AN ASSESSMENT OF PUBLIC HOUSING COMPONENTS IN PORT MORESBY AND LAE CITIES USING PRINCIPAL COMPONENT ANALYSIS (PCA)

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ABSTRACT

This study is designed to identify and assess the salient value-enhancing-features of the existing public housing infrastructure in Port Moresby and Lae cities of Papua New Guinea. The study was conducted in eight (8) randomly selected public housing areas (four suburbs from each of the two cities of Port Moresby and Lae that fall under the same institutional and legal jurisdiction of the Morobe Provincial Government). Residents of 157 public housing units were successfully interviewed using stratified sampling based on segmentation of the income levels of the population sample according to PNG's public servants' performance-based salary scale for 2012-2013.The primary data collection instruments used consisted of questionnaires, informal interviews and field observations, while secondary data was sourced mainly from the National Population Census, 2011.Findings indicate that the patent principal components of public housing in PNG include water leakages and access roads that are infested with pot-holes needing urgent repairs. In addition, many of the housing structures need urgent repairs, while tenant's housing allowances have to be reviewed upwards to match the rate of inflation and neutralize the effects of the current economic hardships on people living in the country. The salient latent components of the public housing units include low levels of tenants' satisfaction with their accommodation that is generally regarded as choky due to the small amount of living space available in the units, and the changing preferences of tenants that are not adequately addressed by the existing public housing policy.

Keywords: Principal components, public housing, open market, Port Moresby, Lae, PNG.

1. INTRODUCTION

Public housing units in PNG are defined as apartments (flats), low- and medium-cost housing units that are referred to as affordable houses when compared to the open market residential housing units. Therefore, the distinguishing factor between the public and open market housing sectors in the country is the fact that rents on public housing units are charged at rates that are well below the open market rates. Public housing units are heavily subsidised by the government, which means that the government pays a huge portion of the housing cost to make the units affordable for the successful tenants who pay a smaller portion of the cost.

Housing affordability has been defined by different researchers from different perspectives. Some researchers define affordability as the cost of housing over the income before tax per annum on any household (Yates, *et al.* 2007). Others express affordability of housing as the proportion of a gross income for a household with which one can be able to afford a house without the deprivation of other life necessities (Jennifer, 2007). According to Gabriel, *et al.* (2005, p. 52), affordability may be defined as a notion of reasonable housing costs with regard to any household income.

Households may be expected to afford housing costs if the costs do not exhaust a greater portion of the household income, thus leaving the household with an adequate portion of the income to access other needs, such as food, clothing, medical services, education, and the like (National Housing Survey, 1991, p. 3). According to LAU (2001, p. 6), households should be able to occupy housing that meets socially accepted norms of adequacy at a net rent which leaves them enough income to live on without falling below some poverty standard. Housing affordability, therefore, is largely a function of income (Fiscelli, 2005, p. 1).

The present study was carried out to identify and assess the salient features and components of the existing public housing stock in Port Moresby and Lae cities, being the two largest cities in Papua New Guinea. The paper comprises four parts in the following order. In the first section, the introduction, problem definition, contributions to knowledge and the conceptual framework, are presented. The method adopted follows in the second section, while the findings and discussion are presented in the third section. The conclusion and recommendations are presented in the last section.

2. NATURE OF THE PROBLEM AND CONTRIBUTIONS TO KNOWLEDGE

The bane of the existing public housing stock in the urban centers of PNG that is developed for public employees is the chronic lack of adequate and regular maintenance. Consequently, the properties are rundown, while it is not an overstatement to say that some are almost unfit for human habitation. The streets are in bad conditions especially in Lae City, although Port Moresby has better street conditions within the public housing areas. There are several reasons for this dilemma. However, poor funding is the major contributing factor. There is a dearth of studies focusing on housing affordability in PNG. Most of the previous studies dwell on city liveability and sustainability issues. The present empirical study is overdue because it attempts to identify the salient components of the public housing stock that add value to housing. The study has also discovered that a change in the added value of one known component of the existing public housing stock would result in a bigger change in the level of satisfaction and preference of the tenants for a house to rent. This in return determines the housing affordability status of the tenants.

Towards this end, the study attempts to answer two research questions as a means of contributing to the knowledge of housing affordability with particular reference to Papua New Guinea, a developing nation, as follows:

i) *What are the salient features and value-creating components of the existing public housing stock?*

ii)   *How can we determine the interrelationships between the public housing components using Principal Component Analysis (PCA)?*

3. CONCEPTUAL FRAMEWORK

The conceptual framework for this study exploits some aspects of housing *affordability* with regards to the interrelationships between the various concepts indicated in Figure 1. According to Jiboye (2011), housing may be conceived as a multi-dimensional package of goods and services, which should extend beyond shelter itself but having diverse social, economic, cultural and physical attributes (Onibokun, 1985). Land supply, cost of compliance with regulatory requirements, fees and charges imposed by all levels of government in the city, taxation policies for investments in property development, taxation incentives, infrastructure costs, rebate schemes and grants are some of the variables impacting the cost of new housing (Tiwari, 2010).

Figure 1 illustrates how housing affordability is usually determined in a typical market economy. The demographic factors include human populations in the cities within a country or region, population growth rate and birth rate, which generate an effective demand for housing. All things being equal, the higher the population in a particular area the higher the demand for housing. Similarly, the supply of housing is dependent upon the availability of buildable land. The more land that is available for housing, the higher the chances are that more houses will be built to ease demand. If demand is not matched by supply, there will be an increase in prices and rents of the limited stock as prospective buyers and renters in the city begin to groan under the biting effects of a seller's or landlord's market. If price rise is not quickly brought under control by the government, a housing bubble may emerge. The interest rates offered by the commercial banks for housing loans also determine the accessibility of the people to finance for housing development (Yates, *et al.* 2007). Meanwhile, city residents who do not have any reasonable housing allowance would most certainly have to depend on their lean income in order to meet the market-determined house prices and rental rates in addition to the interests offered by the mortgage financiers.
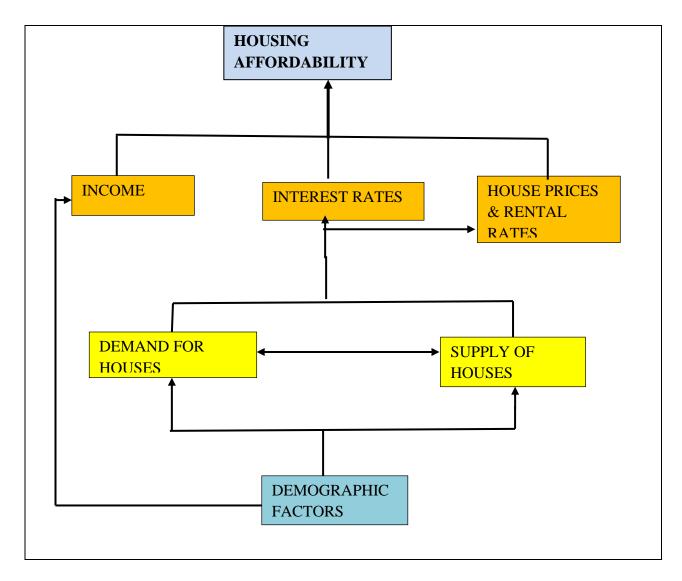
Figure 1: Determination of Housing Affordability
Source: Yates, *et al.* (2007)

4. METHODS

The study was conducted in eight (8) randomly selected public housing areas (four suburbs from each of the two cities of Port Moresby and Lae that fall under the same institutional and legal jurisdiction of the Morobe Provincial Government). Residents of 157 public housing units were successfully interviewed using stratified sampling based on segmentation of the income levels of the population sample according to PNG's public servants' performance-based salary scale for 2012-2013.The primary data collection instruments used consisted of questionnaires, informal interviews and field observations, while secondary data was sourced mainly from the National Population Census, 2011.

Questionnaires and informal interviews were administered on house-to-house basis, while physical observations of the formal housing areas and the squatter settlements were done through guided reconnaissance surveys undertaken with the assistance of two paid local residents in each of the squatter settlements selected for the study for safety reasons. The surveys and interviews were conducted amongst the city residents who are public servants and current tenants living in the National Housing Corporation housing units. Essentially, non-public servants were excluded from the study. The formal and informal interviews were entirely based on the conversations that took place between the respondents and field assistants, which were focused on the respondents' perceptions and experiences concerning the value-enhancing components and features of the existing public housing units.

Stratified sampling technique was used because the sample size had to be divided into three categories of high-income earners, medium-income earners and low-income earners. The three income strata were verified prior to questionnaire design for purposes of accuracy of data, while the stratification process was cross-checked with consultations with the National Housing Corporation in both cities to identify the locations of the low- and medium-cost public housing units sampled for the study. Data based on the public servants' salary scales for 2012-2013 was used to stratify the sample population in the two cities. Data analysis was done using the Statistical Package for the Social Sciences (SPSS), particularly for Chi-Square, Principal Component Analysis (PCA) and associated descriptive statistics.

5. FINDINGS AND DISCUSSION

In this section of the paper, we report on the results yielded by data analysis, based on the two research questions earlier posited in the paper, as follows:

i) *What are the salient features and value-creating components of the existing public housing stock?*

The study has identified the salient features and value-creating components of the existing public housing stock within Port Moresby and Lae cities. The principal components are the utilities, housing allowance, the streets' conditions, property fencing, house rental values, house types, and number of bedrooms. According to the National Association of Home Builders (2007), the economic life of the components of housing depends on the quality of installation, quality of maintenance, the weather and climate, and the intensity of use of the components.

We gathered from our site inspections and the NHC's official records that the existing public housing units have been provided with all the basic utilities, such as pipe-borne water, electricity, garbage collection and sewerage necessary for any approved standard dwelling in the cities and other urban areas of PNG. In other words, these basic utilities are available to each of the existing 157 public housing units surveyed in both cities (Table 1 and Figure 2). The availability of the utilities is the first component (PCA 1) of the existing public housing stock that was verified by this study.

Table 1: Frequency distribution of utilities available in the existing public housing stock

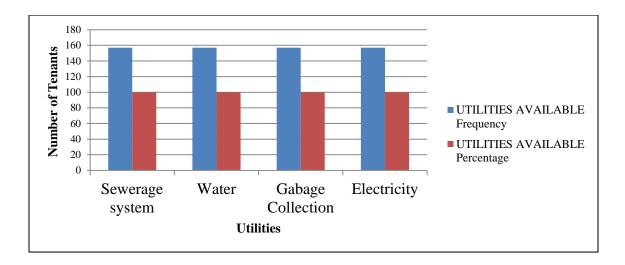| Name of utility	No. of housing units enjoying the utility	Percentage of housing units served
Sewerage	157	100
Pipe-borne Water	157	100
Garbage Collection	157	100
Electricity	157	100
Total	**157**	**100**

Figure 2: Bar chart illustrating utilities available in the existing public housing stock

All of the basic utilities that a habitable dwelling located in an urban area are available to all the 157 housing units that were surveyed during the study. Another public housing component that was investigated was housing allowance, with regards to the question of how much housing allowance does the government allocate to public servants fortnightly along with their fortnight salary? The study found that the fortnightly housing allowance paid to the public servants who currently live as tenants in the surveyed housing units is within the range of K6 to K9 per fortnight. This housing allowance is only paid to public servants on Grade 10 level (PS10) and above within the public service salary scales 2012 - 2013 in PNG, while those workers below Grade 10 level in the public service are not entitled to this housing allowance. This less fortunate category of public servants includes all the public servants earning K10,056/annum (Grade PS 01) up to grade PS 09 (K23,183/annum) who pay their rents out of their fortnight income (PNG General Order, Number 13, Salaries and Allowances, 2012). They are represented by zero (0) housing allowance per annum and there were 59 such tenants in the sampled population. This indicates that the majority of the tenants living in the existing public housing units are those from levels PS 01 to PS 09. Another 34 tenants indicated K156/annum or K6/fortnight as their housing allowance, while yet another 31 tenants indicated that they earn K182/annum or K7/fortnight as housing allowance. There are 26 tenants who are paid

K234/annum or K9/fortnight as housing allowance. A few tenants have housing allowance higher than K9/fortnight. These are tenants of public houses that had been sold out by the NHC and are no longer in the stock of public housing. They are owned by individuals and private firms and rented at open market rates (Table 2).

Table 2*: Housing allowance per annum paid to current tenants living in public housing units

Housing allowance per annum (PNG Kina)	No. of houses	Percent	Comments
0	59	37.6	59 households do not receive any housing allowance
156	34	21.7	34 households receive an allowance of K156 p.a.
182	31	19.7	31 households receive K182 p.a. housing allowance
234	26	16.6	26 households receive K234 p.a. housing allowance
780	1	0.6	1 household receives K780 p.a. housing allowance
3120	1	0.6	1 household receives a housing allowance of K3,120 p.a.
10400	2	1.3	2 households receive K10,400 p.a. housing allowance
14300	2	1.3	2 households receive K14, 300 housing allowance
22100	1	0.6	1 household receives K22, 100 p.a. housing allowance
Total	**157**	**100**	

As indicated in Table 2, about 38% of the tenants interviewed are not paid any housing allowance. Such tenants pay their rents out of their own income. The public housing units are rented within the range of K44/fortnight or K1, 144/annum (for bedsitters) to K400/fortnight or K10, 400/annum (for high-cost houses), depending on the type of house with regards to the size of its floor area. This is another component of the existing public housing stock. Rents above this range (greater than K400/fortnight) are privately-owned and rented at the open market rates. In addition to that, the number of bedrooms also determines the category into which a house falls. For example; there are 3-bedroom high-cost houses and 3-bedroom medium-cost houses of varying floor areas and varying rents within the existing public housing stock.

The identified salient features of public housing are the external conditions of the housing structures (improvements), the accessibility of the homes (streets conditions), and provisions for

security (fencing) of lives and properties. Furthermore, the existing public housing units are easily accessible, although most of the access streets in the suburbs of Lae City are unsealed unlike those in Port Moresby where the majority of the streets are sealed. Generally, the conditions of the streets in Lae are very bad in comparison to those in Port Moresby. There are no street lightings for most of the surveyed streets in Lae while Port Moresby has lightings installed for some of the streets the surveyed suburbs. These observations are summed up in Table 3, where Code 1 represents very good public housing units located along streets that are sealed and have lightings (19.1%), Code 2represents good housing units located along sealed streets without lightings (29.9%), and Code 3 represents bad public housing units along unsealed streets and without lightings (51%).

Table 3*:* Street conditions in public housing suburbs

Street conditions	Codes	No. of housing units	Percent
Very good	1	30	19.1
Good	2	47	29.9
Bad	3	80	51.0
Total		**157**	**100.0**

The second salient feature examined is the external conditions of the housing units. The current conditions of the majority of the houses are good (habitable). This is illustrated in Table4, where 56.1% of the houses are good and are coded 1. Another 60 houses (38.2%) are evaluated as bad (coded 2), while the remaining 5.7% are deemed to be in very bad condition (coded 3).

Table 4: External conditions of public housing units

External condition	Code	No. of housing units	Percent
Good	1	88	56.1
Bad	2	60	38.2
Very Bad	3	9	5.7
Total		**157**	**100.0**

The third salient feature of the existing public housing stock is the security of the homes and tenants with regards to perimeter fencing in any form. Some of the existing homes appear to be secure in terms of fencing (24.8%) as indicated in Table 5. However, most of the fences are old and worn out as a result of persistent weathering and lack of maintenance over the years. In addition to that, the majority of the existing public housing units are not fenced at all (75.2%) as Table 5 reveals.

Table 5: Public housing units that are fenced or not fenced

Fencing	No. of houses	Percent
Fenced	39	24.8
Not Fenced	118	75.2
Total	**157**	**100**

ii)   *How can we determine the interrelationships between the public housing components using Principal Component Analysis (PCA)?*

Principal Components Analysis (PCA) was employed to determine the interrelationship (strengths of association) between the main components of public housing and the number of occurrence of each component in the data set (Table 6).

Table 6*: Data on salient components and features of public housing*

Component	Number of houses	Percent
1. Housing allowance per annum (PNG Kina). 1 USD = 0.3339 PNG Kina (18 November 2016)		
0 –5, 000	152	97
5, 000 – 10, 000	0	0
10, 000 – 15,000	4	2.5
15, 000 – 20, 000	0	0
20, 000 – 25000	1	0.5
Total	**157**	**100**
2. Street Conditions		
Very Good	30	19.1
Good	47	29.9
Bad	80	51.0
Total	**157**	**100**
3. External Conditions		
Good	88	56.1
Bad	60	38.2
Very Bad	9	5.7
Total	**157**	**100**
4. Fencing		
Fenced	39	24.8
Not Fenced	118	75.2
Total	**157**	**100**
5. Housing Type		
High Cost	29	18.5
Medium Cost	60	38.2
Low Cost	68	43.3

Total	157	100
6. Number of Bedrooms		
1 Bedroom	12	7.6
2 Bedrooms	73	46.5
3 Bedrooms	71	45.2
4 Bedrooms	1	0.6
Total	**157**	**100**
7. Rents per Annum (PNG Kina)		
0 – 2000	41	26
2001 – 4000	13	8
4001 – 6000	38	24
6001 – 8000	28	18
8001 – 10000	0	0
10001 – 12000	25	16
12001 and over	12	8
Total	**157**	**100**

Principal Component Analysis (PCA) was performed using the seven variables in Table 6, listing the components and salient features of public housing in Port Moresby and Lae Cities to identify the latent variables under which the components and features of public housing fall. Two types of results were obtained from the initial Principal Component Analysis. First, the anti-image diagonals produced the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) value of 0.561 for each variable (Table 7), while the KMO option produced the overall chi-square value of 184.23 (Table 8). The results indicate good values for all variables, which are above 0.5, but lower than 0.8 (Table 7) with an overall value of 0.561. However, the Bartlett's Test of Sphericity has an associated P-value (sig.) of <0.001 that is recorded as 0.000.

Table 7: Initial Principal Components Analysis indicating sampling adequacy for each salient

feature and component of the public housing stock

Anti-image Matrices								
		Rental Per Annum	Resid Type	No. Bedrooms	Housing Allow	External Condit	Streets condition	Security Level (fences)
Anti-image Correlation	Rental Per Annum	.671a						
	Residence Type	.269	.542a					
	Number of Bedrooms	.000	.706	.550a				
	Housing Allowance per annum	-.302	-.065	-.071	.542a			

External Conditions (structures)	.069	-.004	.012	-.015	.681a		
Streets Conditions	.006	.162	.243	-.139	-.046	.433a	
Security Level (fencing)	-.032	-.038	.065	-.065	-.019	-.162	.693a

a. = Measures of Sampling Adequacy (MSA)

Notes:

The closer the values get to one (1), the better the results. The further from one (1) the values get, the worse the results become. The good values are values that are greater than 0.5 but must be less than 0.9. Those below 0.5 or greater than 0.9 are regarded as bad values and are excluded from further data analysis (data reduction). The results in Table 8 are all good values except streets conditions (0.433) that is nonetheless accepted for further analysis in this study since the data is relatively small.

Table 8: Measure of the overall sample adequacy of the components and salient features of the existing housing stock

KMO and Bartlett's Tests		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.561
Bartlett's Test of Sphericity	Approx. Chi-Square	184.229
	df	21
	Sig.	.000

The KMO and Bartlett's Tests produced an overall sampling adequacy of 0.561. This figure is greater than 0.5, which is a good value by the rule of thumb that says any value between 0.5 and 0.8 is a good value. The overall sample adequacy is significant at 0.001, which is indicated in Table 8 as 0.000.

Extracting the Factors or Components

Further analysis was carried out in order to identify the hidden or latent variables of the already identified components and salient features (Table 9).

Table 9: Extraction Method: Principal Components Analysis for 2 components

Variables	Component 1
Rental Per Annum	.637
Residence Type	-.870

Number of Bedrooms	.855
Housing Allowance per Annum	.637
	Component 2
External Conditions	.642
Streets Conditions	.093
Security Level	.664
Rental Per Annum	.582
Housing Type	.642

Based on the results in Table 9, it can be seen that there are two groups of principal components or latent variables of public housing. 'Rent per annum' and 'housing type' are two unique variables that feature in both PCA 1 and PCA 2, reason being that both variables play a vital role in determining a tenant's level of satisfaction with housing and preference for a particular type of housing. For example, if a tenant lives in a rented housing unit, s/he would prefer to enjoy better external conditions, including a good fence for enhanced security. These two groups of components are analysed separately as Principal Component Analysis One (PCA 1) and Principal Component Analysis Two (PCA 2).

First Principal Components Analysis (PCA 1) of Tenants' Levels of Satisfaction

The first set of principal components or latent variables defines and measures tenants' levels of satisfaction with their accommodation, which has a strong correlation with four (4) variables (Table 9) namely: rent per annum (0.637), type of residence (-0.870), number of bedrooms (0.855), and housing allowance (0.637). The findings under Component 1suggest that as one of the four variables increases, the others will tend to increase as well in either direction (+/-) as indicated by one negative sign and three positive signs (Table 9). Component one (1)is most strongly correlated with the variable 'residence type' (-0.870), albeit in a negative direction. 'Residence type' refers to the three categories of public housing units referred to as high-cost, medium-cost and low-cost housing units. Based on a correlation coefficient of -0.870, this principal component (1) is primarily a measure of the 'residence type' of tenants who live in the high- or medium-cost houses and the rents they pay, which increases as privileges to more bedrooms (more space) increase. On the other hand, those tenants of the low-cost houses pay lower rents and tend to have fewer privileges to higher numbers of bedrooms (less space). This in short demonstrates that the higher the rent, the more space the typical house provides, *ceteris paribus.*

The results show that the quality of public housing units represented by the 'residence type' variable has an inverse relationship with 'number of bedrooms' and 'rents per annum' (Table 9). This means that the higher the rents charged on public housing units, the higher the number of bedrooms. However, public housing units are categorized according to the amount of space they provide to tenants not the number of bedrooms. For example, a 2-bedroom low-cost

house and a 2-bedroom medium-cost house differ in floor and land areas; therefore even when they provide the same number of bedrooms, they are still categorized according to the floor and land space they provide. In view of these findings, it may be summarized that the public housing units in the two study areas generally have similar attributes with the exception of floor and land areas that are used in segmenting the public housing sector. For instance, a 3-bedroom medium-cost house will have a very similar floor area to a 3-bedroom low-cost house in any location across the country. The only exception is that floor and land areas are larger in the high-cost houses than in the low-cost houses. This is the reason why the 'residence type' variable has an inverse relationship with the 'number of bedrooms' and 'rents per annum' variables.

Second Principal Components Analysis (PCA 2) of Tenants' Preferences

The second set of principal components (PCA 2) defines and measures the preferences of tenants for a particular public housing unit, which has a slightly weaker but positive correlation with five variables, namely: external conditions (0.642), street conditions (0.093) with a relatively low correlation coefficient, fencing for security (0.664),rental per annum (0.582), and housing type (0.582). The fact that fencing for security has the highest correlation (0.664) reflects the general preference of all tenants to live in highly secured premises that will be a no-go area for burglars and intruders.

CONCLUSION AND RECOMMENDATIONS

This study has identified some principal components and salient features of public housing in the two largest cities of Papua New Guinea – Port Moresby and Lae. The principal components are analysed in two categories: PCA 1, which are the four factors determining tenants' level of satisfaction with their accommodation, and PCA 2, which are the five factors determining tenants' preferences for particular public housing units. Knowledge of these nine variables is crucial for housing policy makers and other stakeholders in their attempts at improving public housing facilities for workers who live in the public housing sector.

The salient features of the existing public housing stock are the nine (9) statistically significant principal components identified by the study. These include the external conditions of housing units, their accessibility and security (fencing) from burglary and intruders, while the availability of all the basic utilities like pipe-borne water, sewerage and electricity within the houses, housing allowance, rents per annum, number of bedrooms and the house type are also identified as principal housing components. It is interesting to note that all the basic utilities that any habitable dwelling requires in modern times are readily available to all the public housing units in the surveyed sample. Most of the houses are also in good or fair condition while a few are in bad condition and are unfit for human habitation due to their old age which already exceeds their 'economic life'. Generally, therefore, many houses that are presently inhabited by tenants are in dire need of corrective and planned maintenance in order to prolong their 'economic life'. For example, the Korobosea flats in Port Moresby have staircases that are falling apart and need maintenance. Besides, most of the standalone homes in the suburbs surveyed in both Port Moresby and Lae are in need of fly wires, louver blades, frames and walling replacements of broken fibro-walls. Yet, the accessibility of the housing units is generally good,

although many neighborhood streets are in bad condition as most of them, particularly in Lae, are unsealed. Conversely, most of the neighborhood streets in Port Moresby are sealed and in good condition. Nevertheless, the majority of the public housing units in both cities are not fenced so are not really secure from intruders and burglars.

An attempt has been made in this paper to answer two research questions as a means of contributing to the knowledge of housing habitability and city liveability in Papua New Guinea. The first question investigated the principal components and salient features of the existing public housing stock in Port Moresby and Lae. Findings indicate that all the 157 public housing units surveyed are provided with the basic utilities that are essential for healthy living, such as pipe borne water, electricity, sewerage and garbage collection. However, only 3.2% of the respondents who also are public servants on Grade 10 and above receive a housing allowance above PNGK10, 400 per annum. This group of tenants tends to live in purchased/sold public housing units that are no longer in the stock of public housing. Such houses are owned by individuals and private firms and are rented on the open market at higher rates. Housing allowance is intended to assist public servants in meeting their tenancy obligation of rent payment in the face of skyrocketing house rents in the two cities where there is no rent control policy in place. Worse still, public servants below Grade 10 do not receive any housing allowance and they are forced to resign to their fate and pay rent from their low income. The three categories of public housing are the high-cost, medium-cost and low-cost houses, with varying floor and land areas. This categorisation, along with the number of bedrooms per housing unit, determines the rent chargeable by the landlord (National Housing Corporation).

The second research question attempted to apply Principal Components Analysis (PCA) in identifying the significant salient features and principal components of public housing stock in the two cities studied. Two categories of principal components have been identified in the study: PCA 1 which defines and measures tenant's satisfaction with housing, and PCA 2 which defines and measures tenant's preference for housing. Altogether, nine components, including two ('rent' and 'type of housing' that featured repeatedly in PCA 1 and PCA 2 because of their nature and their contributions to "satisfaction" and "preferences") were found to be statistically significant. Findings support a chi-square value of 184.229 that was statistically significant at 0.000 and 21 degrees of freedom. Effectively, the seven significant components of public housing are: rent, type of housing, number of bedrooms, housing allowance, external condition, street condition and security (fencing). All of them have a positive correlation coefficient above 0.5 in their respective component group, except 'residence type' with a negative correlation of -0.870, and street condition with a relatively low and positive correlation coefficient of 0.093.

Based on the various findings above, it may be concluded that more funds need to be made available by the National Housing Corporation (NHC) for both the corrective and planned maintenance of all the public housing units, neighborhood streets within the suburbs, and street lightings. Majority of the housing units have been identified to be insecure as there is no perimeter fencing around them, while some that are fenced are not well maintained. In many cases, the external façade of some houses needs to be replaced in order to enhance the habitability of the houses, as well as guarantee 'quiet enjoyment' for the tenants and raise the standards of city liveability and city sustainability in Papua New Guinea in general.

Finally, more affordable public housing units need to be constructed as a matter of high priority to accommodate more deserving public servants, while eligibility criteria used by policy makers for tenant selection should be reviewed and made more realistic and flexible in order to accommodate more public servants earning low wages.

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