CSID Journal of Infrastructure Development

Volume 6 | Issue 1 Article 2

6-29-2023

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Recommended Citation

Haruna, A. C., Mukiibi, S., & Nnaggenda-Musana, A. (2023). Gender Analysis of Sustainable Housing Choices of Rental Household Heads In Abuja Municipal Council, Nigeria. *CSID Journal of Infrastructure Development, 6*(1). https://doi.org/10.7454/jid.v6.i1.1083

CSID Journal of Infrastructure Development (6) 1: 4-17
ISSN 2407-4438

GENDER ANALYSIS OF SUSTAINABLE HOUSING CHOICES OF RENTAL HOUSEHOLD HEADS IN ABUJA MUNICIPAL COUNCIL, NIGERIA

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(Received: October 2022 / Revised: November 2022 / Accepted: February 2023)

ABSTRACT

Households' income and other concerns constitute important sustainable housing choices factors that play vital roles in influencing rental housing affordability decisions. The study determined both male and female households can make economic, social, and environmental housing choices to meet their affordable rental needs. A cross-sectional survey was conducted, and a questionnaire was administered to a sample of 285 households obtained from a random sampling of 450 households living in private rental housing in Trademore estate in the Lugbe district of Abuja. Among the 285 households, 226 were household heads representing 79.3% of the respondents' households. The household heads consist of 171 and 55 males and females, respectively. Data in sustainable housing choices of household heads, analyzed by principal components analysis method of exploratory factor analysis and mean rating (MR), frequencies, percentages in SPSS 25. Results indicated the sustainable economic housing choices drivers that household heads can consider for household rental affordability are Employment and Housing Prices and income and expenditure. Whereas the sustainable social housing choices drivers for household heads' rental affordability consideration were housing characteristics and access or availability of dare-care and mall, the sustainable environmental choices drivers were waste and pollution, energy efficiency, materials, and noise pollution. The study recommended that households consider the economic, social, and ecological factors for sustainable housing choices when deciding on rental accommodation to meet their rental needs. It is also advocated that both government and private investors and developers of rental housing apply the study findings to provide sustainable and affordable rentals for their clients.

Keywords: Rental affordability; Sustainable housing choices; Households heads; Gender

1. INTRODUCTION

Households' income and other considerations constitute important sustainable housing choices factors that play vital roles in influencing households' rental housing affordability decisions. Scholars identified housing choices as decisions taken by households when considering the choice of house, and these decisions depend, among others, on house type, tenure, neighborhood, and location as well as housing size (Mulder, 1996; Ghazali et al., 2019; Adabre & Chan, 2019; Chan & Adabre, 2019). The rental housing choice factors are influenced by economic, social, and environmental elements, which form the sustainable aspects of rental housing choices.

Integrating sustainability into housing choice is referred to as sustainable housing choice (SHC) or sustainable, affordable housing choice (SAHC) according to Ikenna & Sebnem (2019) and define sustainable housing:

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DOI: 10.7454/jid.v6.i1.1083

> "…as one that is built with sustainability requirement that satisfies the current generation's demand and needs without compromising future generations' ability to meet their housing demand and needs. SAHC is the combined ability to select and choose a house for renting at a minimum price in a safe environment that facilitates healthy living."

To understand the environmental housing decision determinants, this study conducted gender analysis of sustainable housing choices for rental household heads, particularly in Abuja Municipal Council, Nigeria.

2. LITERATURE STUDY

According to Zinas & Jusan (2012), choices are assumed to reflect the decision for preferences in housing. In contrast, Ham (2012) attributed choice to being able to choose a preferred option from a set of distinctive alternatives. Housing choices depend on the characteristics of the individuals and their households. According to Olanrewaju & Woon (2017) and also cited by Ikenna & Sebnem (2019), the likely generating imbalance between demand and supply of affordable housing is the failure to reconcile households' choices and supply. It means inadequate rental housing supply can limit housing choices for rent by households. Housing choice is a topical issue of interest amongst researchers of diverse disciplines studied from different theoretical perspectives. Economists focus on housing prices and how housing costs determine the choice between owning and renting. Sociologists study the housing choices which individual households make and examine housing distribution in a given population. Geographers focus on socio-economic and demographic aspects, the dwelling, and neighborhood features influencing housing choices (Coolen et al., 2002; Tao et al., 2015; Ikenne & Sebnem, 2019). It reveals that households can choose housing that appeals to them based on different choices they have to consider and make decisions on. Jean-Claude (2009) argues that choices result from a decision-making process involving multiple sets of alternatives. Therefore, the housing choices that households can make are usually based on access to information on available rental houses and the ability to make subjective estimations of alternatives (Qu & Hasselaar, 2011).

In an exploratory study of the severity of factors influencing sustainable housing choice among low and medium-income households, Ikenna and Sebnem (2019) observed that integrating sustainability into the concept of affordable housing choices is a strategy that requires environmental and social factors to be considered, which are routinely neglected in the housing choice literature. Thus, this study has integrated sustainability into housing choices factors whereby economic, social, and environmental factors were considered sustainable housing choices (SHCs) factors and examined the perception of male and female rental household heads on the SHCs for their rental housing affordability. Rental housing affordability has been viewed as the ability of households in rental tenure to meet their housing costs, expressed as a ratio of income to rental price not more than 30% (Okey, 2007). Therefore, the study has assisted in achieving the following objectives: to identify the factors that drive sustainable housing choices of rental household heads and establish the severity of the factors by ranking the factors based on the rental households' sustainable housing choices perception. Consequently, answers were sought to the following questions: What are the drivers of sustainable housing choices of households' rental affordability? How important are each of the sustainable housing choices factors to the household's decision for rental affordability?

This study looked at the sustainable housing choices of rental household heads in the study area, Trademore Estate. The household head was regarded as the person/member whom the household members recognized as such. They are usually an adult and is the one who bears the major responsibility of training the household members and making decisions on their behalf. The head

can be a male or female (National Bureau of Statistics, 2007). The study considered the sustainable housing choices decisions by household heads of different gender taken from economic, social, and environmental considerations. The research contributed to filling the gap in sustainable housing choices for rental household heads' affordability.

3. METHOD AND ANALYSIS

Data on Sustainable Housing Choices (SHC) of 226 rental household heads who constituted the respondents for the study were collected from residents in Trademore estate Abuja. The household heads were obtained from 285 rental households sampled by simple random techniques. A semi-structured questionnaire survey was used in the collection of data on SHC. Face-to-face interviews were also conducted with three (3) male and three (3) female household heads tenants and obtained more information on the households' rental experiences and choices. The female respondents interviewed were given the following pseudo names for confidentiality to conceal their identity: Abella, Dora, and Favour. The quasi-names given to the male respondents were Broda, Chris, and Eris. The SHCs, classified into three sustainable categories: economic, social, and environmental, were identified and obtained through literature and questionnaires administered in the pilot survey based on the respondents' perceptions. Data were analyzed utilizing a severity index using mean rating and principal component analysis (PCA).

3.1. Mean Rating Ranking

The severity of factors influencing sustainable housing choices was calculated and ranked using a mean rating score. The ranking was done according to gender and both gender combination. The severity levels of the SHC factors influencing rental households' affordability were distributed in 5 Linkert scales. This severity index of each SHC factor revealed its critical importance. Descriptive statistic of mean score rating was used. The mean rating (MR) score is commonly used to determine the relative importance of a data set (Field, 2009). It was used to identify the top-ranked variables deemed appropriate for large samples (Norman, 2010). Therefore, the mean score rating was used to rank the factors of SHCs. The data were analyzed by the computation of mean ratings (MR) of each variable using five (5) point Linkert scale with scale values ranging from 1 to 5 given to each factor by the respondent (1 number = No Comments responses; 2 number = Not Severe responses; 3 number = Somehow Severe; 4 number = Severe responses; and 5 number = Very Severe response).

The total number of respondents (TR) rating each variable was obtained and used to calculate the percentage of respondents associating a particular rating point (Rp). The mean rating (MR) was calculated as the summation of the products of each rating point (Rp) and the corresponding percentage response to it (R%) out of the total number of responses (TR) involved in rating a particular variable as shown in Equation 1:

$$MR = \sum_{j=1}^{5} (Rpi \cdot Ri\%) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where: Rpi = rating point ranging from 1 to 5

Ri = percentage response to rating point i

3.2. Principal Component Analysis

Exploratory factor analysis (EFA) using Principal Component Analysis (PCA) method was used to analyze the economic, environmental, and social factors of the SHC using the IBM SPSS Statistics 25 package. The PCA was used to extract the most severe factors in sustainable housing choices in the study area. The operational equation of the factor analysis is given by:

$$P_1 = a_{11}X_1 + a_{12}X_2 + \cdots + a_{1k}X_k$$
$$a??a??a??a??a?? \qquad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$
$$P_k = a_{k1}X_1 + a_{k2}X_2 + \ldots + a_{kk}X_k$$

Equation (2) is the mathematical basis for analysis. The X's in the equation are the component scores of Pi's, called the principal components. The aij.'s's are the factor loading worked out in such a way that the extracted components satisfy two conditions: (i) the principal component is 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 X's confidence level for all inferential statistics was 95%, which implies a 0.05 level of significance.

The key concept of the Principal Component Method of Factor Analysis (PCA) is that multiple observed variables with similar response patterns are grouped 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 subjects such as sustainable housing choices for the rental affordability of household heads. It described variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factor (which are given a common name). Using the PCA, top severe SHC factors were narrowed down to the minimum. The principal component method of factor analysis was used to extract the most severe SHC factors in the study area.

Before conducting factor analysis, the Kaiser-Meyer-Olkin (KMO) index and Bartlett's test of sphericity, measures of sampling adequacy, were used to evaluate the suitability of the collected data for factor analysis (Williams et al., 2010). Data with a KMO value exceeding the minimum value of 0.5 were acceptable and within the acceptable range (Tabachnick et al., 2007; Field, 2013). Bartlett's's tests indicate statistical significance with a value less than the maximum of 0.05. These tests show the suitability of the data for factor analysis. To determine the number of important underlying factors (drivers), PCA was carried out on the SHCs measures with varim'x' as the factor rotation method (Corner, 2009). As an outcome of factor analysis, eigenvalues were utilized to signal the variance of each underlying factor from the total variance. Factors with an Eigenvalue of 1.0 were retained (Nunnally, 1994; Brown, 2001). Variables with a factor loading below 0.5 were excluded to reduce cross-loading and clarify outcomes interpretation of outcomes (Lingard et al., 2000; Akinade et al., 2017; Hadi et al., 2016).

4. RESULTS AND DISCUSSION

The results and discussion of the findings based on the exploratory factors analysis of SHCs and the three (3) dimensional spheres of rental housing choices of household heads: economic, social, and environmental, are presented in this section.

4.1. Sustainable Housing Choices of Household Heads

The sustainable economic factors (SECF) had Household income level (SECF1) and Rental cost concerning income (SECF3) topped in the first and second position, respectively, as the most severe economic SHC factors indicated in Table 1. Male and Female HHHs had household income (SECF1) as the topmost severe economic SHC factor. It suggests that both households were challenged by income level as corroborated by gender housing demand by Skaburskis (1997) that renters are challenged greater in household income and more confronted with housing burden. Therefore, the rent-to-income ratio appeal to households' common-sense and experiences

for their rental affordability (Stephen & Hoskara, 2019). In summary, EFA on economic factors grouped the SECF into three and rated accordingly: Employment and Price, Income and Expenditure, and Transport Cost and Banking. It confirmed the study by Li et al. (2018), which linked housing cost and cost of transportation to a household's housing affordability.

For the sustainable social factors (SSOF), Availability of water supply (SSOF25) and availability of power supply (Electricity) (SSOF24) topped in the first and second position, respectively, as the most severe social SHC factors. Also, both Male and Female HHHs indicated water supply availability (SSOF25) as the first top-ranked social SHC factor, as presented in Table 2. This demonstrated Hoda (2007)'s assertion that gender housing preferences by households are influenced by their expectations. The provision and availability of water supply as well as power in rental housing for domestic use do influence households' choices for such rental and cannot be overemphasized. Water and power services are usually provided to make buildings generally and houses, particularly, liveable and comfortable for occupants. In summary, EFA on social factors grouped the SSOF into four drivers and rated accordingly: Housing Characteristics, daycare and Mall, Road Access and Transportation, and Education and Location.

For the Sustainable Environmental Factors (SEVF) shown in Table 3, Efficient waste management (SEVF2), Less/Absence of noise pollution (SEVF6) topped in the first and second positions, respectively, as the most severe environmental SHC factors. However, while Male HHHs indicated SEVF2, Female HHHs showed SEVF6 as the topmost environmental SHC factor. This finding implies that households place important value on non-economic factors such as Efficient waste management (SEVF2) and Less/Absence of noise pollution (SEVF6) in the environment are equally important factors driving households' rental housing choices. This affirmation is in line with Oguntoyinbo (2012) as well as Stephen & Hoskara, 2019), who argued that poor waste management in the housing environment is among the factors of Sustainable Housing Choice. The EFA of environmental factors grouped the SEVF into three drivers and rated accordingly: Waste and Pollution, Energy Efficiency, and Materials and Noise Pollution.

Table 1 Household Heads Sustainable Housing Choices SECF Ranking

Sustainable Economic Factors (SECF)	Female N=55		Male N=171		Overall Score Rank	
	MR	Rank	MR	Rank	MR	Rank
Household income level **(SECF1)**	4.018	1	4.187	1	4.146	1
Available mortgages and interest rates **(SECF2)**	3.582	5	3.152	7	3.257	6
Rental cost in relation to income **(SECF3)**	3.945	3	4.029	2	4.009	2
Energy bill in relation to income **(SECF4)**	3.491	6	3.567	4	3.549	5
Water bill in relation to income* **(SECF5)**	3.091	9	2.971	10	3.000	10
Employment opportunities **(SECF6)**	3.982	2	3.579	3	3.677	3
House price in relation to income **(SECF7)**	3.709	4	3.561	5	3.597	4
Taxation and subsidy influences **(SECF8)**	2.982	10	3.088	9	3.062	9
Rent tenure security **(SECF9)**	3.182	8	3.211	6	3.204	7
Transportation cost in relation to income **(SECF10)**	3.291	7	3.135	8	3.173	8
Availability of banking services* **(SECF11)**	2.491	11	2.626	11	2.593	11

*Added by responding MR: Mean Rating Source: Survey 2021

Table 2 Household Heads Sustainable Housing Choices SSOF Ranking

Sustainable Social Factors (SSOF)	Female N=55		Male N=171		Overall score (Rank)	
	MR	Rank	MR	Rank	MR	Rank
Accessibility **(SSOF1)**	3.109	6	3.175	9	3.159	6
Building types (flats, detached/semi-detached bungalow) **(SSOF2)**	3.109	6	3.211	7	3.186	5
Housing quality/Adequacy (meeting decent home standards) **(SSOF3)**	3.145	5	3.222	5	3.204	4
Safety/Security (reduced incidence of crime) **(SSOF4)**	3.218	4	3.275	3	3.261	3
Minimized social segregation **(SSOF5)**	2.691	19	2.766	22	2.748	23
Car parking spaces **(SSOF6)**	2.800	15	2.877	19	2.858	19
Presence of lift or elevator **(SSOF7)**	2.345	26	2.029	26	2.106	26
Suitability/Type of architectural design **(SSOF8)**	2.436	25	2.368	25	2.385	25
Access to leisure facilities (Parks, green open spaces) **(SSOF9)**	3.400	2	3.012	14	3.106	9
Effective maintenance and management of property **(SSOF10)**	2.800	15	3.181	8	3.088	11
Household size **(SSOF11)**	2.618	22	2.959	16	2.876	18
Housing unit size **(SSOF12)**	2.709	17	2.936	17	2.881	17
Clean and attractive **(SSOF13)**	2.927	11	3.158	10	3.102	10
Number of bedrooms **(SSOF14)**	2.818	14	3.222	5	3.124	7
Number of bathrooms **(SSOF15)**	2.964	10	2.971	15	2.969	14
Housing location (city, urban, etc.) **(SSOF16)**	2.873	13	3.023	12	2.987	13
Access to sports facilities **(SSOF17)**	2.655	20	2.830	21	2.788	21
Access to health facilities **(SSOF18)**	2.927	11	3.047	11	3.018	12
Access to religious places **(SSOF19)**	3.073	8	2.690	24	2.783	22
Access to educational centers **(SSOF20)**	2.655	20	3.023	12	2.934	15
Access to child daycare centers **(SSOF21)**	3.036	9	2.836	20	2.885	16
Access to/location of the shopping mall **(SSOF22)**	2.491	24	2.725	23	2.668	24
Availability of public transportation **(SSOF23)**	2.509	23	2.930	18	2.827	20
Availability of power supply **(SSOF24)**	3.400	2	3.316	2	3.336	2
Availability of water supply **(SSOF25)**	3.527	1	3.795	1	3.730	1
Major and minor access road network **(SSOF26)**	2.709	17	3.251	4	3.119	8

MR: Mean Rating Source: Survey 2021

Table 3 Household Heads Sustainable Housing Choices SEVF Ranking

Sustainable Environmental Factors	Female N=55		Male N=171		Overall Score Rank	
	MR	Rank	MR	Rank	MR	Rank
Air quality **(SEVF1)**	2.836	5	2.889	4	2.876	4
Efficient waste management **(SEVF2)**	3.109	2	3.269	1	3.230	1
Use of appropriate materials **(SEVF3)**	2.927	4	2.784	7	2.819	5
Thermal comfort (heating/cooling system) **(SEVF4)**	2.636	7	3.006	2	2.916	3
Energy access **(SEVF5)**	2.509	8	2.854	5	2.770	8
Less/Absence of noise pollution **(SEVF6)**	3.145	1	2.947	3	2.996	2
Absence of water pollution **(SEVF7)**	2.836	5	2.789	6	2.801	7
Lighting quality, e.g., Daylighting **(SEVF8)**	3.036	3	2.737	8	2.810	6

MR: Mean Rating Source: Survey 2021

4.2. Exploratory Factor Analysis of the Suitability of Sustainable Economic Factors

Exploratory factor analysis (EFA) is conducted to reduce the number of items from large to small to provide construct validity evidence (Field, 2013). EFA was carried out using IBM SPSS25 on eleven (11) sustainable economic factors (SECF) variables of sustainable housing choices (SHC). The factor analysis was carried out on the eleven (11) SECF factors obtained from the responses of 226 household heads.

The 11 factors were reduced into eight (8) SECF factor items, as shown in the communalities of factors for household heads in Table 4. The factors reduction was carried out by setting the absolute value for extraction at 0.5 value. At initial extraction, any item (factor) with an extraction value less than the 0.5 absolute value was deleted to obtain communalities. All items were loaded with absolute values greater than 0.5 extraction value in the communalities of factors. The communalities of the factors were achieved after four (4) iterations. Total variance analysis, as shown in Table 5, indicated a cumulative variance of 59.8% by three extracted components. Table 6 shows that the eight (8) reduced items of SECF were loaded and factored into three (3) components, with component 1 having four (4) items, component 2 having two (2) items, and component 3 having two (2) items after rotation converged at four (4) iterations using principal component analysis (PCA) method of extraction. The three components extracted accounted for 59.8% total (cumulative) variance, as indicated in Table 6. The three components were coded as Income and Expenditure (IE) for Component 1, with 26.5% variance; Employment and Price (EP) for Component 2, with 17.9% variance; and Transport and Banking (TB) for Component 3, with 15.4% variance. The items under Income and Expenditure (IE) included: Energy bill in relation to income **(SECF4)**, Household income level **(SECF1)**, Rental cost in relation to income **(SECF3)**, and Water bill in relation to income* **(SECF5)**. Items under Employment and Price (EP) comprised Employment opportunities **(SECF6)** and House price in relation to income **(SECF7)**. At the same time, Transport Cost and Banking (TB) contained the following items Availability of banking services* **(SECF11)** and Transportation cost in relation to income **(SECF10)**.

Table 6 also shows the Kaiser-Meyer-Olkin (KMO) value which measures sampling adequacy as 0.6 is more than the 0.5 minimum recommended by Kaiser (1974) and is equal to Pallant (2013) recommendation of a KMO value of 0.6 and above. Thus, data sampling adequacy is sufficient. Hence, the SECF sample is acceptable. Bartlett's Test of Sphericity showed the significance of SECF factors with 0.000 significant value. The value of Bartlett's test of sphericity indicates that the correlation matrix is not an identity matrix. None of the Average Variance Extracted (AVE) values for each component were below the minimum acceptable 0.5 value. All the composite reliability (CR) values were 0.7 and above.

Table 4 SECF Communalities of Factors

Communalities[a]		
	Initial	**Extraction**
SECF1	1.000	.520
SECF3	1.000	.573
SECF6	1.000	.687
SECF7	1.000	.710
SECF10	1.000	.639
SECF11	1.000	.501
SECF4	1.000	.612
SECF5	1.000	.539

Extraction Method: Principal Component Analysis.
[a] Head of Household = Household heads

Table 5 SECF Total Variance Explained[a]

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.120	26.504	26.504	2.120	26.504	26.504	1.844	23.044	23.044
2	1.430	17.881	44.385	1.430	17.881	44.385	1.632	20.406	43.450
3	1.231	15.387	59.771	1.231	15.387	59.771	1.306	16.321	59.771
4	.905	11.317	71.088						
5	.813	10.167	81.255						
6	.602	7.531	88.786						
7	.502	6.271	95.057						
8	.395	4.943	100.000						

Extraction Method: Principal Component Analysis.
[a]Head of Household = Household heads

Table 6 SECF Rotated Component Matrix[a,b]

Common Name	Item	Component		
		1	2	3
Income and Expenditure (IE)	SECF4	.718		
	SECF1	.709		
	SECF3	.698		
	SECF5	.558		
Employment and Price (EA)	SECF6		.827	
	SECF7		.798	
Transport Cost and Banking (TB)	SECF10			.795
	SECF11			.688
Eigen Value (*59.771%)*		26.504	17.881	15.387
Average Variance Explained (AVE ≥ 0.5)		0.5	0.7	0.6
Composite Reliability (CR ≥ 0.7)		0.8	0.8	0.7
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy				0.6
Bartlett's Test of Sphericity		Approx. Chi-Square		246.518
		Df		28
		Sig.		.000

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a]Head of Household = Household heads
[b]Rotation converged in 4 iterations.

4.3. Exploratory Factor Analysis of the Suitability of Sustainable Social Form

EFA was carried out using IBM SPSS25 on twenty-six (26) sustainable social factors (SSOF) variables of sustainable housing choices (SHC). The factor analysis was carried out on the twenty-six (26) SSOF factors obtained from the responses of 226 household heads. The factors were reduced into ten (10) SSOF factor items as shown in the communalities of factors for household heads in Table 7. The factors reduction was carried by setting the absolute value for extraction at 0.5 value. At initial extraction, any item (factor) with an extraction value less than the 0.5 absolute value is deleted to obtain communalities. All items were loaded with absolute values greater than 0.5 extraction value in the communalities of factors. The communalities of the factors were realized after six (6) iterations. Total variance analysis, as shown in Table 7, indicated a cumulative variance of 72.5% by four extracted components. Twenty-six (26) items or factors of SSOF were reduced into ten (10) items which were loaded and factored into four (4) components, with components 1 and 2 having three (3) items each, while components 3 and 4 having two (2) items each after rotation converged at six (6) iterations using principal component analysis (PCA) method of extraction (See Table 8 and Table 9). The four components extracted accounted for

72.5% total (cumulative) variance, as indicated in Table 9. The four components were coded as Housing Characteristics (HC) for component 1, with 35.0% variance; Education and Location (EL) for Component 2, with 13.9% variance; Daycare and Mall (DM) for Component 3, with 12.4% variance; and Accessibility and Transport (AT) for component 4, with 11.2% variance. The items under Housing Characteristics (HC) included Housing unit size **(SSOF12),** Household size **(SSOF11)**, and Clean and attractive **(SSOF13)**; items under Education and Location (EL) comprised Access to educational centers **(SSOF20)**, Availability of power supply **(SSOF24)**, and Housing location, (city, urban, etc.) **(SSOF16)**; Daycare and Mall (DM) contained the following items Access to child daycare centers **(SSOF21)** and Access to/location of a shopping mall or market **(SSOF22)**; while Road Access and Transportation (RT) contained the following item's Availability of public transportation **(SSOF23)** and Major and minor access road network **(SSOF26)**.

Table 9 also shows the Kaiser-Meyer-Olkin (KMO) value which measures sampling adequacy as 0.6, which is more than the 0.5 minimum recommended by Kaiser (1974) and Pallant (2013), who recommended a KMO of 0.6 and above for sufficient sampling adequacy. Hence, the SSOF sample is acceptable. Bartlett's Test of Sphericity showed the significance of SSOF factors with a 0.000 significant value. None of the Average Variance Extracted (AVE) values for each component were less than the minimum acceptable 0.5 value. All the composite reliability (CR) values were 0.7 and above.

Table 7 SSOF Communalities of Factors

	Communalities[a]	
	Initial	Extraction
SSOF11	1.000	.822
SSOF12	1.000	.739
SSOF13	1.000	.711
SSOF21	1.000	.817
SSOF22	1.000	.724
SSOF20	1.000	.749
SSOF24	1.000	.841
SSOF23	1.000	.708
SSOF26	1.000	.561
SSOF16	1.000	.582

Extraction Method: Principal Component Analysis.
[a]Head of Household = Household heads

Table 8 SSOF Total Variance Explained[a]

Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	3.502	35.016	35.016	3.502	35.016	35.016	2.172	21.717	21.717
2	1.400	13.999	49.015	1.400	13.999	49.015	1.870	18.705	40.422
3	1.236	12.358	61.372	1.236	12.358	61.372	1.762	17.621	58.043
4	1.117	11.172	72.545	1.117	11.172	72.545	1.450	14.502	72.545
5	.701	7.012	79.557						
6	.653	6.533	86.090						
7	.499	4.986	91.076						
8	.362	3.622	94.699						
9	.290	2.895	97.594						
10	.241	2.406	100.000						

Extraction Method: Principal Component Analysis.
[a] Head of Household = Household heads

Table 9 SSOF Rotated Component Matrix[a,b]

Common Name	Item	Component			
		1	2	3	4
Housing Characteristics (HC)	SSOF12	.817			
	SSOF11	.787			
	SSOF13	.768			
Education and Location (EL)	SSOF20		.817		
	SSOF24		.755		
	SSOF16		.667		
Daycare and Mall (DM)	SSOF21			.866	
	SSOF22			.743	
Road Access and Transportation (RT)	SSOF23				.837
	SSOF26				.683
Eigen Value (72.545%)		35.016	13.999	12.358	11.172
Average Variance Explained (AVE ≥ 0.5)		0.6	0.6	0.7	0.6
Composite Reliability (CR ≥ 0.7)		0.8	0.8	0.8	0.7
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy					0.7
Bartlett's Test of Sphericity		Approx. Chi-Square			716.375
		Df			45
		Sig.			.000

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a]Head of Household = Household heads
[b]Rotation converged in 6 iterations.

4.4. Exploratory Factor Analysis of the Suitability of Sustainable Environmental Factors

EFA was carried out using IBM SPSS25 on eight (8) sustainable environmental factors (SEVF) variables of sustainable housing choices (SHC). The factor analysis was carried out on the eight (8) SEVF factors obtained from the responses of 226 household heads. The factors were reduced into six (6) SEVF factor items, as shown in the communalities of factors for household heads in Table 10. The factors reduction was carried out by setting the absolute value for extraction at 0.5 value. At initial extraction, any item (factor) with an extraction value less than the 0.5 absolute value is deleted to obtain communalities. All items were loaded with absolute values greater than 0.5 extraction value in the communalities of factors. The communalities of the factors were achieved after four (4) iterations. Total variance analysis, as shown in Table 11, indicated a cumulative variance of 72.8% by three extracted components. Table 12 indicated that the six 6) reduced items of SEVF were loaded and factored into three (3) components which had two (2) items each after rotation converged at four (4) iterations using the principal component analysis (PCA) method of extraction. The three components extracted accounted for 72.8% total (cumulative) variance, as indicated in Table 12. The three components were coded as Waste and Pollution (WP) for Component 1, with 29.3% variance; Energy Efficiency (EE) for Component 2, with 25.7% variance; and Materials and Noise Pollution (MN) for Component 3, with 17.8% variance. The items under Waste and Pollution (WP) included Air quality **(SEVF1)** and Efficient waste management **(SEVF2)**; items under Energy Efficiency (EE) comprised Energy access **(SEVF5)** and Thermal comfort (heating/cooling system) **(SEVF4)**; while Materials and Noise Pollution (MN) contained the following items Use of appropriate materials **(SEVF3)** and Less/Absence of noise pollution **(SEVF6)**.

Table 12 also shows the Kaiser-Meyer-Olkin (KMO) value which measures sampling adequacy as a 0.5 value. It satisfied the 0.5 value minimum Kaiser (1974) recommended for sufficient sampling adequacy. Bartlett's Test of Sphericity showed the significance of SEVF factors with a 0.000 significant value. None of the Average Variance Extracted (AVE) values for each component were below the minimum acceptable 0.5 value. Also, the composite reliability (CR) values were 0.8, above the minimum 0.7 value.

Table 10 Communalities of Factors

Communalities[a]		
	Initial	Extraction
SEVF1	1.000	.753
SEVF2	1.000	.696
SEVF3	1.000	.823
SEVF4	1.000	.657
SEVF5	1.000	.806
SEVF6	1.000	.631

Extraction Method: Principal Component Analysis.
[a]Head of Household = Household heads

Table 11 SEFV Total Variance Explained[a]

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.756	29.272	29.272	1.756	29.272	29.272	1.552	25.871	25.871
2	1.540	25.660	54.932	1.540	25.660	54.932	1.515	25.256	51.127
3	1.070	17.840	72.771	1.070	17.840	72.771	1.299	21.644	72.771
4	.645	10.746	83.517						
5	.604	10.062	93.579						
6	.385	6.421	100.000						

Extraction Method: Principal Component Analysis.
[a]Head of Household = Household heads

Table 12 SEVF Rotated Component Matrix[a, b]

Common Name	Item	Component		
		1	2	3
Waste and Pollution (WP)	SEVF1	.848		
	SEVF2	.824		
Energy Efficiency (EE)	SEVF5		.894	
	SEVF4		.774	
Materials and Noise Pollution (MN)	SEVF3			.890
	SEVF6			.668
Eigen Value *(72.771%)*		29.272	25.660	17.840
Average Variance Explained (AVE ≥ 0.5)		0.7	0.7	0.6
Composite Reliability (CR ≥ 0.7)		0.8	0.8	0.8
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy				0.5
Bartlett's Test of Sphericity		Approx. Chi-Square		185.434
		Df		15
		Sig.		.000

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a]Head of Household = Household heads
[b]Rotation converged in 4 iterations.

Figure 1 summarizes the framework of drivers of social, environmental, and economic sustainable housing choices for rental household heads. Forty-five (45) SHC drivers or factors were extracted using principal component analysis of exploratory factor analysis and reduced to 24 items which were then condensed to ten (10) main groups: SECF were ultimately grouped into three main drivers (i.e., Employment and Price, Income and Expenditure, Transport Cost and Banking); SSOF were grouped into four drivers (Housing Characteristics, Education and Location, Daycare and Mall, Road Access and Transportation); and SEVF grouped into three drivers (Waste and Pollution, Energy Efficiency, Materials, and Noise Pollution).

Figure 1 also indicates each Sustainable Housing Choices grouped component's average mean (AM) rating value. Each of the component SHC was rated and ranked using the AM values. Results show Employment and Price (EP) with a 3.35 average mean and Income and Expenditure (IE) with a 2.91 average mean rated first and second positions for SHC Sustainable Economic Factors. Housing Characteristics (HC) and Daycare and Mall (DM), with an average mean of 2.99 and 2.71, were rated first and second, respectively, for the SHC Sustainable Social Factors. Waste and Pollution (WP), with an average mean of 2.81, was ranked first among the SHC Sustainable Environmental Factors. In contrast, Energy Efficiency (EE) and Materials and Noise Pollution (MN) were jointly rated second with a 2.71 average mean.

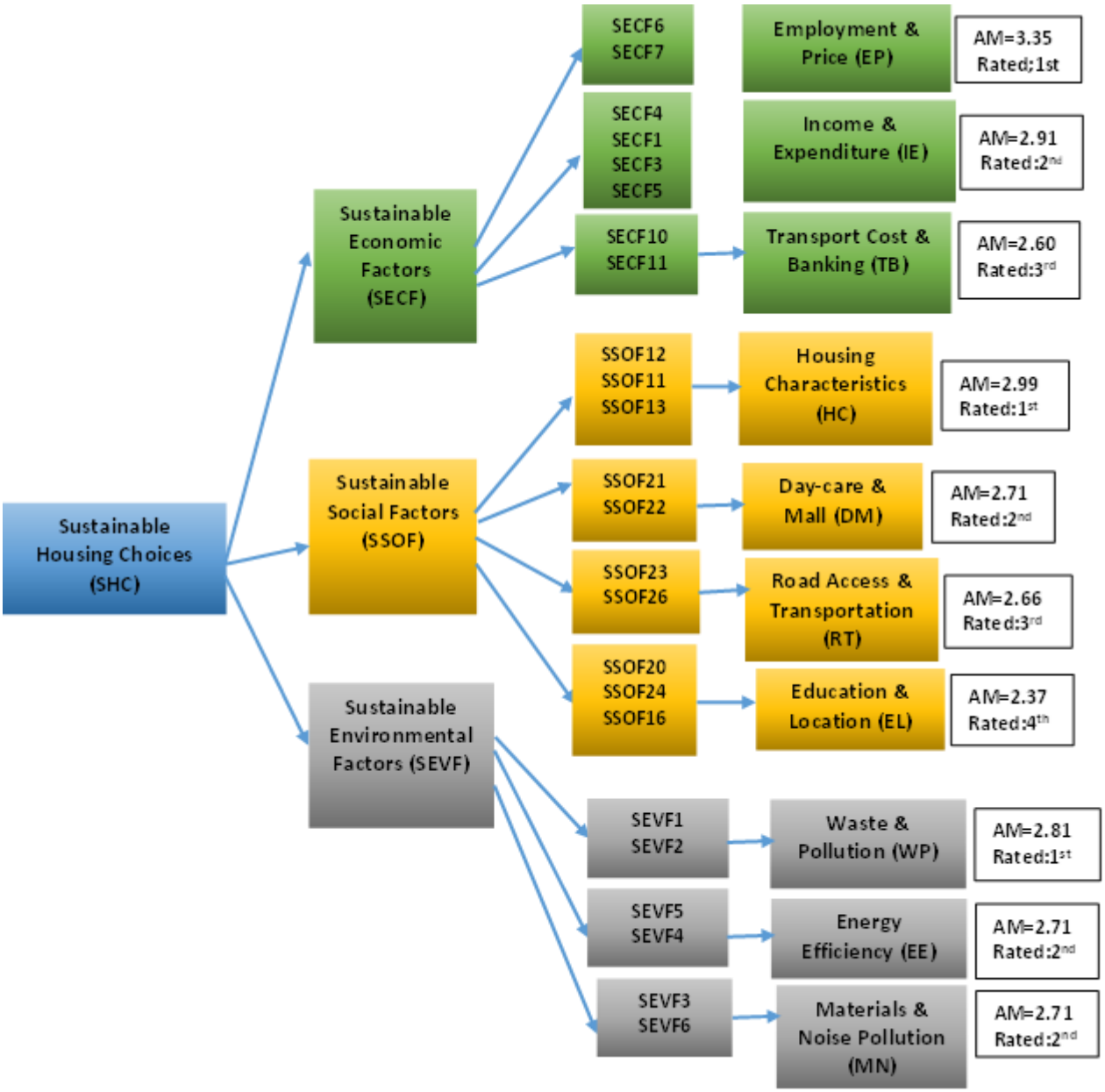

Figure 1 SHC Exploratory Factor Analysis

5. CONCLUSION

The study concluded on the economic, social, and environmental housing choices that both male and female households could make for their rental affordability. The sustainable economic housing choices drivers that household heads can consider for household rental affordability are Employment and Housing Prices and income and expenditure. Employment and housing prices comprise employment opportunities and house prices concerning income. Income and expenditure are the combinations of energy bills regarding income, household income level, rental cost on income, and water bill pertaining to income. Sustainable social housing choices drivers are housing characteristics and access or availability of dare-care and malls. Housing characteristics include housing unit size, household size, and clean and attractive houses, while access to daycare and mall, as well as the availability included location, shopping mall, and daycare for children. Sustainable environmental housing choices drivers are waste and pollution, energy efficiency, as well as materials and noise pollution. The overall conclusion is that there are some similarities in the factors of sustainable housing choices decisions for rental affordability of male and female household heads.

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