THE NATIONAL RESEARCH INSTITUTE
PAPUA NEW GUINEA

DISCUSSION PAPER

DYNAMICS OF MARKET PRICES FOR RESIDENTIAL PROPERTIES IN PAPUA NEW GUINEA: EVIDENCE FROM PORT MORESBY

Eugene E. Ezebilo
Logea Nao
Lucy Hamago
Maureen Thomas

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Abbreviations & Acronyms

- CBD: Central Business District
- GDP: Gross Domestic Product
- ICCC: Independent Consumer and Competition Commission
- NEC: National Executive Council
- NHC: National Housing Corporation
- PNG: Papua New Guinea
- PNG LNG: Papua New Guinea Liquefied Natural Gas
- OLS: Ordinary Least Squares
- SME: Small and Medium Scale ENTERPRISES

Abstract

Access to affordable housing and secure land for development is a long-standing issue in Papua New Guinea (PNG). This paper reports on a study of market prices for houses and land in Port Moresby, and factors influencing house prices. It also aims to explore potential strategies for improving access to housing and secure land. Data were obtained from properties that were advertised for sale and rent in The National newspaper from March 2015 to March 2016. The data were analysed using descriptive statistics and the ordinary least squares regression model. The results show that market prices for residential properties have decreased, but are still beyond the reach of most Port Moresby residents. The weekly house rent price ranges from PNG Kina (K)550 to K8,000 (US$167 to $2,424). The sales price for houses ranges from K160,000 to K23 million (US$48,485 to $6,969,697). The average sales price for one hectare of land was K2,803,460 (US$849,533). House price was influenced by factors such as house type, number of bedrooms and location. The residential property market in PNG could be improved by urban development managers and policy-makers by considering the economic cycle of the country when making decisions. The findings of this study can assist in making informed decisions on sustainable access to housing and land in Port Moresby and potentially other cities in PNG.

Keywords: Economic cycle; housing policy; residential property market; real estate; urban development

Ch. 1 Introduction

Household's expenditures on housing play an important role in the share of the household's income available for other necessities such as food, clothing, health care and education. As house prices increase, the ability of households to afford other necessities decreases and consequently their standard of living lowers. For this reason, providing housing that households can pay for and while at the same time being able to pay for other necessities is becoming a policy issue in many countries (Bramley, 2012; Gurran & Phibbs, 2013). For example, in a Chinese study of housing affordability in post-reform China, Cheng et al. (2010) found that many households in China find it difficult to afford the housing price. In a Dutch study, Haffner and Boumeester (2010) found that house prices in the Netherlands are increasing due shortages in supply of houses relative to demand. In a Nigerian study, Makinde (2014) found that house prices in Nigerian cities are becoming beyond the range that households can afford. The housing market in Papua New Guinea (PNG) is not well organised and data on house prices for planning and making informed policy decisions are lacking (Ezebilo et al. 2016; Endekra et al., 2015). This study contributes to generating market prices for residential property over time and the dynamics associated with this.

Many factors have been identified that influence house prices. A shortage in supply of houses relative to demand increases house prices (Haffner & Boumeester, 2010), and a low interest rate increases investment in housing and consequently increases the supply of houses to the housing market, which pushes down house prices (Hashim, 2010). Prices are influenced by house quality, location, access to services, human population in an area (Mulliner et al., 2013; Kamal et al., 2016) and government policies on provision of housing (Haffner & Heylen, 2011; Kutty, 2005). Shortages in supply of land push up costs of building houses and consequently push house prices up (Nubi, 2008; Glaeser et al., 2005). Shortages of skilled personnel, high cost of building materials and high cost of land also push house prices up (Makinde, 2014); as do accessibility to city centre (Tse, 2002) and credit supply (Kasparova & White, 2001; Agnello & Schuknecht, 2011). Housing prices are also influenced by income growth, industrial production, employment rate and housing characteristics (Hwang & Quigley, 2006; Ceron & Suarez, 2006; Zietz et al., 2008). Finally, they are affected by mortgage market features (Adams & Fuss, 2010), human population in an area, size and number of rooms, household income and external demand (Jud & Winkler, 2002; Salim, 2008; Balazs & Dubravko, 2007). All these factors are important for designing an effective housing policy and making informed decisions about housing.

Economic booms and busts participation in SMEs in PNG

It is important to note that residential property prices often follow the trend of the business cycle or economic cycle in a country. For this reason, during the period of boom (economic growth) residential property prices are expected to rise, whereas they fall during economic bust (economic decline). An economic boom is characterised by increased productivity, rising demand, increased commercial activity, and increased output, employment and income, which might be accompanied by a period of inflation. Detken and Smets (2004) found that periods of asset price booms occur when real asset prices are more than 10 percent above the estimated trend. Bust is often associated with a rapid decrease in economic

growth, which leads to a decline in the gross domestic product (GDP) of a country. A feature of 'boom-bust' is that the fall in asset prices is associated with a decline in economic activity (Bordo & Jeanne, 2002). Gerdesmeier et al. (2009) found that domestic credit aggregates, nominal long-term interest rates and investment are the best indicators for busts.

Housing is one of the most important sectors of the economy because it provides shelter for people, which is a necessity and at the same time can serve as an asset. The housing sector provides jobs for many people as well as generating revenue for the state. It is important to have a greater understanding of the dynamics of residential property prices in the different phases of the economic cycle. This could then assist urban development planners and policy-makers in making informed decisions on the provision of housing to urban dwellers.

In a study of fiscal policy during boom-bust phases in asset prices, Jaeger and Schuknecht (2007) found that fiscal revenue is strongly linked to asset price cycles, which lead to an increase in public expenditure during period of booms and public debt during busts. In a comparative study of boom-bust cycles in Nordic countries, Jonung et al. (2009) found that the volatile character of the Finnish and Swedish boom-bust cycle from 1984 to 1995 was influenced by financial liberalisation and hard currency policy. In a study of multi-directional linkages between asset markets and fiscal policy for a set of industrialised countries, Agnello and Sousa (2011) found that fiscal policy multiplier effects are strongly magnified during severe housing busts. Meanwhile Agnello and Schuknecht (2011) found that global liquidity plays an important role in the occurrence of housing boom and banking crises during bust periods. It is important for policy-makers and planners to take into account the emerging asset price booms when making informed decisions and to develop early-warning devices for identifying booms and busts.

Boom and bust cycle in Papua New Guinea

The construction phase of the PNG Liquefied Natural Gas (LNG) project triggered a five-year construction boom in the housing sector in Port Moresby due to the increase in demand for houses by workers at the PNG LNG and other allied businesses. This contributed to immense inflation in house prices because supply of houses could not match demand. House rental price doubled between 2008 and 2012. However, the PNG LNG project contributed positively to the GDP of the country.

PNG is a typical country that has passed through a period of economy boom and is currently experiencing the period of bust. The boom came during the construction phase of the PNG LNG project, which generated a lot of jobs and migration of people from various parts of the country to areas near the site of the project such as Port Moresby, in search of jobs. PNG is one of the countries whose economy depends on the export of petroleum to generate revenue. The price of petroleum in the international market during the period of the economy boom was stable. This led to investments in the housing industry and services to meet the demands that came along with the boom. This in turn led to the construction of several new roads, new hotels, shopping malls and an upgrade of the Port Moresby International Airport. Several private property developers, such as EDAI Town Development Limited, built houses to accommodate the teeming population in Port Moresby while subsidiaries of Glory Group of Companies that focus on residential properties emerged.

In a study of property price movements in Port Moresby conducted during the economy boom phase, Endekra et al. (2015) found that the sales prices for residential properties had an increasing trend. Likewise, in a study of market prices of residential properties in Port Moresby towards the end of the construction phase of the PNG LNG, Ezebilo et al. (2016) found that the prices remained high. During the study period, several projects in the hous-

ing industry that began during the construction phase of PNG LNG were completed. It is important for urban development planners and policy-makers to have more understanding of the impacts of periods of economy boom and bust on residential property prices so they can make informed policy decisions. The study reported in this paper contributes to it. This study has some similarities to studies by Endekra et al. (2015) and Ezebilo et al. (2016), especially in the data collection procedures and analysis. However, the main differences are that the data used for Endekra et al. and Ezebilo et al. studies were collected during the economy boom and a year after the boom, respectively. The data collection for this study were collected during economy bust, when oil prices in the international market crashed. In addition, this study compares residential property prices during the boom period, at the end of the boom period and during bust periods, whereas Endekra et al. (2015) and Ezebilo et al. (2016) focused on the mid-phase and later phase of the boom period, respectively.

Built areas are often classified into informal and formal built areas (Arvanitis, 2013). Informal built areas are those developed without a proper development plan, land without proper titles and trunk infrastructure, and where services are not introduced. Formal built areas are characterised by the presence of proper building plans, land with proper titles and serviced with all necessary trunk infrastructure and services such as clean potable piped-borne water, sewerage, electric power and good road networks. This study focuses on residential properties in formal built areas.

The aims of this paper

The aims of this paper are three-fold. The first is to examine the dynamics of supply and pricing of residential properties across all suburbs of Port Moresby. The second is to compare the market prices of properties in the city during boom and bust periods. The third is to explore policy lessons that could be drawn from findings from this study.

We hope that findings from this paper will contribute to the ongoing policy discussions on potential strategy for making housing more accessible to residents of major cities in PNG. The findings contribute to an understanding of the impacts of economic cycles on market prices for residential properties in Port Moresby and potential strategies that could be used to absorb shocks triggered by different phases of the cycle. This should contribute to informed decisions on the development of policies for improving the residential property sector in PNG.

Ch. 2 The study area

Port Moresby is the capital of PNG and the largest city in the country, as well as the largest residential property market (Ezebilo et al., 2016). People often migrate from different areas of PNG to Port Moresby in search of jobs to better their lives, which contributes to an increase in the population of the city. Port Moresby had a population of 364,125 people in 2011, which had increased to over 400,000 people in 2015 (Global Cities Research Institute, 2015; PNG National Statistical Office, 2015). However, the supply of houses to residents of the city has not been able to match with demand, which has contributed to pushing up house prices especially during the construction phase of PNG LNG (Endekra et al., 2015). This was exacerbated by the shortages of secure land for development. State-owned land, which is preferred by investors due to security of tenure and reduced transaction costs, is almost exhausted. The remaining land, which is customarily-owned, is conversely difficult to access and in most cases the tenure is insecure. This has led to an upsurge of the informal housing sector in Port Moresby, where trunk infrastructure and services such as clean potable piped-borne water, electric power and sewerage are lacking (Yala, 2010). Coupled with the problems associated with inaccessibility of secure land for development, most house building materials are imported from abroad and there are shortages of skilled labour and equipment. This contributes to the cost of developing houses (Ezebilo and Hamago, 2017). In order to tackle the problems associated with provision of housing, the PNG Government introduced several initiatives such as the National Land Development Program (NLDP), whose mandate was to develop systems and processes for accessing customary land. Besides doing this, the Program advocated for the establishment of the Office of Customary Land and Development, which was designed to administer customary land. The Office was established in 2016 (NEC Decision No. 33/2016) but was rescinded the same year by the National Executive Council. The government also contributes towards the provision of housing through the National Housing Corporation and National Housing Estate Limited. These state-owned entities are theoretically involved in the development and supply of houses to the market (Webster et al., 2016). Recently, several private property developers, including EDAI Town, the Glory Group of Companies and the Curtain Brothers, have emerged and are involved in providing housing too.

There are 15 suburbs in Port Moresby, as follows:

- Badili, Boroko and Erima;
- 8 Mile, 5 Mile and Gerehu;
- Gordons, Hohola and Korobosea;
- 9 Mile, Sabama and 6 Mile; and
- Tokarara, Town (also known as Downtown) and Waigani.

For a more detailed description of the suburbs of Port Moresby, see Endekra et al. (2015).

Ch. 3 Data collection and analysis

The data collection approach is similar to that of Endekra et al. (2015) and Ezebilo et al. (2016). The data were obtained from houses and land that were advertised for sales and rental on the Homes and Property pages of The National newspaper. The houses and land were reviewed and their attributes and prices were registered on an Excel spreadsheet on every first Tuesday of each month from March 2015 to March 2016; that is, for a period of 13 months. The attributes of house prices collected include location, number of bedrooms and house type, while those of land prices included location and size. Sales and rental prices, date (day, month and year) that the advertisement was placed and name of the real estate agent that paid for the advertisement were also collected.

The data were analysed using simple average, median, simple percentages and ordinary least squares (OLS) regression. These were presented in graphs and pictograms such as bar charts. The analysis focused primarily on differences between house sales and rental prices in relation to location, house type, number of bedrooms and month of the year. Land sales and rental prices in relation to location, size and month of the year were analysed. In PNG, three-bedroom houses are most common. For this reason, sales and rental prices for a three-bedroom in relation to location, house type and period of the year were analysed.

Some of the advertised land was listed in square metre (m2), and some in hectares (ha). For uniformity and to allow for comparison of land sales and rental prices in relation to location and size, the unit of each of the advertised land was converted to ha. To covert land area that was listed in m2 to ha, we divided the area by 10,000.

Ordinary least squares regression

The OLS was used to examine factors influencing the sales and rental price of houses. The OLS assumes that the error terms have the same variance; that is, homoscedasticity (Verbeek, 2007). To explore whether our OLS models meet the assumptions, the Breusch-Pagan test was applied (Greene, 2003). The test statistics were 273.70 and 186.71 for sales and rental price models, respectively. The critical value of chi-squared at six degrees of freedom at one percent statistical significance level is 16.81; thus, the null hypotheses of homoscedasticity were rejected for the two models. This indicates that the error terms in each of the models do not have equal variance (heteroscedasticity). In order to correct for the heteroscedasticity, the log-linear form of OLS was applied. This involves the transformation of continuous variables in the model to log form. For this reason, the price and bedroom variables were converted to logarithms using the LIMDEP statistical package (Econometric Software, Inc. 2007). For the Breusch-Pagan test for the log-linear form, the test statistics were 23.15 and 69.77 for the sales and rental price models, respectively. The critical value of chi-squared at 6 degrees of freedom at one percent level is 16.81, which indicates that the log-linear form decreased the heteroscedasticity. The results from the logarithmic transformation were corrected for heteroscedasticity by means of White's heteroscedasticity-consistent variance estimate (Greene, 2003). To explore multicollinearity in the independent variables, the variance inflation factor of the variables was estimated. The variance inflation factor of each of the included independent variables did not exceed 2.8. This indicates that multicollinearity and correlation are not serious problems (Chatterjee & Price, 1991) in the estimated models. The valuation function for OLS was estimated as

in equation 1:

$$Log(\Pr ice_h) = \alpha + \beta_1 H_type + \beta_2 Log(Bedroom) + \beta_3 CBD + \beta_4 M_Area + \beta_5 EN_Mile + \beta_6 L_Area + \varepsilon$$

Where is constant, β is a vector of parameters to be estimated, Price is house sales or rental price, H_type is house type, Bedroom is number of bedrooms, CBD is central business district, M_Area is historical medium-income area, EN_Mile is 8 and 9 Mile suburbs, L_Area is historical low-income area and ε is the error term.

Limitations of study

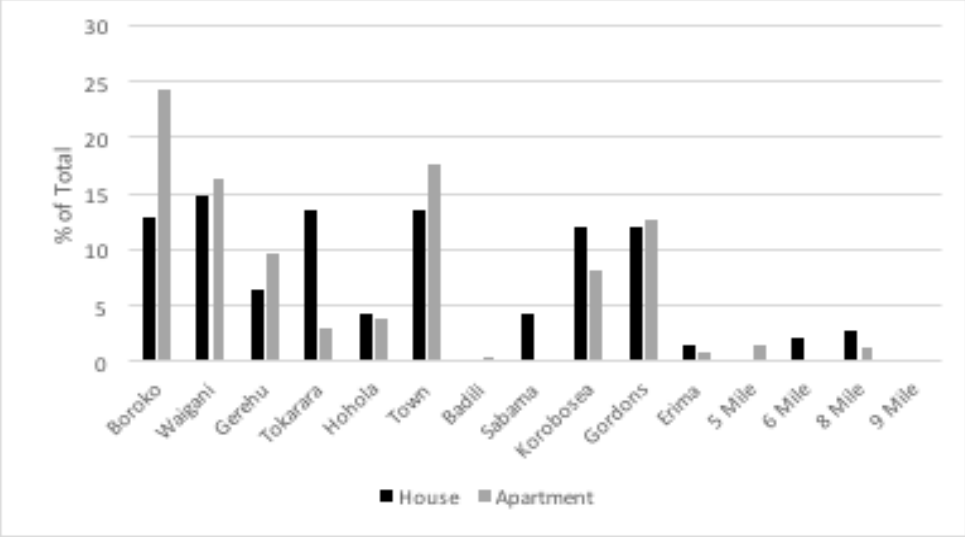
The data used in this study came from sales and rental prices of houses and land that were advertised in a newspaper. Some houses and land might be sold or rented without being advertised on The National newspaper. For this reason, the monetary values reported in this study do not reflect the values of all residential properties transactions that took place in Port Moresby's property market within the study period. Like in most developing countries, the residential property market in PNG and Port Moresby in particular is not well organised. There are huge informal market transactions in the city which is difficult to account for (Chand & Yala, 2012). In addition, other sources from which we could access residential property price data such as real estate agencies often find it difficult to provide such data. For these reasons, we have used the newspaper as our data source. The aim is to use series of the data to develop a property price database which will be useful for planning and decision making.

Some of the houses and land that were advertised might be readvertised, which might result in double counting and overestimation of monetary value of the residential properties that were advertised during the period of study. Numerous factors such as lot size, house age, maintenance history and distance to the city centre have been implicated to influence house and land prices. However, these factors were not included in the advertisements and we could not explore them.

Ch. 4 Results

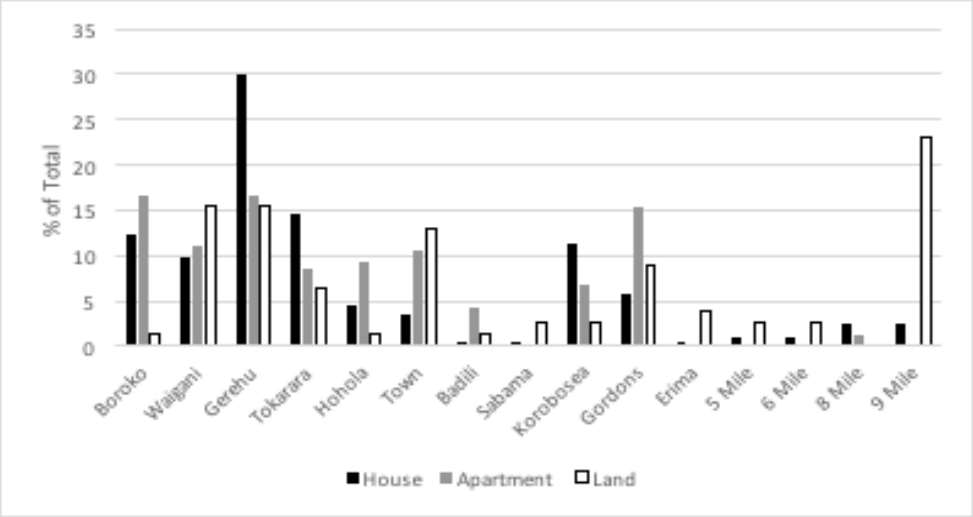
Of the 1,061 residential properties that were advertised for sale and rent, approximately 94 percent were useable for analysis. Six percent of the properties were excluded because they were advertised jointly and lacked some unit of measurement. For example, some land was advertised for sales without specifying its size. In other cases, houses and land were on the same advertisement without specifying their specific prices. Approximately 58 percent of the useable advertised properties were for rent and 42 percent for sale. Of the properties for rental, approximately 99.7 percent were houses and 0.3 percent land. Of the houses advertised for rental, 77 percent were apartments and 23 percent standalone houses. Boroko had the highest number of apartments for rent (24%), whereas 9 Mile, Sabama and 6 Mile had the least (0.2% each). In the case of standalone houses, Waigani had the highest (15%) and Erima had the least (1.4%). Badili, 5 Mile and 9 Mile had no standalone house for rent (see Figure 1).

Figure 1: Properties advertised for rent in Port Moresby in The National, March 2015 to March 2016



Of the properties that were advertised for sale, 92 percent were houses and 8 percent land. Approximately 64 percent of the houses were standalone houses and 36 percent apartments. Gerehu had the highest number of standalone houses for sale (30%); Badili, Erima and Sabama had the least (0.5% each). Boroko and Gerehu had the highest number of apartments (16.6% each); 8 Mile had the least (1.2%). Sabama, Erima, 5 Mile, 6 Mile and 9 Mile had no apartments offered for sale (see Figure 2). Of land advertised for sale, 9 Mile had the most (23.1%); Boroko, Hohola and Badili had the least (1.3% each); 8 Mile had no land for sale.

Figure 2: Properties advertised for sale in Port Moresby in The National, March 2015 to March 2016



Property type, location and corresponding rental prices

The results show that weekly house rent prices range from K550 to K8,000 (see Table 1). The average weekly rent price was K2,146, which corresponds to a median of K1,700. Town had the highest average weekly rent price for apartments (K3,457) and standalone houses (K4,731). Six Mile had the lowest average weekly rent price (K800) for apartments and Hohola had the lowest for standalone houses (K1,150). The average weekly rent price for a three-bedroom house ranges from K650 to K7,000. Badili, Erima and 9 Mile were excluded from this analysis because they had only few observations, which might not be a true representative of house rental prices in the suburbs.

Table 1: Average and median weekly house rent prices, in Kina

Suburb	All houses	S. house	Apartment	3-bedroom
Boroko	2,146	2,350	2,113	2,306
	[2,100]	[2,250]	[2,100]	[2,500]
8 Mile	1,325	1,613	1,133	1,063
	[1,150]	[1,100]	[1,150]	[1,100]
5 Mile	1,200	-	1,200	1,370
	[1,100]		[1,100]	[1,500]
Gerehu	1,232	1,153	1,252	1,227
	[1,300]	[1,200]	[1,300]	[1,200]
Gordons	1919	1,711	1986	2,329
	[1,500]	[1,500]	[1,500]	[2,150]
Hohola	1,148	1,150	1,072	1,081
	[1,000]	[1,000]	[1,000]	[1,000]
Korobosea	2,144	2,440	2009	2,130
	[2000]	[2,500]	[2000]	[2000]

Sabama	2,083	2,083	-	2,100
	[2000]	[2000]		[2000]
6 Mile	1650	2,075	800	1,840
	[925]	[950]	[800]	[950]
Tokarara	1,456	1,606	1,168	1,447
	[1,200]	[1,200]	[1,200]	[1,000]
Town	3,688	4,731	3,457	3,708
	[3,500]	[5,000]	[3,500]	[3,500]
Waigani	1980	2,470	1,812	2,509
	[1,300]	[1,800]	[1,200]	[1,500]

S. house is standalone house, US$1 is Papua New Guinea Kina (K)3.3. Median price is in square brackets.

Property type, location and corresponding sales prices

The results revealed that house sales price range from K160,000 to K23 million. The average sales price was K1,861,270, corresponding to the median of K1,100,000. The average sales price for one hectare (ha) of land was K2,803,460. Town had the highest average sales price for standalone (K5,064,710) and three-bedroom houses (K3,360,000), see Table 2. Gerehu had the lowest sales price for standalone houses (K683,165) and 9 Mile had the lowest for three-bedroom (K536,250). Boroko had the highest average sales price for apartments (K5,500,000)and 9 Mile had the lowest (K536,250). In terms of land, 9 Mile had the highest average sales price (K5,735,330), see Table 2. Waigani had the lowest sales price (K326,000). Erima, Sabama and 6 Mile were excluded from this analysis because they had only few observations, which might not be a true representative of property sales prices in the suburbs.

Table 2: Average and median sales price for houses and land, in Kina

Suburb	All houses	S. house	Apartment	3-bedroom	Land in ha
Badili	2,173,750	2,069,290	2,320,000	2,110,000	-
	[2,200,000]	[850,000]	[2,200,000]	2,500,000]	
Boroko	3,422,830	1,825,000	5,500,000	2,428,100	-
	[2,500,000]	[1,675,000]	[4,900,000]	[1,750,000]	
8 Mile	894,286	802,000	1,125,000	914,000	-
	[820,000]	[820,000]	[1,125,000]	[800,000]	
5 Mile	2,066,670	2,066,670	-	-	-
	[2,500,000]	[2,500,000]			
Gerehu	699,091	683,165	838,889	661,053	408,333
	[550,000]	[550,000]	[850,000]	[500,000]	[285,000]
Gordons	1,947,370	1,404,760	2,617,650	1,895,000	950,000
	[1,500,000]	[1,400,000]	[2,500,000]	[1,500,000]	[1,200,000]
Hohola	1,025,260	720,000	1,300,000	748,000	-
	[650,000]	[650,000]	[1,300,000]	[650,000]	

Korobosea	2,412,900	1,760,000	3,600,000	2,018,000	-
	[1,800,000]	[1,700,000]	[3,500,000]	[1,700,000]	
9 Mile	536,250	-	536,250	536,250	5,735,330
	[425,000]	[425,000]	[425,000]	[6,700,000]	
Tokarara	702,653	572,250	1,282,220	715,185	335,000
	[700,000]	[550,000]	[780,000]	[550,000]	[210,000]
Town	4,620,370	5,064,710	3,865,000	3,360,000	4,200,000
	[2,800,000]	[2,500,000]	[5,100,000]	[2,650,000]	[5,300,000]
Waigani	942,391	850,529	1,800,000	1,008,000	326,000
	[880,000]	[720,000]	[1,100,000]	[880,000]	[290,000]

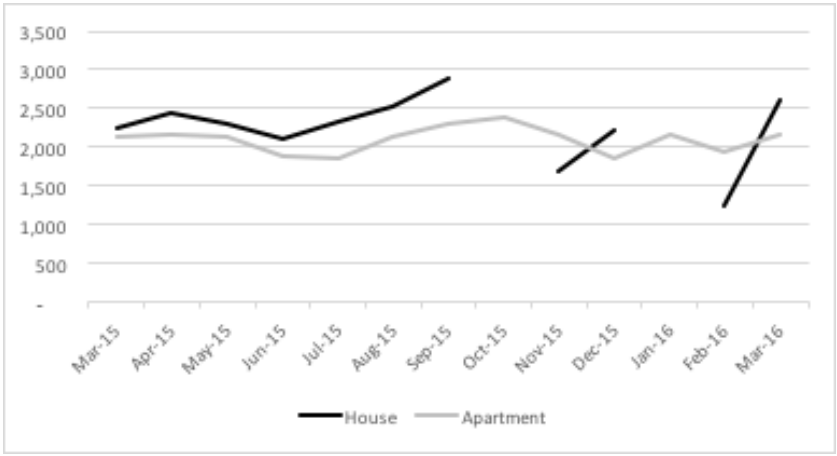
S. house is standalone house, US$1 is Papua New Guinea Kina (K) 3.3. Median price is in square bracket.

The total monetary value of all properties that were advertised for sales was K735.2 million. Accounting for the stamp duty of three percent gives approximately K22 million, which would have accrued to the state as revenue.

Rental price in relation to property type and time of year

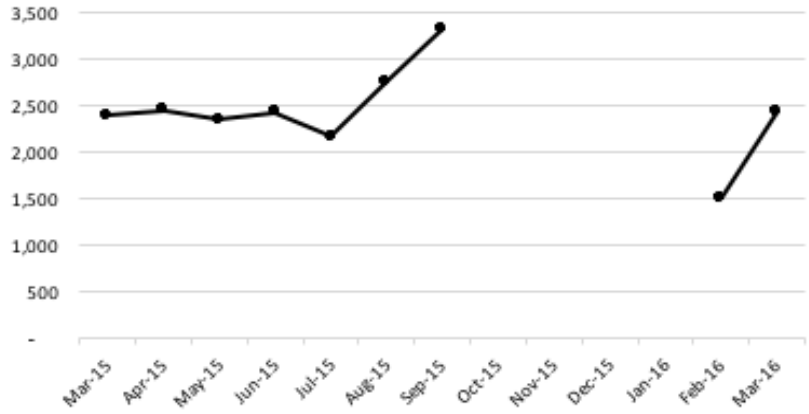
The results show that September 2015 had the highest average rental price for standalone houses (K2,875) and February 2016 had the lowest price (K1,250), see Figure 3. In terms of median house rental prices, July 2015 had the highest (K2,500) and June 2015 the lowest (K1,350). For apartments, October 2015 had the highest average rental price (K2,392) and December 2015 had the lowest (K1,854). September 2015 (K2,400) had the highest median rental price for apartments, whereas December 2015 (K1,300) had the lowest (see Figure 3).

Figure 3: Average weekly rent prices in Kina by month and property type



The average weekly rental price for a three-bedroom house was highest in September 2015 (K3,317) and lowest in February 2016 (K1,500), see Figure 4. The median weekly rental price for a three-bedroom house was highest in May 2015 (K2,500), and lowest in April 2015 and July 2015 (K2,000 each).

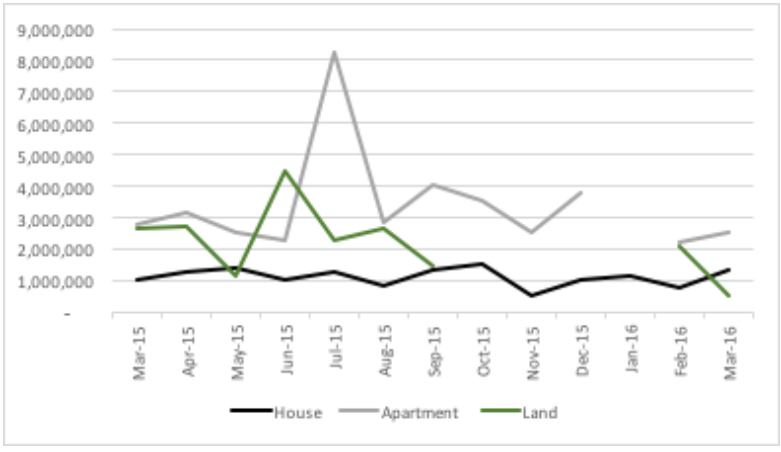
Figure 4: Average weekly rent prices in Kina by month for a three-bedroom house



Sales price in relation to property type and time of year

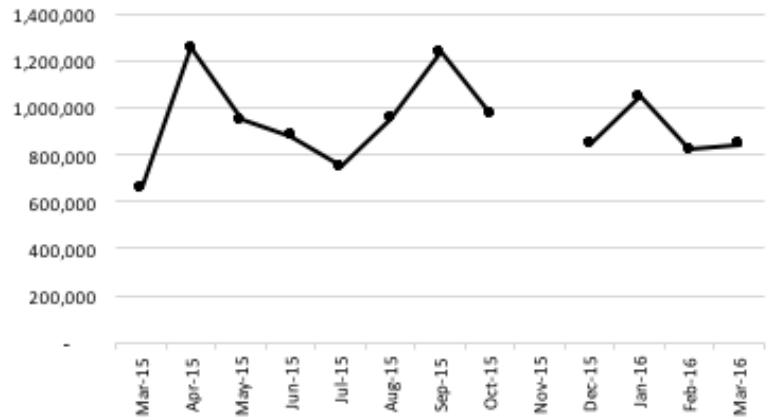
The results show that October 2015 had the highest average sales price for standalone houses (K1,507,000) and November 2015 had the lowest (K542,500), see Figure 5. April 2015 had the highest median sales price for standalone houses (K1,350,000) and February 2016 had the lowest (K460,000). In the case of apartments, July 2015 had the highest average sales price (K8,220,000) and February 2016 had the lowest (K2,225,000). July 2015 had the highest median sales price (K4,600,000) and November 2015 had the lowest (K750,000). There was no advertisements for sales of apartments in January 2016. December 2015 had the highest average sales price for land (K8,165,000); March 2016 had the lowest (K538,400). In terms of median land sales price, June 2015 had the highest (K4,600,000) and March 2016 the lowest (K265,000). Land sales were not advertised from October to December 2015 and in January 2016 (see Figure 5).

Figure 5: Average sales price in Kina by month and property type



The average sales price for a three-bedroom house was highest in April 2015 (K1,254,000); and lowest in March 2015 (K657,000), see Figure 6. April 2015 had the highest median sales price (K1,450,000), whereas May 2015 had the lowest (K500,000). Three-bedroom houses were not advertised for sale in November 2015.

Figure 6: Average sales price in Kina by month for a three-bedroom house



Factors influencing house sales and rent price

The results show that more standalone houses were advertised for sale than apartments and more apartments were advertised for rent than standalone houses (see Table 3). Houses with higher numbers of bedrooms were advertised for sale compared with rent. Of all the houses that were advertised, seven percent are found in the central business district (CBD), which is part of the Town suburb.

Table 3: Description of variables used in statistical analysis

Variable	Description	Mean	SD
$Price_h$	House sales or weekly rental price in K:		
	Sales price	1,861,270	2,289,050
	Rent price	2,159	1,347
H_type	Type of house: Apartment = 1; standalone = 0	0.35	0.48
		[0.75]	[0.44]
Bedroom	Number of bedrooms present in the advertised house.	3.41	1.20
		[2.81]	[0.74]
CBD	Advertised house is located in central business district: Yes = 1, No = 0	0.07	0.26
		[0.16]	[0.37]
M_Area	House is located in historical medium-income (Boroko and Korobosea): Yes = 1, No = 0	0.19	0.39
		0.29]	[0.46]
EN_Mile	House is located in 8 Mile or 9 Mile: Yes =1, No = 0	0.07	0.25
		[0.02]	[0.13]
L_Area	House is located in historical low-income area (Gerehu, Tokarara and Hohola): Yes = 1, No = 0	0.39	0.49
		[0.30]	[0.45]

US$1 is Papua New Guinea Kina (K)3.3. Values associated with house rental variable are in square bracket. SD is standard deviation.

Two OLS models were estimated to examine factors that might have influenced house prices (see Table 4). The first is house sales price (PricehS) and the second is house rental price (PricehR). The results showed that signs of the coefficients were similar for the two models. The coefficients associated with number of bedrooms, CBD and historical medium-income areas had positive and statistically significant effects for the two models. Coefficients associated with house type had significant effects for only the house sales price model. This implies that an increase in the number of bedrooms increases house sales and rental price.

Table 4: OLS regression model results for factors influencing house price

	PricehS		***PricehR***	
Variable	**Coefficient**	**t-value**	**Coefficient**	**t-value**
Constant	13.44	78.02***	6.66	85.95***
	(0.17)		(0.08)	
H_type	0.62	7.92***	0.01	0.16
	(0.08)		(0.05)	
Log(Bedroom)	0.32	3.12**	0.72	11.93***
	(0.10)		(0.06)	
CBD	0.84	5.21***	1.12	18.71***
	(0.16)		(0.05)	
M_Area	0.58	6.63***	0.22	5.15***
	(0.09)		(0.04)	
EN_Mile	-0.54	-3.12**	-0.21	-2.02*
	(0.17)		(0.10)	
L_Area	-0.58	-6.32***	-0.36	-7.26***
	(0.09)		(0.05)	
R^2	0.62		0.44	
Adjusted R^2	0.60		0.43	
F value	67.77		75.36	
Number of observations	263		591	

, ** and * represent 5%, 1% and 0.1% levels of statistical significance, respectively. Standard error is in parenthesis.*

The presence of CBD and historical medium-income areas are associated with an increase in house sales and rental price, whereas the presence of apartment increases only sales price. Coefficients associated with 8 Mile and 9 Mile and historical low-income areas had negative and statistically significant effects for the two models. This implies that the presence of 8 Mile and 9 Mile suburbs are associated with a decrease in house sales and rental prices.

In terms of elasticity, an increase in bedroom by one room was associated with an increase in house sales price by 0.32 percent, whereas it was 0.72 percent for rental price. The presence of apartment was associated with 0.62 percent increase in sales price. The presence of CBD was associated with an increase in sales price by 0.84 percent and rental price

by 1.12 percent. The presence of historical medium-income areas was associated with an increase in sales price by 0.58 percent, whereas it was 0.22 percent for rental price. The presence of 8 Mile and 9 Mile was associated with a decrease in sales price by 0.54 percent and 0.21 percent for rental price. The presence of historical low-income area was associated with a decrease in sales price by 0.58 percent and rental price by 0.36 percent.

Ch. 5 Discussion and policy lessons

The findings from this study show that on average, residential property prices in Port Moresby have decreased. However, the house price still remains beyond the reach of an average Port Moresby resident. The lowest weekly house rent price is K550, which corresponds to K2,357 monthly. The median gross monthly salary for public servants in PNG is K2,115 (Wangi and Howes, 2014), which indicates that the income of many Port Moresby residents is not enough to pay house rent prices. This suggests that if the aim is to make housing more affordable for Port Moresby residents, there is a need to provide more houses especially in areas that have the lowest house prices. However, there is a need to introduce trunk infrastructure such as clean potable piped-borne water, electric power and good road networks in the areas before constructing houses there, as reported by Nao and Ezebilo (2017). Comparing 2014 to 2015 market prices for residential property, the lowest average weekly house rent price in 2015 was K633 (Ezebilo et al., 2016), which corresponds to a 13 percent decrease in rent price from 2014.

The findings reveal that secure land for development in Port Moresby is becoming increasingly scarce. In this study, only eight percent land was advertised for sales, whereas in a study on assessment of market prices for residential properties, Ezebilo et al. (2016) found that land accounts for 20 percent of properties that were advertised for sales. This indicates that there is a need for the state to put more effort towards developing a potential strategy for accessing more secure customary land for development. This should be done through its agencies such as the Department of Lands and Physical Planning, Department of Planning and Monitoring, Magisterial Services, Department of Treasury, and the National Research Institute.

Findings from this study reveal that Gerehu is becoming more important in providing houses for sales than Boroko and Gordons, which have traditionally been the areas with the highest supplies of houses. Ezebilo et al. (2016) found that Boroko had the most standalone houses for sales, whereas Gordons had the most apartments for sales. In our study, we found that Gerehu had the most standalone houses for sales, while Boroko and Gerehu had the most apartments for sales. It is worrisome that most of the suburbs had either little or no land for sales compared with findings by Ezebilo et al. (2016).

In this study, 9 Mile is the most important suburb for providing land for development. This might be because the state-owned land often cherished by property developers, which is concentrated in and around the CBD, is almost exhausted and more attention have shifted to areas dominated by customary land such as 9 Mile. In addition, landowners in and around CBD who wish to sell their land might delay the sale until the period of boom so that they can get more from sales. This suggests that a delay in supplying land to the market by landowners might be a strategic response to the trends of the PNG economic cycle. In addition it is more profitable for landowners to sell their land during the economic boom than during bust when the willingness to pay diminishes. For this reason, a rational landowner will tend to be risk-neutral and would prefer to maximise benefits from sales (Casavant et al., 1999; Ezebilo et al., 2012). This is in line with Detken and Smets (2004) who found that a bust period is associated with a decrease in economic growth, which is in turn associated with a decrease in asset prices (Bordo & Jeanne, 2002). This suggests that all things being equal, landowners would get more benefits from sales of land if they

could delay the sale during a bust period until the economic cycle reverts again to boom. In addition, the price of a block of land is strongly linked to its topography and the extent of work required to make the land suitable for development. This may be the possible reason that 9 Mile, which is located in low-income neighbourhoods, had the highest land price. It may be that the topography of most of the advertised land from 9 Mile is flat and requires less work to develop it, whereas land in areas such as Town may be located in hilly areas which require a lot of work and money to develop.

House price is strongly linked to the neighbourhood where the house is located. The extent of trunk infrastructure and services, as well as security concerns of an area, often play an important role in determining the price of houses there. This could be a possible reason that houses found in historically medium to high-income areas such as Boroko, Korobosea and Town had higher sales and rental prices than houses in historically low-income areas such as Gerehu, Tokarara and Hohola. Our findings are in line with that of Endekra et al. (2015) and Ezebilo et al. (2016). However, Waigani, which had been a low-income area is becoming a medium-income area. For example, average weekly house rental price for a three-bedroom house there is higher than that of Boroko and Korobosea. Ezebilo et al. (2016) also found the same trend. This might be due to developments in Waigani such as new hotels, shops and government offices. This highlights that the value of houses can be increased by introducing the necessary facilities and services in the area.

Our findings show that average weekly rent prices for standalone houses are greater than that of apartments. This could be because standalone houses are often larger and often have more facilities than apartments, which makes them more convenient. This indicates that the rent price for a standalone house also includes cost associated with convenience. This is in line with findings by Ezebilo et al. (2016). However, our findings do not conform to that of Endekra et al. (2015) who found that in most of the suburbs of Port Moresby, house rent price for apartments were higher than that of standalone houses. A possible reason could be that during the period that Endekra et al. conducted their study, apartments were in higher demand than standalone houses, which might have pushed up prices. Another possible reason could be that some real estate agencies in PNG have not been classifying the houses correctly. For example, semi-detached houses appear to be often classified as apartments in the advertisements. This is evident in our findings on sales price of houses where the price of apartments was higher than that of standalone houses for all suburbs except Town. Our findings on house sales price is in line with that of Endekra et al. (2015) and Ezebilo et al. (2016).

Residential property prices are expected to rise during an economic boom period and fall during bust. Our findings are in line with the boom-bust cycle scenario. The property price data of 2012 to 2013 (the boom period) revealed that average weekly house rent prices for houses found in Town, Boroko, Waigani and Gerehu were K11,650, K10,173, K4,135 and K4,616, respectively (Endekra et al., 2015). Our study reveals that house rent prices from 2015 to 2016 (bust period) were K3,688, K2,145, K1,980 and K1,232 for Town, Boroko, Waigani and Gerehu, respectively. Using market price property data from 2012 to 2013, Endekra et al. (2015) found that the average sales price for standalone houses in Town was K6,342,308, Boroko K5,823,077, Korobosea K2,900,215; Gerehu K2,779,231 and Waigani K1,173,846. In our study, we found that the average sales price for standalone houses in Town was K5,064,210, Boroko K1,825,000, Korobosea K1,760,000, Gerehu K683,165 and Waigani K850,525. This reveals that house prices in Port Moresby are decreasing and that market prices for residential properties in the city follow trends of the PNG economic cycle. Our findings are in line with that of Jaeger and

Schuknecht (2007) who found that public expenditure increases during periods of boom and decreases in periods of bust. Agnello and Sousa (2011) also found that fiscal policy are magnified during bust. This tends to decrease economic activities in periods of bust and consequently lowers consumers' willingness to pay for housing. This suggests the need for policy-makers and urban development planners to consider the economic cycle and the implications of development projects on goods prices. In order to stabilise housing prices during boom-bust periods, it is important for the state to facilitate an increase in supply of houses before boom to match with demand. In addition, the state has an important role to play in managing the activities of real estate agencies to reduce the tendency of manipulating housing prices. It is necessary for housing price to be determined by market forces rather than being fixed by a group of people.

Regarding factors influencing house price using the OLS, most of our findings are in line with the literature. For example, we found that an increase in the number of bedrooms in a house increases the price of that house. One reason is that as bedrooms increase, floor space is also likely to increase. Having more bedrooms also suggests that more people who live in the house could have their own privacy. Our finding is in line with that of Salim (2008) who found in a Turkish study that an increase in number of rooms increases housing price. This suggests that in accounting for the costs of developing a house, the number of rooms should be considered, especially in developing low cost houses for improving housing affordability.

Houses located in and around CBD have the potential to attract higher prices than houses found in areas further away. Our findings support this premise and are also in line with findings from previously published papers. In an assessment of sustainable housing and developers' perspectives of housing price Mulliner et al. (2013) and Kamal et al. (2016) found that location and access to services influence housing price. In our study, we found that the Town suburb, which is the CBD of Port Moresby, is associated with an increase in housing price. In addition, Boroko and Korobosea suburbs, which are historical medium-income areas and located around the CBD were associated with an increase in housing price. A possible reason is that houses found in and around the CBD have greater access to trunk infrastructure and services and less security concerns, which are reflected in the housing price.

Houses located in areas long distances away from the CBD are likely to attract a lower market price. We found that historical low-income areas such as Gerehu, Hohola and Tokarara were linked to a decrease in housing price. This was also so for areas such as 8 Mile and 9 Mile, which are located long distances from the CBD and have little infrastructure and services. Though houses located in the areas attract lower prices compared with houses in and around the CBD, it is important to consider that some people who live in low-income areas often travel to and from the CBD for work and other business. This makes it important to provide good road networks in low-income areas to reduce travel cost and travel time to work and other activities in the CBD. Our findings are in line with that of Endekra et al. (2015) and Ezebilo et al. (2016).

Standalone houses are often larger and have more facilities than apartments and should attract higher market prices. Surprisingly, we found that apartments in Port Moresby are linked to an increase in house prices. A possible reason for the finding is that the house-type classification currently used in Port Moresby is misleading, which might have influenced the results. For example, detached houses were advertised as standalone houses and others advertised as apartments. It is necessary for real estate agencies in PNG to include semi-detached houses in their classifications of houses and not apartments.

Regarding information provided by real estate agencies on the newspaper advertisements, it is necessary for the agencies to improve information related to properties being advertised. Currently, most of the advertisements contain asymmetric information. Though the property market in Port Moresby is still in infancy stage, there is a need to make the market more competitive and efficient. To move the property market forward, all relevant information related to the properties being advertised must be included in the advertisement. Correct information on properties offered for sales or rental will contribute towards providing proper valuation for the properties. Unit price for all advertised properties should be made clearer. In the case of houses, it is necessary to include information related to floor space, history of the house, size of rooms, maintenance history and ownership. Properties should be advertised separately, not jointly. However, in cases where properties such as land and a house are advertised jointly, the price of each of the property types must be included in the advertisement.

To improve housing affordability for Port Moresby residents, it is necessary to supply more houses in low-income areas such as Gerehu, Hohola and Tokarara as well as in areas located long distances from the CBD. However, the supply of more houses to the areas must be accompanied with the introduction of necessary trunk infrastructure and services. It is also necessary to increase capacity of electricity, water supply and sewerage in the areas to meet demand. Incentives and facilities that could attract more investors in areas such as 8 Mile and 9 Mile could be introduced so that residents could be more comfortable living there. This has the potential to decongest areas in and around the CBD as well as improve underdeveloped areas of Port Moresby. The state has a lot to benefit from the development being sought here. The supply of more houses in low-income areas and in areas such as 8 Mile and 9 Mile will provide more jobs for the teeming population and revenue from taxes on salaries will accrue to the state. Stamp duties and goods and services tax from sales of houses will also accrue to the state. The investor benefits from profits made from businesses. Individual workers benefit from salaries, which should improve their welfare. To this end, policy-makers and urban development managers should see the introduction of trunk infrastructure into an area as an investment rather than a cost to the state.

Policy lessions that can be drawn from the findings

There is a need for policy-makers and planners to consider the economic cycle of PNG in making informed decisions. The boom period especially during the construction phase of PNG LNG generated much economic activities in Port Moresby that attracted people from different segments of the country and abroad. However, supply of houses during that period could not match with the demand, which pushed up house prices. The high residential property prices benefit real estate agencies, property developers and the state. Meanwhile property buyers and tenants are worse off. In addition, workers whose salaries do not reflect the upsurge in economic activities suffer more because they have to pay more for housing and their salaries do not change to accommodate the price increase. It is important for policy-makers to consider the implications of projects such as the PNG LNG on housing prices. A potential strategy to manage the situation could be to supply more houses in various segments of Port Moresby by facilitating the private sector in advance before the construction phase of PNG LNG. It is important to note that supply of the houses should have started between five to ten years before the commencement of the PNG LNG project. In addition, it is necessary to provide trunk infrastructure and services in areas long distances from the CBD to lower demand for houses in and around CBD and consequently push down house prices.

Secure land is becoming increasingly scarce. This is a long-standing problem that limits the

housing industry in PNG. Attention has shifted from state-owned land often cherished by property developers to customarily-owned land because the state land is almost exhausted (Wangi & Ezebilo, 2017). Land is one of the most important factors of production and it contributes to the cost of constructing a house and consequently influences house price. It is necessary for the state to put more effort into developing an effective strategy for unlocking more secure customary land to supplement the remaining state-owned land. A potential strategy that could be applied to access secure customary land could be to invoke Section 10 of the PNG Land Act 1996 as advocated by Dr Charles Yala, the former Director of the PNG National Research Institute. This involves landowners leasing their land to the state, urban development leases being processed by the Department of Lands and Physical Planning without advertising the lease, and the landowners being issued title. This has the potential of promoting a 'win-win' situation for the landowner, investor and the state in the development of customary land.

There is a lot of information asymmetry on the part of real estate agencies. Most advertised properties for sales and rental are devoid of some necessary information that could guide potential property buyers on the property offered to them. In order to protect the interest of consumers, it is necessary for government agencies such as ICCC (PNG's 'Independent Consumer & Competition Commission') to develop guidelines for advertising residential properties. The advertisements for properties must be monitored by the agency to see that real estate agencies adhere to the guidelines. For example, it is important to provide information on floor space, size of rooms, age of the house and maintenance history of the house. It is also important for governmental agencies such as the National Housing Corporation (NHC) to monitor the quality of houses offered for sales, review house price determination procedures and correct any associated anomalies.

Housing prices have decreased but remain high. Though sales and rental price of houses have declined, there is a need for prices to decrease further so that most Port Moresby residents can afford them. To improve housing affordability in Port Moresby, more low cost houses could be built in areas such as 8 Mile and 9 Mile as well as historical low-income areas such as Gerehu. The state has attempted to provide houses through NHC and private housing contractors at Duran Farm, 8 Mile. However, some houses have been completed in Duran Farm but are not occupied due to lack of trunk infrastructure (Nao & Ezebilo, 2017). For housing projects to be more effective in PNG, governmental agencies such as NHC must focus at playing facilitating roles while the private sector builds houses, as advocated by Webster et al. (2016) and Ezebilo (2016). In addition, Ezebilo and Hamago (2017) found that private property developers have the potential to finance development of trunk infrastructure. However, the state will need to compensate the developer through schemes such as tax credits and assess quality of the infrastructure. The infrastructure constructed by private developers must be evaluated to ensure that it meets the set standards.

Areas in and around CBD are becoming congested and there is a need to free up the area by providing more houses in peri-urban areas of Port Moresby. This could decongest the city and contribute towards developing other segments of Port Moresby, which should spur economic growth through economic activities triggered by the development. To make this development effective, some offices of governmental agencies could be moved to areas such as 8 Mile and 9 Mile and consequently some allied private enterprises might also follow the movement. This has the potential of redistributing the flow of traffic in the city and more revenue could also be generated for the state through payment for services.

Trunk infrastructure and services must be provided in all segments of Port Moresby. Trunk infrastructure and services in housing development account for approximately 30 percent

of the housing costs that involve private provision of infrastructure (Ezebilo & Hamago, 2017). This indicates that house prices especially in low-income areas could be reduced to a greater extent if the state provides more trunk infrastructure. It is important to note that infrastructure contributes towards promoting development of an area, which creates jobs for people, adds more value to houses in the area and improves the welfare of the society. For these reasons, policy-makers and urban development planners should see the introduction of trunk infrastructure to areas as an investment that generates revenue for the state and improves welfare of the society rather than a cost to the state.

Ch. 6 Conclusions

This study provides an insight into market prices for residential properties in Port Moresby and factors influencing housing price. The findings reveal that house prices have decreased; however, an average Port Moresby resident still may not be able to afford them. The supply of land to the property market has declined especially in and around the CBD, which supports the assertion that state-owned land is almost exhausted. An increase in the number of bedrooms increases house price. CBD and historical medium-income areas are strongly linked to an increase in house price. Historical low-income areas and areas located long distances from the CBD such as 8 Mile and 9 Mile are strongly linked to a decrease in house prices. The findings also show that market prices for residential properties in Port Moresby mimic trends of the economic cycle in PNG. The construction phase of the PNG LNG, which led to an upsurge in economic activities (boom period) in the city, is strongly linked to a sharp increase in residential property prices, including house prices. However, property prices are currently declining due to less economic activities (bust period) but the decline appears not to be proportionate to the increase during the boom period.

Some policy-related lessons that could be drawn from the findings of this study include the need for policy-makers and planners to consider economic cycles when making informed decisions on urban development. The scarcity of secure land for development is becoming more evident and there is a need for governmental agencies such as the PNG National Research Institute, Department of Lands and Physical Planning, Department of Planning and Monitoring and Department of Treasury, and Magisterial Services to develop an effective strategy for accessing secure customary land. The state through its agencies such as the NHC must facilitate the supply of more houses in areas long distances away from the CBD such as 8 Mile and 9 Mile. In the long-term, satellite towns should be developed in peri-urban areas of Port Moresby, which could stretch into the Central Province. Introducing trunk infrastructure and services adds more value to residential properties and attracts more investment to the area. This often results in a 'win-win' situation for the state, the investor and the society at large. The state benefits from taxes and service charges; investors benefit from profit generated from businesses, while society benefits from higher salaries and improvements in welfare. For these reasons, it is necessary for the state to see provision of trunk infrastructure and services as an investment rather than a cost. Some important information related to residential properties brought to the market is often not disclosed by real estate agencies in PNG. To protect the consumers, there is a need for governmental agencies such as the ICCC and the NHC to develop effective guidelines for information that should be presented in advertisements. It is also important for governmental agencies to review the techniques that real estate agencies use for determining house prices.

If the aim is to develop an effective and efficient residential property market in Port Moresby, there is a need to consider the demand and supply of houses and land during different phases of the economic cycle in urban development planning. There is also a need to develop a database on market prices for properties so that information generated from it can be used for making informed decisions. Relevant governmental agencies such as the Department of Planning and Monitoring, Department of Lands and Physical Planning, Department of Treasury, Magisterial Services, National Research Institute, ICCC and NHC must collaborate more, especially in sharing information on potential strategies for

supplying more houses to the market and to protect consumers. The state must put more effort towards unlocking more customary land for development and introducing trunk infrastructure into areas where it is lacking. It is important to note that, as more houses are supplied to the market, there is also a need to increase the capacity of infrastructure such as clean potable piped-borne water supply and electricity. The activities of real estate agencies related to sales and rent prices of properties must be reviewed. This study is based on secondary data; it is necessary to also do more research on housing supply and demand, as well as access to trunk infrastructure and services, in Port Moresby using primary data. This will help us get a clearer picture of Port Moresby residents' housing demands and accessibility to infrastructure and services. The findings from this study contribute to a greater understanding of the impacts of phases of the economic cycle (boom and bust) on market prices of residential properties and potential strategies to lower their adverse impacts. This should help urban development managers and policy-makers in making informed decisions by considering the demand and supply of residential properties during economic boom and bust periods in Port Moresby and potentially in other cities of PNG.

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