	4.3
N100,000–N200,000	58	22.8
N210,000–N300,000	40	15.7
N310,000–N400,000	52	20.5
N410,000–N500,000	45	17.7
Above N500,000	48	18.9
Number of family members		
1–2 members	50	19.7
3–6 members	173	68.1
More than 6 members	31	12.2
Type of House		
Terraced house	51	20.1
Apartments/Flats	121	47.6
Condominium	42	16.5
Others	40	15.7
Age of House		
Less than 5 years	58	22.8
5–10 years	103	40.6
11–20 years	53	20.9
More than 20 years	40	15.7
Vehicle Ownership		
Yes	157	61.8
No	97	38.2
Distance from house to recreation facilities		
Less than 2 Km	53	20.9
2 Km–5 Km	128	50.4
More than 5 Km	73	28.7
Distance from house to Health Centres		
Less than 2 Km	88	34.6
2 Km–5 Km	111	43.7
More than 5 Km	55	21.7
Distance from house to religious places		
Less than 2 Km	127	50.0



Table 3. Cont.

Variable	Frequency (N = 254)	Percentage (%)
Distance from house to Educational centre		
2 Km–5 Km	72	28.3
More than 5 Km	55	21.7
Distance from house to child day care centre		
Less than 2 Km	104	40.9
2 Km–5 Km	88	34.6
More than 5 Km	62	24.4
Distance from house to shopping mall or market		
Less than 2 Km	132	52.0
2 Km–5 Km	95	37.4
More than 5 Km	27	10.6
Distance from house to working place		
Less than 2 Km	89	35.0
2 Km–5 Km	122	48.0
More than 5 Km	43	16.9
Distance from house to public transport station		
Less than 2 Km	107	42.1
2 Km–5 Km	76	29.9
More than 5 Km	71	28.0
Distance from house to public transport station		
Less than 2 Km	141	55.5
2 Km–5 Km	97	38.2
More than 5 Km	16	6.3

The family size of the respondents are majorly clustered around 3–6 members (68.1%), with a total of 47.6% living in apartment/flats, 20.1% living in terraced houses, 16.5% living in condominiums, and the remaining 15.7% living in other types of houses. Most of these houses (63.4%) are aged 10 years or below. However, only 38.2% of the respondents are vehicle owners, while only 61.8% do not. The result of proximity to various facilities was normal, as most of them are located not farther than 5 km away from the respondent's residence.

#### 4.2. General Ranking of the Factors Affecting SAHC Based on Respondent's Opinion

The general responses and ranking of factors by affordable housing applicants, affordable housing residents, and residents of shantytown are shown in Table 4. The overall rank (score) is an average of the scores of the three groups. A total of forty-three list of factors influencing SAHC were extracted from literature. These 43 set of potential factors comprise of nine (09) economic sustainability factors, twenty-six (26) social sustainability factors, and eight (08) environmental sustainability factors.

Table 4. General ranking of the factors affecting SAHC in the study area.

Factors	AHA (n = 83)		RAH (n = 102)		RST (n = 69)		Overall Score (Rank)
	Mean	Rank	Mean	Rank	Mean	Rank	
Economic Sustainability factors							
ESF01	4.88	1	4.87	1	4.86	1	100 (1)
ESF02	3.11	37	3.19	36	3.18	36	18.6 (36)
ESF03	2.55	39	2.51	40	2.62	39	11.6 (39)
ESF04	4.59	3	4.72	2	4.61	3	97.7 (2)
ESF05	4.54	7	4.65	3	4.68	2	95.4 (3)
ESF06	4.02	25	4.11	22	3.96	25	44.2 (25)
ESF07	4.57	5	4.60	4	4.61	3	91.9 (4)
ESF08	4.56	6	4.58	5	4.60	5	87.2 (6)
ESF09	3.09	38	3.12	37	3.02	38	14.0 (38)

Table 4. Cont.

Factors	AHA (n = 83)		RAH (n = 102)		RST (n = 69)		Overall Score (Rank)
	Mean	Rank	Mean	Rank	Mean	Rank	
Social Sustainability factors							
SSF01	3.16	36	3.09	38	3.16	37	16.3 (37)
SSF02	4.63	2	4.55	7	4.58	7	91.9 (4)
SSF03	4.53	8	4.54	9	4.49	10	83.7 (8)
SSF04	4.53	8	4.49	11	4.51	9	81.4 (9)
SSF05	4.29	16	4.30	15	4.28	15	66.3 (15)
SSF06	4.42	12	4.48	12	4.33	12	74.4 (12)
SSF07	4.39	13	4.51	10	4.30	14	72.1 (13)
SSF08	4.47	10	4.44	13	4.52	8	76.7 (11)
SSF09	3.49	32	3.50	31	3.52	30	27.9 (32)
SSF10	4.16	22	4.19	20	4.13	21	54.6 (20)
SSF11	3.54	30	3.48	32	3.51	31	30.2 (31)
SSF12	3.31	35	3.35	34	3.34	34	23.3 (34)
SSF13	3.62	28	3.64	28	3.51	31	33.7 (29)
SSF14	4.24	17	4.21	19	4.22	17	62.8 (17)
SSF15	4.20	20	4.23	17	4.14	20	60.5 (18)
SSF16	4.59	3	4.55	7	4.59	6	87.2 (6)
SSF17	3.60	29	3.57	30	3.59	29	33.7 (29)
SSF18	4.22	18	4.08	23	4.18	19	54.7 (20)
SSF19	2.45	40	2.59	39	2.44	40	9.3 (40)
SSF20	2.34	42	2.12	43	2.23	43	2.3 (43)
SSF21	2.41	41	2.45	41	2.39	41	7.0 (41)
SSF22	4.05	24	4.05	24	4.04	22	46.5 (24)
SSF23	4.44	11	4.58	5	4.48	11	79.1 (10)
SSF24	4.33	14	4.34	14	4.32	13	69.8 (14)
SSF25	3.92	26	4.04	26	3.83	27	41.9 (26)
SSF26	4.18	21	4.16	21	4.21	18	58.1 (19)
Environmental Sustainability factors							
ENSF01	3.87	27	3.91	27	3.86	26	39.5 (27)
ENSF02	4.33	14	4.30	15	4.24	16	66.3 (15)
ENSF03	4.07	23	4.22	18	4.03	24	51.2 (22)
ENSF04	3.54	30	3.63	29	3.62	28	37.2 (28)
ENSF05	4.21	19	4.05	24	4.04	22	48.8 (23)
ENSF06	3.34	34	3.48	32	3.42	33	25.6 (33)
ENSF07	3.36	33	3.22	35	3.28	35	20.9 (35)
ENSF08	2.34	42	2.23	42	2.33	42	4.7 (42)

Note: AHA = Affordable Housing Applicants; RAH = Residents of Affordable Housing Estate; and RST = Residents of Shantytown.

#### 4.3. Level of Agreement among the Respondents' Groups

Before the combined extraction, the researchers ascertained the level of agreement in opinions of the respondents, by employing Kendall's W test of concordance. The result is, as shown in Table 5 below:

Reject the null hypothesis ( $H_0$ ) that there is no agreement between the opinions of the three respondent groups; if the  $p$ -value is less than or equal to 0.05 (i.e.,  $p \leq 0.05$ ); otherwise, do not reject. With the result of Table 5 above, there is a high level of agreement in the opinions of the groups. This high level reflects the importance of the factors identified and the need for a more comprehensive approach that takes into consideration all factors and the interplay between them.

**Table 5.** Result of Test of Agreement among the Respondents' Groups.

Criterion	Kendall's W Test Result and Associated Probability Values	Ho: No Agreement
ESF01	Kendall's W = 0.947; df = 2; p-value = 0.0000 < 0.05	Reject Ho
ESF02	Kendall's W = 0.522; df = 2; p-value = 0.0231 < 0.05	Reject Ho
ESF03	Kendall's W = 0.602; df = 2; p-value = 0.0117 < 0.05	Reject Ho
ESF04	Kendall's W = 0.812; df = 2; p-value = 0.0002 < 0.05	Reject Ho
ESF05	Kendall's W = 0.647; df = 2; p-value = 0.0012 < 0.05	Reject Ho
ESF06	Kendall's W = 0.912; df = 2; p-value = 0.0071 < 0.05	Reject Ho
ESF07	Kendall's W = 0.692; df = 2; p-value = 0.0005 < 0.05	Reject Ho
ESF08	Kendall's W = 0.781; df = 2; p-value = 0.0011 < 0.05	Reject Ho
ESF09	Kendall's W = 0.844; df = 2; p-value = 0.0037 < 0.05	Reject Ho
SSF01	Kendall's W = 0.652; df = 2; p-value = 0.0497 < 0.05	Reject Ho
SSF02	Kendall's W = 0.604; df = 2; p-value = 0.0023 < 0.05	Reject Ho
SSF03	Kendall's W = 0.702; df = 2; p-value = 0.0019 < 0.05	Reject Ho
SSF04	Kendall's W = 0.698; df = 2; p-value = 0.0105 < 0.05	Reject Ho
SSF05	Kendall's W = 0.805; df = 2; p-value = 0.0090 < 0.05	Reject Ho
SSF06	Kendall's W = 0.705; df = 2; p-value = 0.0056 < 0.05	Reject Ho
SSF07	Kendall's W = 0.870; df = 2; p-value = 0.0120 < 0.05	Reject Ho
SSF08	Kendall's W = 0.701; df = 2; p-value = 0.0115 < 0.05	Reject Ho
SSF09	Kendall's W = 0.502; df = 2; p-value = 0.0499 < 0.05	Reject Ho
SSF10	Kendall's W = 0.797; df = 2; p-value = 0.0113 < 0.05	Reject Ho
SSF11	Kendall's W = 0.610; df = 2; p-value = 0.0383 < 0.05	Reject Ho
SSF12	Kendall's W = 0.553; df = 2; p-value = 0.0372 < 0.05	Reject Ho
SSF13	Kendall's W = 0.899; df = 2; p-value = 0.0027 < 0.05	Reject Ho
SSF14	Kendall's W = 0.882; df = 2; p-value = 0.0064 < 0.05	Reject Ho
SSF15	Kendall's W = 0.839; df = 2; p-value = 0.0011 < 0.05	Reject Ho
SSF16	Kendall's W = 0.592; df = 2; p-value = 0.0022 < 0.05	Reject Ho
SSF17	Kendall's W = 0.647; df = 2; p-value = 0.0002 < 0.05	Reject Ho
SSF18	Kendall's W = 0.881; df = 2; p-value = 0.0068 < 0.05	Reject Ho
SSF19	Kendall's W = 0.564; df = 2; p-value = 0.0255 < 0.05	Reject Ho
SSF20	Kendall's W = 0.701; df = 2; p-value = 0.0445 < 0.05	Reject Ho
SSF21	Kendall's W = 0.879; df = 2; p-value = 0.0031 < 0.05	Reject Ho
SSF22	Kendall's W = 0.903; df = 2; p-value = 0.0000 < 0.05	Reject Ho
SSF23	Kendall's W = 0.611; df = 2; p-value = 0.0210 < 0.05	Reject Ho
SSF24	Kendall's W = 0.922; df = 2; p-value = 0.0041 < 0.05	Reject Ho
SSF25	Kendall's W = 0.932; df = 2; p-value = 0.0000 < 0.05	Reject Ho
SSF26	Kendall's W = 0.548; df = 2; p-value = 0.0275 < 0.05	Reject Ho
ENSF01	Kendall's W = 0.974; df = 2; p-value = 0.0000 < 0.05	Reject Ho
ENSF02	Kendall's W = 0.794; df = 2; p-value = 0.0018 < 0.05	Reject Ho
ENSF03	Kendall's W = 0.759; df = 2; p-value = 0.0211 < 0.05	Reject Ho
ENSF04	Kendall's W = 0.890; df = 2; p-value = 0.0010 < 0.05	Reject Ho
ENSF05	Kendall's W = 0.896; df = 2; p-value = 0.0102 < 0.05	Reject Ho
ENSF06	Kendall's W = 0.401; df = 2; p-value = 0.1036 > 0.05	Accept Ho
ENSF07	Kendall's W = 0.498; df = 2; p-value = 0.0521 > 0.05	Accept Ho
ENSF08	Kendall's W = 0.734; df = 2; p-value = 0.0102 < 0.05	Reject Ho

Hence, we can now perform aggregated analysis since there is no significant difference in the opinions of the three respondent groups. The overall top thirty (30) severe factors were extracted and presented in Table 6 below.

From the overall ranking results in Table 6 above, showing the top 30 severe factors affecting the decision for affordable housing choice in the area, it was ascertained that the most severe factors were House price in relation to income (ESF01) with a fractional rating of 100%. This position is followed by rental cost in relation to income (ESF04) with a rating of 97.7%, and transportation cost in relation to income (ESF05) with a ranking of 95.4%. The least severe of the extracted factors is Access to health facilities (SSF17) with a rating of 33.72%. For further extraction, the top 30 severe factors were subjected to Principal Component Analysis (PCA). The result is presented in Table 7 below.

**Table 6.** Top thirty (30) severe factors affecting the decisions of affordable housing choice in the area.

Rank	Factors	Score (%)
1	House price in relation to income (ESF01)	100.0
2	Rental cost in relation to income (ESF04)	97.67
3	Transportation cost in relation to income (ESF05)	95.35
4	Type of building e.g., Apartments, condominiums, semi-detached etc. (SSF02)	91.86
4	Taxation and Subsidy influences (ESF07)	91.86
6	Household income level (ESF08)	87.21
6	Housing location e.g., City, countryside etc. (SSF16)	87.21
8	Housing quality e.g., meeting decent home standards (SSF03)	83.72
9	Safety/Security (reduced incidence of crime) (SSF04)	81.4
10	Availability of power supply (Electricity) (SSF23)	79.07
11	Suitability/Appropriateness (SSF08)	76.74
12	Number of parking spaces (SSF06)	74.42
13	Presence of lift or elevator (SSF07)	72.09
14	Pipe borne water (SSF25)	69.77
15	Minimize social segregation (SSF05)	66.28
15	Efficient waste management (ENSF02)	66.28
17	Number of bedrooms (SSF14)	62.79
18	Number of bathrooms (SSF15)	60.47
19	Minor access road (SSF26)	58.14
20	Effective maintenance and management of properties (SSF10)	54.65
20	Access to religious places e.g., Temple, mosque, church etc. (SSF18)	54.65
22	Use of appropriate materials (ENSF03)	51.16
23	Energy efficiency (ENSF05)	48.84
24	Availability of public transportation (SSF22)	46.51
25	Employment opportunities (ESF06)	44.19
26	Major and minor access road (SSF26)	41.86
27	Air quality (ENSF01)	39.53
28	Thermal comfort, e.g., presence of heating and cooling system (ENSF04)	37.21
29	Clean and Attractive (SSF13)	33.72
29	Access to health facilities (SSF17)	33.72

**Table 7.** Result of Factor Analysis.

Sustainability Factors	Components						
	1	2	3	4	5	6	7
ESF01	0.992	−0.050	0.035	0.095	−0.032	0.038	−0.003
ESF04	0.881	0.989	−0.109	0.146	−0.004	−0.038	0.048
ESF05	0.756	0.450	−0.179	0.173	0.402	−0.036	−0.020
SSF02	0.633	−0.064	0.047	0.769	0.037	−0.007	0.004
ESF07	0.676	−0.700	0.206	0.075	−0.053	0.033	0.005
ESF08	−0.142	0.978	0.081	−0.061	−0.012	0.062	0.045
SSF16	0.488	0.621	−0.697	0.125	0.276	−0.021	0.087
SSF03	0.510	−0.624	0.588	0.054	−0.011	0.016	0.011
SSF04	0.008	0.972	−0.122	0.007	0.049	−0.045	−0.028
SSF23	0.950	0.125	−0.146	0.149	0.148	−0.092	−0.030
SSF08	0.980	0.050	0.030	0.163	0.077	−0.022	0.050
SSF06	−0.061	−0.058	0.596	0.023	−0.014	0.009	0.010
SSF07	0.980	−0.065	−0.038	0.180	0.032	−0.002	0.009
SSF24	0.902	−0.412	−0.005	0.086	−0.002	−0.046	0.044
SSF05	0.061	0.988	−0.117	0.013	0.044	−0.043	−0.026
ENSF02	0.554	−0.359	−0.682	0.151	0.083	0.249	0.193
SSF14	0.966	−0.107	−0.201	−0.025	−0.068	−0.090	−0.012
SSF15	0.961	0.220	0.005	0.098	−0.003	0.049	−0.117
SSF26	−0.244	0.930	0.140	0.150	0.002	0.153	−0.096
SSF10	0.866	−0.496	−0.022	0.012	0.016	−0.050	−0.013
SSF18	−0.020	0.827	−0.404	0.031	0.362	−0.144	0.023

Table 7. Cont.

Sustainability Factors	Components						
	1	2	3	4	5	6	7
ENSF03	0.114	0.927	0.196	0.173	−0.180	−0.008	0.157
ENSF05	0.838	−0.271	0.321	−0.067	−0.213	0.265	−0.010
SSF22	0.965	−0.083	0.113	0.173	0.035	−0.015	0.043
ESF06	0.857	0.485	−0.087	0.109	−0.066	0.007	−0.054
SSF25	0.919	0.359	0.140	−0.065	−0.001	0.002	0.032
ENSF01	0.122	−0.440	0.791	0.365	0.174	−0.002	0.007
ENSF04	0.912	0.301	0.146	−0.214	−0.023	−0.039	0.052
SSF13	0.732	0.114	0.488	−0.406	0.149	0.152	0.019
SSF17	0.979	0.060	−0.161	0.025	−0.048	−0.047	−0.081
<i>Eigenvalue</i>	8.652	6.839	3.683	1.678	1.495	0.525	0.485
<i>%age of Variance</i>	47.68	14.95	11.18	9.49	5.25	3.23	1.58
<i>Cumulative %age</i>	47.68	62.63	73.81	83.30	88.55	91.78	93.36

Extraction Method: Principal Component Analysis.  
a. 7 ccomponents extracted.

Using principal component analysis, the 30 severe factors affecting SAHC were reduced to seven factors that accounted for 93.4 percent of the total variation in the system. These seven factors were found to be severely influencing SAHC according to the evaluation of the three respondent groups. The factors were House price in relation to income (ESF01), Rental cost in relation to income (ESF04), Housing location, e.g., City, countryside etc. (SSF16), Transportation cost in relation to income (ESF05), Type of building e.g., Apartments, condominiums, semi-detached etc. (SSF02), Energy efficiency (ENSF05), and Efficient waste management (ENSF02). From the PCA result, the framework, as shown in Figure 3 below, was developed.

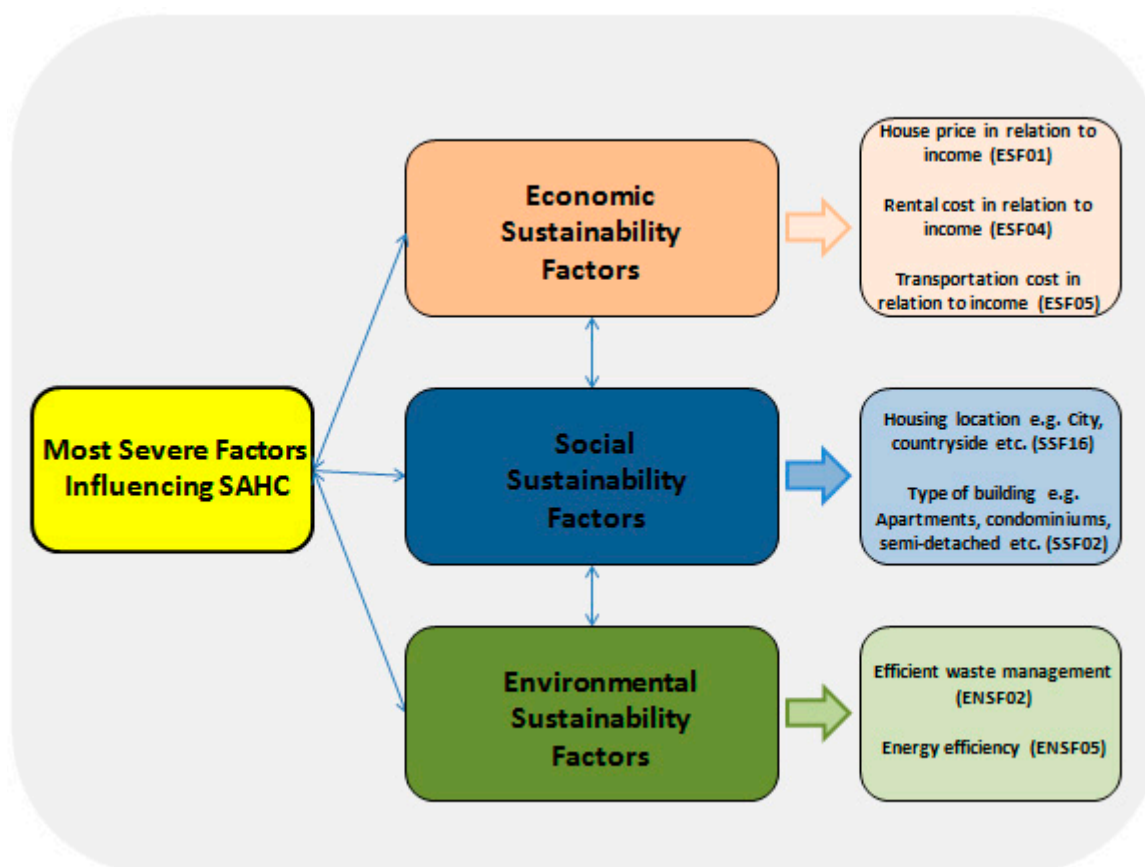


Figure 3. Framework for Sustainable Affordable Housing Choice in Nigeria.



## 5. Discussions

The quantitative study performed in Section 4 shows the analysis of 254 questionnaires from three respondent groups (applicants of affordable housing, residents of affordable housing estates, and residents of a shantytown), which was carried out in Abuja, Nigeria. This survey enabled the authors to establish the severity of 43 potential SPF influencing sustainable affordable housing choice. 30 severe SPF were established using the respondent's opinion. Based on the analysis carried out in this study and the set research questions and hypothesis, the major findings of this study are:

First, there is a general agreement between the opinion of each group of the respondent and the general opinion of all groups about the factors influencing sustainable affordable housing choice (SAHC). This result shows that the hypothesis formulated for this study was rejected. Hence, this total agreement points to the significance of the identified factors as determinants of SAHC in the study area. Secondly, the critical factors affecting SAHC in Abuja, Nigeria, are factors that cut across social, environmental, and economic dimensions. Prominent among the factors, according to PCA based on respondent's opinion, include: House price in relation to income (ESF01), and Rental cost in relation to income (ESF04) taking the 1st and 2nd position as the most severe factors. This finding is not surprising, given that studies have demonstrated that housing cost and its relation to income has been typically used to measure and define housing affordability situations [49,83–85]; and that this ratio technique appeal to peoples' common sense experience [10]. This finding is congruent with Ghazali, et al. [51] study, which noted that as many households are confronted with financial difficulties in making residential choices, housing cost remains a key factor that influences housing location decisions. Earlier findings by Wu et al. [86] also discovered that household income has a strong influence on residential location choice.

However, the interesting thing about this study is that residents of urban areas are beginning to consider other non-economic factors as equally severe, such as Type of building, e.g., Apartments, condominiums, semi-detached e.t.c. (SSF02), Housing location, e.g., City, countryside e.t.c. (SSF16), Transportation cost in relation to income (ESF05), Energy efficiency (ENSF05), and Efficient waste management (ENSF02). This finding implies that urban residents (just like academia, housing providers and professionals) are also beginning to place very high importance on non-economic factors. This assertion is in line with the debates of some researchers who demonstrated that the relationship between housing cost, housing location, and cost of transportation ensures an actual measure of housing affordability [87].

Thirdly, the nature/characteristics of housing affordability problems experienced by residents of Abuja, Nigeria, significantly affect the choice of housing perceived by its residents as affordable. The various forms of housing units deployed by successive governments in response to the rising housing affordability dilemmas, do not reverse the growing rate of residential dissatisfaction amongst residents. At some stage, residents respond to this dissatisfaction through relocation. Hence, the continued reported cases of housing abandonment on housing projects delivered by successive governments in Nigeria (see [6]). More so, the profit-oriented nature of public housing programs, lack of user participation and near-zero consideration of determinants of SAHC in affordable housing programs in the study area, has left the poor urban residents, according to Obiadi et al. [15] with little or no choice, but to make do with shanty houses in less desirable areas like, neighborhoods adjacent to refuse dumps, marshy sites, among others. This report is consistent with Seelig & Phibbs [88] study, which found that households with low-income usually do not choose to reside in cheap housing if it offered poor options regarding location and quality. The authors noted that while cost was considered essential, issues like needs, proximity to services and facilities, housing preferences were as well important to most low-income renters, in as much such choice meant paying more for housing and tighter household budgets.

Fourth, the determinants of SAHC are not presently incorporated into public housing delivery practices in Nigeria. From the statistical result, the respondents unanimously agreed that broader dimensions and wide-ranging factors affecting SAHC as propagated by researchers are presently

not incorporated in housing delivery practices in the study area. This assertion aligns with studies which have reported lack of consideration to socio-cultural related factors like kingship and security [6]; poor solid waste management system [89], problems of open/recreational space delivery and management [90], spatial variations in housing quality [91], and improper utilization of natural resources available in the housing environment [92] as well as low user participation in housing delivery processes in Nigeria [55] amongst many others. Therefore, it can be said that the factors affecting SAHC are overlooked in the design and construction of affordable housing programs in the study area. Finally, this study developed a framework for achieving SAHC, considering the nature and characteristics of housing affordability in Abuja, Nigeria.

## 6. Limitations and Agendas for Future Studies

There are limitations in this study, including a small, non-random sample, which restricts the generalizability of the study findings. Obtaining respondents were difficult, given the lack of a sampling framework. The researchers depended on snowball convenience sampling, which could initiate selection bias and could affect the generalizability of the findings. Consequently, the generalization and interpretation of our findings can be improved by future researches, which employs a larger sample size of respondents. Further studies can increase data coverage and substantiate the quality of our study findings. Also, future studies can corroborate the SPF established by this study using evidence-based case studies.

In addition, only affordable housing applicants, residents of affordable housing estates, and residents of a shantytown residing for a minimum of five years in Abuja, Nigeria, were surveyed. Another limitation was the application of an online survey. Online distribution of surveys neglects audiences without computers, participants of online surveys are somehow more educated [93]. Hence, this study did not capture the opinions of residents without a computer or smartphone; it marginally considered respondents with no form of education. Future studies are encouraged to consider this group of residents and compare their findings with ours.

Another limitation of this study is that only the opinions of urban residents were surveyed. Future studies should consider the opinions of rural residents to ascertain the urban-rural differences in the factors influencing SAHC since housing experience in the rural and urban settings are dissimilar. Furthermore, future surveys can study residents' housing preferences and compare the findings with ours.

## 7. Conclusions, Implications, Recommendations, and Research Contributions

Many factors influence sustainable affordable housing choice (SAHC), and recent studies emphasized the need for reconsideration in the way housing affordability problems are assessed and conceptualized. From this study, it is observed that housing affordability is also a product of subjective judgment, which arises from the overall perception of what residents hold dear towards what they view as important features of an acceptable housing setting at a given time. (show as Supplementary Materials) This study discussed the concept and wide-ranging factors influencing SAHC, which transcends mere economic terms widely adopted in assessing housing affordability. It established that the demand for affordable housing concerns cuts across economic, social, and environmental factors. The empirical evidence determined that these are three separate but interrelated factors. Through a systematic literature review and pilot survey, this study identified a comprehensive list of factors influencing SAHC within the ambit of sustainability. It established the severity of the identified factors and ranked them based on the respondent's opinion. The purpose is to understand why and how urban residents choose their current houses. Then a case study of Abuja, Nigeria, is applied to exemplify how urban residents conceptualize and choose housing they consider affordable in a specific regional and national context.

From the results, the criterion "House price in relation to income" is the most important which is consistent with similar studies in this domain, but it was also found that the respondents consider as severe other non-economic factors like security (safety), location and building type; as well as other

non-housing related costs such as transportation cost and energy bill. The theoretical purpose of this study is to guarantee that households are well guided in making the best choice of affordable housing, and developers make that "reasonable" profit margin. The study's policy implications are that the views and perceptions of residents be routinely assessed, and such an opinion should drive the delivery of sustainable affordable housing.

From the findings of this research, the following recommendations are proposed for the sustenance of affordable housing programs in Nigeria. Since the study discovered that housing affordability problems significantly affect housing choice in Abuja, Nigeria, therefore, users' perceptions should be considered in determining which housing is affordable. The major indices that show why public housing programs perform below user expectations and needs are the inadequate knowledge of the changes in user preference, choice, and need by industry professionals, government agencies, real estate companies, and stakeholders.

In furtherance, although this research suffers some weaknesses, it, however, makes the following salient contributions that are worthy of note. The research findings contribute to filling the knowledge gap in housing choice literature. Through the statistical analysis of respondent's opinion on the determinants of SAHC, by providing a comprehensive as well as a holistic set of factors influencing SAHC in the study area, from the ambit of sustainability, which was previously not existing. Hence, it provided an understanding of the evolving concept of affordable housing choice. The research identified issues related to the development and location of affordable housing programs as the severe factors influencing urban residents choice of a sustainable affordable house in the study area using Principal Component Analysis; this has not been done previously. Architects, developers, government agencies and international organizations can depend on the salient information passed by this study to allocate resources in delivering sustainable affordable housing in the study area. The established SPF can aid policy makers in determining suitable locations for affordable housing programs. In the same manner, these SPF can be useful to potential residents and future affordable housing applicants in identifying the most energy-efficient housing facilities and the best affordable location when making a choice of housing that is affordable.

Finally, utilizing the established SPF for SAHC from this study, policymakers can easily evaluate the performance rate of affordable housing programs and possible improvement policies to minimize housing abandonment as well as reported cases of housing dissatisfaction amongst residents of urban areas. The study also developed a framework for achieving sustainable affordable housing choice in the area under study.

**Supplementary Materials:** The following are available online at <http://www.mdpi.com/2071-1050/11/20/5792/s1>, Questionnaire: SURVEY ON FACTORS INFLUENCING TO SUSTAINABLE AFFORDABLE HOUSING CHOICE.

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