DO ACCESS TO URBAN INFRASTRUCTURE INFLUENCE RENTAL HOUSING PRICES IN KENYA?

BY

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DECLARATION

This research paper is my original work and has not been presented for any degree award in any institution.

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SUPERVISORS' DECLARATION

This research paper has been submitted for examination with my approval as university supervisor.

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DEDICATION

This research paper is dedicated to my late father for his insistence on the culture of gaining knowledge and knowing how to apply it.

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I would like to thank my supervisor Dr. Mwai for his commitment, advice and guidance he offered during the period of research. I also acknowledge staff and fellow students of the School of Economics for their assistance during research. Finally, I thank God for the good health, wisdom and power that He has given me over the entire period I undertook this study.

LIST OF ABBREVIATIONS

NHC	National Housing Corporation
ANOVA	Analysis of Variance
VIF	Variance Inflation Factor
WB	World Bank
WEF	World Economic Forum
KNBS	Kenya National Bureau of Statistics
KES	Kenya Shillings
KEEP	Kenya Electricity Expansion Project
KEMP	Kenya Electricity Modernization Project
UN	United Nations
SDG	Sustainable Development Goals

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ABSTRACT

Increased urbanization caused by increased birthrates and accelerated rural-urban migration has caused the mushrooming of low-income residential neighborhoods in major towns in Kenya. The growth of these low-income areas emanates from an increased demand for housing which outstrips the supply. Consequently, as housing demand increases, there is also increased demand for infrastructural development (water, electricity, drainage and waste management). Access to such basic infrastructure is believed to improve people's standards of living. This study therefore, sought to establish the effects of provision such infrastructure to rental prices using a hedonic pricing model. The results show that provision of streetlights, drainage system, electricity connection, provision of piped water and access to transport services influence rental prices. Additionally, secure neighborhoods, proximity to a park, occurrence of flooding, nearness to a garbage dumpsite, proximity to a factory, number of rooms, external wall material, floor material, and roof material all influence rental prices. The study therefore recommends that that government should protect the low-income people by subsidizing specific building materials and legislating to protect rent hikes beyond specified magnitudes. Such moves will promote affordable housing for the low-income earners.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

There has been a sustained increase in urbanization over the last half-century due to increased births in urban areas and continued rural to urban migration. According to UNESCO, urbanization forces have led to former peri-urban settlements to be integrated with nearing cities as well as becoming secondary cities. The percentage number of people in developing countries living in cities has near doubled since the 1960s (from below 22% to more than 40%), while in those countries in more developed regions, the urban percentage has increased from 61% to 76%. According to the World Bank (2018), Africa and Asia are still the least urbanized among the developing country regions (less than 38% each). The Latin America and Caribbean region is more than 75% urban, almost nearing Europe, Northern America, and Japan (all are between 75 and 79%).

This high rate of urbanization means that there has been increased demand for urban housing and basic urban infrastructure, for instance: water and sanitation, roads including drainage, electricity, and waste management. Formal housing markets have been inefficient in supplying affordable housing in the formal housing markets, leading to many urban residents living in informal settlements characterized by low-quality houses and inadequate access to basic urban infrastructure (Salon, 2010). According to figures in the World Economic Forum (2019), only 13% of the world population can afford adequate homes. With an estimated 1.1 billion urban dwellers living in substandard housing by 2014, a rethink on other urban housing solutions away from homeownership is required (McKinsey Global Institute, 2014). This number is projected to hit 1.6 billion people by 2025. The situation is worst in Africa, where it is probable that over 50% of the

inhabitants live in substandard housing. Therefore, to fulfill citizens' housing rights, countries should improve access to housing by encouraging rental housing growth through policy and legislation.

Since the 1980s, most governments advocated for policies that favored homeownership. With this came the pressure on individuals to own homes, which has led to the proliferation of substandard housing and increased land cost (Gary & Taffin, 2013). It was not until the 2008 financial crisis that rental housing gained recognition worldwide (Joint Center for Housing Studies, 2013). During the crisis, many homeowners in the United States were displaced, leaving most households with the choice of rental housing. Besides, the great depression led to unprecedented unemployment rates that stifled household budgets, thus reducing disposable incomes for homebuyers. For instance, in the United States, the share of households renting stood at 31% in 2004, a figure that increased to 35% in 2012. A study by Carliner and Marya (2016) on rental housing in 12 countries in North America and Europe observed that renting was preferred for households with below-median incomes. For example, in the Netherlands, 80% of the households in the low-income group were renters, with Canada and Belgium having less than 10% of their high-income households renting. However, it was interesting to note that countries with the lowest median household incomes had the lowest renters rate and vice-versa, as was Switzerland.

Additionally, most developed nations have regulations for charging rent on tenants, making rental housing the preferred choice because of the advantages it brings. In Germany, for example, the majority of the citizens prefer lifelong tenancy to homeownership because of the regulations that the Government has set on the rent payable. The rent payable is based on a local reference rent,

and owners cannot increase rent by more than 20% of the local reference rent. The reason for the dominating rental housing market in Latin America is different. The rental market is dominating because of the huge informal rental housing (Shelter Afrique & French Development Agency, 2014). In South America, just like Africa, most households believe that one must own home due to the bias created by public housing agencies that advocate for homeownership instead of renting.

A report from the Africa Rental Housing Conference held in Nairobi in 2014 raised concerns over the predominantly increasing challenge of access to housing, particularly for African countries. The reason is, most policymakers have turned their attention to homeownership, even with only about 10% of Africans being able to afford to buy a house. The report indicated that only South Africa had a more developed rental-housing sector, as compared to other African countries. With an increase in population and urbanization rates, pressure has been exerted on the few existing housing units in urban areas (Shelter Afrique & French Development Agency, 2014). With about 40% of Africans living in urban areas and half of this population living in slums and informal settlements, concerted efforts must therefore be made to improve housing access to improve the living environments of those who live in slums and informal settlements. The report recommended rental housing as an alternative to improving access to housing.

In Kenya, rental units can be classified as ownership, public housing, versus private housing. According to the Kenya National Bureau of Statistics (2018), public housing for rental purposes accounts for only 2.6% of the rental housing market. The Kenya Integrated Household Budget Survey (2018) report further indicates the sort of houses rented, indicating that 40% of households live in one-roomed housing units, 26.6% two-roomed, and 20.6% three roomed units. This report

showed a decline in living conditions compared to a decade earlier, where 35.1%, 27.6%, and 22.6% of people lived in one, two, and three-roomed units, respectively. This indicates a higher proportion of the population is not accessing adequate housing in terms of space. Specifically, the survey report indicates more than two-thirds of urban residents in Nairobi and Mombasa live in one-roomed housing units.

According to the Centre for Affordable Housing Finance in Africa (2018), nearly 90% of the people living in major urban areas rent houses. The majority are in low-income areas. These low-income areas are manifested by slum conditions and informality in planning and land tenure. The report further indicates that an estimated 53% of the urban dwellers that rent pay KES 2000 or less per month; 26% pay between KES 2000 and 4000; 16% pay between KES 4000 and KES 10,000; while a paltry 5.5% can afford rent above KES 10,000. For a country with a low-income housing deficit of 2 million housing units, these statistics are alarming because most urban dwellers live in slums and informal settlements that lack basic housing-related infrastructure and services. Due to the higher proportion of urban residents living in rented housing units, Salon (2010) uses rent payable as a proxy for living conditions. It thus shows that those living conditions are determined by structural, location, environmental characteristics, and access to basic services.

To improve access to urban infrastructure, both the national and county governments have a role to play in providing urban physical and social infrastructure such as roads, water, electricity, drainage systems, waste management services, schools, and hospitals. To provide a standard of living that accords dignity to urban dwellers, the Government must also address environmental

issues such as pollution, provision of parks, and buildings' protection in risky areas such as wetlands and areas prone to landslides.

Several factors affect the supply of affordable housing for the rental markets, including rental price expectation, construction costs, access to finance, availability of infrastructures such as access roads and drainage, truck sewer, electricity, and other social infrastructure, for instance, schools and hospitals. Similarly, the rental market's inverse demand curve will show that the rental price is influenced by the housing stock, household income, and access to urban infrastructure, among others.

Access to water within the housing unit is only available to a few units, while other houses share common taps and other source water from water vendors. The Kenya Integrated Household Budget Survey (2018) report showed that 86.7% of the households in urban areas have access to improved water sources, including piped water, boreholes, springs, wells, rainwater bottled water. These figures were an improvement from the 2004/2005 survey, which indicated only 59%, had access to improved water sources.

Electricity provision is not adequate, resulting in illegal connections and alternative lighting sources. An approximated 65% of households in Kenya are connected to electricity according to the Kenya Integrated Household Survey (2018). The majority of those not connected to electricity find the connection fee high to connect while others cite their plight to being tenants of unconcerned or unwilling property owners. In partnership with World Bank, the Government has

sought to increase electricity connections to poor urban households through the last Kenya Electricity Expansion Project (KEEP) followed up by Kenya Electricity Modernization Project.

In terms of access roads, the data from the World Bank Integrated Household Survey (2012) showed that most 66% town settlement roads are earth roads, 25% gravel/murram, only 8% tarmacked, and 1% paved with stones or bricks. The report further shows that during the rainy season, only 38% of the access roads are usable all the time, while 15.3% are completely impassible during the rainy season. Even during the dry season, only 55% of the access roads are in good condition, 75% of the houses do not have drains to rainwater.

1.2 Statement of the Problem

To improve urban residents' living conditions, access to adequate housing must be an important target for any government. Access to these basic infrastructures is seen as an important factor in the level of living conditions. Access to improved water, sanitation, and drainage, for instance, reduces the incidence of infectious diseases like diarrhea, cholera, malaria, and dengue fever. Access roads and efficient transport reduce travel costs and time spent going to school or work. It also increases economic activity and, by extension, jobs. A clean environment provides a conducive space for people to live and work besides reducing disease incidence. It also influences the rest of the attributes; for instance, good infrastructure will attract proper housing investments. Therefore, the Government should provide good public services in nature, such as roads and drainage, street lighting, water and sanitation, recreational parks, and security. Although the Government has put investments towards basic infrastructure investments, the investments are far below the requirements. Consequently, there are still a sizable proportion of urban dwellers that

cannot access guaranteed safe drinking water, therefore running water-borne diseases. Only 8% of access roads either are paved or tarmacked, thus inaccessibility during rainy seasons for most urban residents. Besides, the lack of proper drainage brings flooding to 75% of the urban population, thus increasing the incidence of diseases and poor living conditions. Inadequate electricity connections lead to a high cost of energy for the dwellers, thus further impoverishing them. Simultaneously, the Government loses revenue due to illegal connections, which also are a risk to residents.

Failure to address these concerns, which are primarily lack of provision of adequate public infrastructures such as access roads, clean water, and sanitation, will aggravate the majority of urban dwellers' already impoverished living conditions. Therefore, the proposed study is an attempt to investigate to what extent the provision (or lack thereof) of this infrastructure affects rent prices, which in this case are the proxy for living conditions. Given that limited studies in Kenya have explored the problem from a hedonic model approach. The study, therefore, will use such a model, similar to the one employed in Gulyani (2012). Cross-sectional data from the Kenya Integrated Housing Survey (2012) will be applied.

1.3 Objectives of the Study

1.3.1 General Objective

To estimate the impact of access to basic infrastructure on rental prices in urban areas in Kenya.

1.3.2 Specific Objectives

1. To estimate the effect of access roads on rental prices.
2. To estimate the effect of access to clean water on rental prices.

3. To draw policy recommendations from the study findings.

1.4 Study Hypotheses

HO: access to urban infrastructure influences rental-housing prices in Kenya

HA: access to urban infrastructure does not influence rental-housing prices in Kenya

1.5 Contribution of the Study

The fact that there has been a consistent rise in the fraction of populace living in urban areas makes the subject of study worth researching. UN-Habitat (2013) noted that the size of rental stock varies between various countries and within countries and between and within cities. Further, the variation and diversity of tenure systems worldwide are also reflected in the rental housing stock. As a result, UN-Habitat (2013) opined that it is difficult to draw up a generic list of recommended lists of policies to tackle rental issues among the urban population.

Thus, it is important for countries, especially the developing countries, to carry out location specific research for urban rental prices. Researchers can get more value by studying the problems associated with imputed rents in specific towns to further knowledge. At the same time, governments and state agencies can carry research to allocate scarce resources in the provision of urban services and infrastructure.

From the preceding, Abidoye and Chan (2017) carried out a critical study of the application of the hedonic pricing model in Nigeria, concluded that while there was a considerable increase in studies on hedonic rental prices since 2010, most studies were scholarly, and only focused on Lagos metropolis area. Mongare (2017) attempted to apply hedonic pricing in Nairobi by stratifying the

metropolitan settlements according to income groups. However, the proposed study differs from Mongare (2017) in that it uses data from across the country. It uses infrastructure as the core attribute of focus as a proxy to the living conditions.

The purpose of this research is to apply the hedonic pricing method to low-income urban settlements. The study will focus on 15 growing urban areas in Kenya and provide unique analysis in a less studied sector. The study will also build on existing literature on the hedonic pricing of rent in Kenya by adding missing studies on low-income settlements. Finally, the study utilizes micro data on household characteristics not previously used from the literature reviewed.

CHAPTER TWO: LITERATURE REVIEW

This section details the housing pricing theories and reviews the empirical studies done on factors influencing rental prices in urban areas.

2.1 Theoretical Literature Review

Neoclassical economists within the context of consumer theory have studied the problem of housing choice and demand. According to Maclennan (1982), neoclassical models to housing analysis of demand make major assumptions on consumer behavior and housing markets' nature. The models assume a perfectly competitive housing market and that the consumers are continuous, transitive, and utility-maximizing. The use of consumer demand theory under these assumptions is not without problems. Struyk (1976) observed that the durability nature of a house, permanent income, and investment options bring operational problems in demand estimation and propose that such estimation must be with simultaneous modeling of the supply side and the financial sector of the housing market.

The second problem in the estimation of housing demand is the heterogeneous nature of a house. According to Maclennan (1982), the multidimensional nature of housing means that it has a composite demand for a set of services showing a varied mix of characteristics instead of uniquely identifiable units of a house. The framework developed by Rosen (1974) drew out the observational effects of the nature of implicit markets for characteristics that are associated with the differentiated good. According to Rosen (1974), when a good comes as a package of different attributes, observed prices can be compared to those characteristics. For this reason, the hedonic

pricing approach built on Rosen's framework has been applied in housing markets to estimate housing prices and housing rental values against the attributes of those houses.

Freeman (1979) used the hedonic model in establishing demand functions for environmental attributes. He observed that the model can be used on any consumer-differentiating attribute and that the supply of such attributes and individual preferences can affect housing prices. Further, Maclennan (1982) observed that hedonic indices could explain the implicit prices of commodities not explicitly transacted but are characteristics of a traded good.

The attributes of the house could be locational, structural, neighborhood, and environmental. Once a house has been constructed, the structural attributes are provided effortlessly to those who rent; for instance, a landlord who acquires a three-bedroom apartment does not have to pay further to maintain that number of bedrooms. For the locational, neighborhood, and environmental attributes, the provision level is usually out of control of the property owner and therefore considered exogenous attributes. Some of these exogenous attributes may be considered public goods such as access to parks, public transport, health clinics, and air and noise pollution.

The major drawback of using the hedonic approach is the assumption of an equilibrium market (Freeman 1979). This model may give biased results due to search costs and infrequency of purchase (Maclennan 1982). Further, Maclennan (1982) observed that the supply of houses in certain submarkets is inelastic even in the long run, therefore generating disequilibrium in that market. Maclennan (1982) proposed an expanded framework of housing choice that relaxed the

assumption of market equilibrium. The framework is a microeconomic analysis of the mobility and spatial search behavior developed by Clark (1980) based on urban geography.

Frameworks based on observed behavior have been developed over time. One such method is the repeat sales method. It is used on properties, which have been in the market at least twice. In the case of renting, the property must have been on the rental market at least twice as well. This method utilizes data observed repeatedly in one single unit.

For this reason, the repeat sales method is assumed to control for observed housing attributes more accurately than the hedonic price method. The model assumes that there are no changes in the house characteristics. Grimes and Young (2010) suggested that the main drawback in this method is that it may suffer biases due to reduced sample size since only houses in the market can be considered more than once.

2.2 Empirical Literature

This section looks at previously researched determinants of housing rents and prices. It is arranged thematically concerning the various attributes of housing. Researchers have used the hedonic price method to measure different attributes depending on their areas of interest.

2.2.1 Infrastructure Facilities

Zhang et al. (2016) investigated the role of rail transit prices on housing prices in China with panel data on housing prices and urban rail transit amenities for 35 Chinese urban areas between 2002 and 2013. A correlation test was done to show the correlation between the prices of housing and rail transit amenities. The results showed that rail transit amenities could substantially raise

housing prices. Their findings indicated that for a 1% rise in rail transit mileage, there is a 0.0233% rise in housing price. Other statistically significant variables included GDP per capita, land prices, investment level in real estate, and population density. However, the study found that the expectation of new rail lines did not significantly affect housing prices. Although the study was on the impact of rail prices, the variables used were mainly macroeconomic aggregates, consumer attributes, and locational characteristics. The study, therefore, ignores the salient characteristics of housing good.

Morais and Cruz (2015) sought to estimate the demand for housing and urban services in Brazil's ten major metropolitan areas. The hedonic pricing model was used to estimate prices and characteristics of properties, namely number of bedrooms and other rooms, kind of the walls and roof, household per capita income, number of people per bedroom, private bathroom, piped water and sewerage system, effective garbage collection, and general characteristics of the municipal area. The study focused on the impact of consumer demand for urban services, return on investments, house type, sanitation, and other urban development programs. The study concluded that the provision of sufficient housing and infrastructure has a significant effect on property prices. The study further showed that such improvements could have a redistributive effect positively influencing wealth creation among the urban poor. However, the sample was derived from a central business district only and is therefore likely to have a locational bias, especially with the findings on the urban poor.

In a study on amenities, Choumert et al. (2014) focused on the accessibility of water as a determinant of rental prices in the city of Kigali, Rwanda. The study identified that the cost

involved in connecting houses to piped water was considerably high and therefore estimated its impact on the rental asking prices using a hedonic approach. The data used was from a household survey undertaken between January and April 2011in three districts of Rwanda. The data set had 103 observations. The monthly rent of each unit of housing was regressed against inherent characteristics. They included the number of bedrooms, construction material, wood or brick, and materials used for roofing metal sheets or tiles. There was also a district location variable and dummies to control for other location and structural properties. The findings showed that each new connection of piped water to households improved access to clean water but resulted in many cases with the rental values being raised. The findings indicated that the resultant price increase was sufficient to pay back the installations' capital cost within two years. Rent for a dwelling built of wood was substantially lower than one built of bricks or blocks. The metal sheet roof also increases the value of rent compared to tiles. District location variables were found not being significant. The study, however, failed to show the impact of rents increases arising from water accessibility. The empirical finds also reveal a low R^2 averaging 0.322 for the simple regression and the semi-log equation.

2.2.2 Structural characteristics

Yayah and Demir (2014) estimated housing prices in Turkey using a hedonic approach against structural and spatial attributes. The study used data from the Household Budget Survey 2010. It had 45 independent variables. Linear, logarithmic, linear, and full-logarithmic regressions were carried out with price as the dependent variable. The significance level did not vary much in either of the regression models, and they were statistically significant. This study concluded that the presence of Jacuzzi, the water tank and swimming pool, heating system, parking lots, cable TV

and telephone lines, plinth area, closeness to the central business district, banking services and basic education services, type of material used in the bathroom as factors that increase the value of a house. The age of the building and whether on the housing unit is on the ground floor reduced the value of the houses. However, the study seems to have focused on high-end areas that are already well serviced in terms of infrastructure and incomes.

Similarly, Miller (2014) investigated the factors that affect rental prices in the Wa Municipality in Ghana. The study was done through analysis of field survey data from the municipality. The study found that electricity availability was a major determinant in both the rental price and the decision to rent. Other factors identified in the study included the house type, whether self-contained, bathrooms, water supply, and waste disposal. Security and internet access were considered auxiliary factors. The analysis model was limited to mere ranking but did not have the scientific analysis of cause and effect.

Ahned (2015) researched housing demand in Pakistan's urban areas. The goal was to estimate the imputed rent using the hedonic regression model. Predictive variables used in this study to estimate the imputed rent were building materials used in roofing and walling, sanitary facilities, water availability, and electricity for the middle- and high-income areas. The results showed that where the roof was built of reinforced concrete cement and reinforced brick cement, the rent increased by 43% and 44%, respectively. Rent also increased in similar percentages where the walling is made of stone. The availability of electricity increased the rent by 36% while flush toilets, lavatories, and outdoor toilets affected rents by 96%, 53%, and 76%, respectively. The availability of piped water did not, however, have as much impact at 8%. Middle-income groups paid rents

that were 36% higher over time. These findings are consistent with Akbar and Altaf (1995), who carried out a rental hedonic pricing model for low-income housing in Karachi. They also studied the impact of utilities such as gas, water, and electricity on the rental prices of housing units in Karachi's informal and squatter settlements. The study found a positive impact on utility services on the willingness of these settlements' willingness to pay for them.

Amenyah and Fletcher (2013) explored the determinants of rental prices of apartments in the Accra Metropolitan Area, Ghana. The focus of the study was the location and the attributes of the apartment. Data were obtained from three different residential areas within the metropolis and analyzed using a hedonic approach with monthly rent being the dependent variable and location, water, electricity, and facilities (shared facilities). The findings showed that the availability of amenities and facilities are statistically significant when determining rent. Shared facilities reduce rent due to lack of privacy, and so does noise pollution within the neighborhood. Proximity to work was a major consideration for renting a household. However, residents of low-income areas did not consider amenities such as water and electricity as important determinants of rent. They considered living close to their families more important.

2.2.3 Neighborhood conditions and location

Won and Lee (2017) compared the conventional hedonic and spatial models to investigate the effects of location and neighborhood environmental characteristics for small houses, mostly for a household of one or two people. The study used geographical information systems to measure spatial variables. The findings indicated that spatial hedonic pricing models were better than the conventional models as per the goodness of fit. On the impact of attributes to rental values, the

study found that all location features such as the distance to the central business district that is most near among the three such location districts in the City of Seoul in kilometers, distance (square) to the central business district, access to a subway had a positive relation to the rental values. At the same time, distance to the nearest university also in kilometers showed an inverse relationship meaning that rents were lower within the proximity of the university. Accessibility of parks to residents did not have a significant impact on rental values.

In a different view, Nakamura (2017) undertook a study on the impact of regularized tenure on the housing markets by estimating the willingness to pay for formalized and secure tenure by residents of informal settlements and slums. The study was undertaken in Pune, India, a city that had benefited from regularized tenure under the "Slum Declaration" by the Government. The study's objective was to estimate how communities living therein valued formalized land tenure using a spatial hedonic econometric model. The study used primary data collected from household surveys in Pune in 2013. The analysis results indicated that the marginal gain related to the regularized tenure was 19.2% of the average rent in those settlements. Further, depending on other legal conditions and castes, households were willing to pay 6.7% of their average service expenditure.

Sirmans et al. (1989) examined how amenities, services, and other external factors affect apartments' rental prices. Hedonic indices were used to estimate these relationships using 188 observations in 92 apartments in September 1986. The attributed examined in this paper included parking availability, whether the apartment has a modern kitchen, maid services, any restrictions, for instance, “pets disallowed” and external issues, for example, traffic snarl-ups, distance from work to home, and availability of public transport. Empirical results indicated that all the factors

affect rent, with parking and kitchen being important determinants. The sample size used in this study was too small, and therefore the empirical findings might have been biased. The difference in the R2 between a simple linear regression (0.67) and a semi-log model (0.61) shows the material variance in the two compared equations, which was not explained.

In a similar study, Vanichvatana (2006) studied the relationship between rent payable in 231 apartments in Bangkok's central business district and the 27 types of available building amenities and in what quantities are available. The study's objective was to identify where to spend capital investments for sustainable rents for serviced apartments. The data used was cross-sectional data collected in 2003 in Bangkok, Thailand. The analysis included frequency of ranking, causal relationships between rents and amenities, and regression analysis. The empirical analysis indicated that rents were affected by the type of amenity available and not by the quantity of that amenity or the total of amenities provided. Equally, the type of amenity had a significant effect on rent, then the apartment's size or location.

In an attempt to predict the prices of houses in the middle-income estates of Nairobi City, Mbugua (2014) used the hedonic pricing model to measure how various significant attributes of a house were to the price of a housing unit. The predicting variables analyzed were age, number of bedrooms, distance from the central business district, average income, and macroeconomic variables such as prevailing interest rate and inflation. This study's findings indicated a positive impact on selling price by the income, presence of amenities such as gym swinging pool or sauna, and the number of bedrooms. However, there was an adverse impact on selling price by the

building's age, how far the building was from the central business district, and the macroeconomic variables, namely inflation and interest rates.

Umar and Sulaiman (2013) studied the factors that affect rental prices within the university environment. The study area was the Modibbo Adamma University of Technology. The study utilized the hedonic price model using rent as the observed variable and the independent variables being age, expected lifespan of the house, tenement rates charged by local Government, and the number of houses available. The empirical finding showed that rental prices were influenced by age, local government rates, the number of houses supplied, and the university's distance. The study further indicated a positive impact on wealth creation arising from housing provision by the local community.

Finally, Mongare (2017) assessed the demand for residential houses in Nairobi's up-market and lower market areas using the hedonic pricing approach. The study used primary data sampled from 50 households in Nairobi. The focus was on the rental prices. The study found a positive correlation between the number of bedrooms, access to recreational facilities, ease of garbage disposal and collection, and the rent payable. There was, however, an inverse relationship between the pollution levels and the house rent payable.

2.2.4 Environmental Attributes

Maslianskaia and Baumont (2016) studied the impact of environmental externalities on housing prices using the spatial hedonic pricing model. The paper classified environmental spillovers into both local and global. The empirical study was undertaken on the estuary of the Loire in France

and focused on both natural areas and built up artificialized areas such as the frontage to the ocean, rivers and riparian land, noise pollution from the road. The study concluded that the implicit prices are not beyond the value of coefficient but rather a combination of both a reaction and a spread effect.

Guttery, Poe, and Sirmans (2000) undertook a study on the impact of regulations related to Wetlands on selling residential buildings' prices in Baton Rouge, Louisiana. The study's variable costs included the cost of delays, cost of preparation of environmental impact assessment report, and the cost of mitigation measures. Although those costs are usually loaded onwards to permit applicants (usually developers), the applicants will often pass these costs on to the property buyers. Data used was collected from the selling prices and features of a 328 housing units sample within the study location between 1983 and 1988. The timing was of particular interest since it coincided with the time that regulations on wetlands became effective. In this regard, the sample units sold were pre and post regulations. The authors used hedonic regression in the analysis. The results showed that property selling prices in wetlands declined by 10.5 percent, compared to non-wetlands houses in the post regulations period. This change was attributed to the restrictions put on land development; therefore a shift in demand for properties in the less attractive properties wetlands triggering the prices to decline.

On the other hand, Ioannides (2010) undertook a constructive study on neighborhood effects on housing markets by empirically analyzing observed individual decisions on location and the individual and group characteristics. This approach differed from the common approach of looking at neighborhood effects from an externality point of view, which affects the locational equilibrium.

Focusing on the impact of slum area amenities or lack of them on city development and sustainable planning, Touseef et al. (2019) analyzed Islamabad's development in Pakistan. The study sought to evaluate the negative impact of nearness to slums on property values and the asking rental prices. The hedonic price model was used to measure rental prices within at least a kilometer and compared those far from the slum vicinity. The study found a positive correlation between the distance from the slum and the rent increase. The farther away from the slum, the higher the rent. Rent was lower by 10% for a unit near a slum, while a similar unit located away from the slum was 10% higher. This study used slums as an indicator of a bad neighborhood but failed to tackle the environmental predicaments of those who live in those areas.

2.3 Overview of the literature

From the literature reviewed, few researchers have comprehensively studied the role infrastructure plays in urban residents' living conditions. There is, however, attempts to correlate infrastructure with other well-being indicators such as travel costs and access to jobs. The housing attributes examined also vary. Some studies were carried out on a single set of attributes, such as structural amenities only, environmental or neighborhood amenities. Some have combined different sets of attributes. Most studies have focused on luxury amenities when studying the structural attributes such as modern kitchen, swimming pools and Jacuzzi, parking and gym areas.

This study attempts to comprehensively analyze the impact of infrastructure attributes of the hedonic equation. The infrastructural amenities include access to clean and safe drinking water,

connection to electricity, and the quality of access roads. It also attempts to link the access of infrastructure to the wellness of the urban populace.

CHAPTER THREE: METHODOLOGY

This section discusses the methods and procedures that were used for the study to achieve the set objectives. It includes the theoretical framework, model specification, measurement, and definitions of the study variables, diagnostic tests, and the types and sources of the study's data.

3.1 Theoretical Framework

3.1.1 Theory of consumer behavior

The use of hedonic method as a tool of analysis dates back to as early as 1928 when Waugh used it in the analysis of agricultural markets. However, it was not until 1974 when Rosen's seminal work explored theoretically and empirically how housing attributes affects consumer's decision making. Housing choice is not only influenced by structural features but also location attributes of the property, such as propinquity to environmental amenities. Rosen (1974) laid out the pedestal behavioral process that is presumed to be the intrinsic foundation of hedonic price equilibrium. Borrowing from Taylor (2003), if we have a perfectly competitive market with multiple buyers and sellers with unlimited number of house characteristics are available.

If we let Z represent a housing bundle with attributes such that:

$$\underline{Z} = Z_1 Z_2 \dots Z_n \quad (1)$$ where:

$\underline{Z}$ - Housing bundle,

z_i - House characteristics.

i= 1-n

A price schedule,$P(\underline{Z})$, is established, by the competitive equilibrium. This price is taken as exogenous by each buyer and seller in the housing market.

If we let consumer utility be defined over two goods, Z and X, then a consumer j with demographic attributes α^j will have their utility defined as:

$$U^j\left(X\, z_1 z_2, .., z_n\, ; \alpha^i\right) \text{ (2)}$$

Assuming the consumer only rents one, then budget constraint becomes:

$$y^j = X + P(\underline{Z}) \text{ (3)}$$

TO maximize utility the consumer will choose X and each element of Z to an extend that the following marginal condition is satisfied for each z_i

$$\frac{\partial P}{\partial z_i} = \frac{{}^{\partial U}/_{\partial z_i}}{{}^{\partial U}/_{\partial X}} \text{ (4)}$$

The consumer's choice of each z_i and X levels such that the marginal rate of substitution between any characteristic,z_i, and, X, is equal to the rate at which the consumer can trade z_i for X in the marketplace.

3.2 Model Specification

Borrowing from Taylor (2003), we intend to estimate a hedonic price function;

$$p_i = f(H_i L_i E_i N_i A_i) \text{ (5)}$$

Where p_i is the price/rent of house i=1,2.3..,n, f is an unknown function, H_i is a vector of house characteristics, L_i a vector of locational characteristics and E_i and a vector of environmental characteristics, N_i is a vector of neighborhood characteristics, and A_i is a vector amenities available. To estimate the price hedonic function above, we expand it to a popular semi-log model, that is,

$$\log p_j = \beta_0 + \sum \beta_i H_{ij} + \sum \beta_i L_{ij} + \sum \beta_i E_{ij} + \sum \beta_i N_{ij} + \sum \beta_i A_{ij} + \varepsilon_j \text{ (6)}$$

Whereby we assume that ε_j is normally distributed with a constant variance i.e.$\varepsilon_i \sim N(0, \sigma^2)$

Equation 6 can be expanded further to include all variables of interest such that:

$$logp = \beta_0 + \beta_1 HSW_i + \beta_2 HBW_i + \beta_3 OW_i + \beta_4 RIS_i + \beta_5 RTL_i + \beta_6 RC_i + \beta_7 ORT_i + \beta_8 FE_i + \beta_9 FC_i + \beta_{10} FT_i + \beta_{11} PA_i + \beta_{12} NR_i + \beta_{13} NBR_i + \beta_{14} HK_i + \beta_{15} HT_i + \beta_{16} CE_i + \beta_{17} HPW_i + \beta_{18} WSC_i + \beta_{19} ATS_i + \beta_{20} PAR_i + \beta_{21} GAR_i + \beta_{22} TAR_i + \beta_{23} TTW_i + \beta_{24} HNP_i + \beta_{25} SFT_i + \beta_{26} FLD_i + \beta_{27} MCW_i + \beta_{28} WTW_i + \beta_{29} HSPL_i + \beta_{30} HIPL_i + \beta_{31} HSPW_i + \beta_{32} HPL_i + \beta_{33} DA_i + \beta_{34} SLA_i + \beta_{35} GD_i + \varepsilon_i \quad (7)$$

In matrix notation the equation 7 becomes

$$logP = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Where:

X_i is the list of explanatory variables of the model.

β_i are the model parameters

ε_i the error term

3.3 Measurement and Definition of Variables

Table 1: Variable Definition

variable	**Notation**	**Measurement**	**Expected sign**	**Source**
Dependent variable				World Bank (2012)
Log Rent	logp	Continuous		World Bank (2012)
Explanatory variables				World Bank (2012)
House with stone wall	HSW	Yes =1 0=Otherwise	positive	World Bank (2012)
House with brick/block wall	HBW	Yes =1 0=Otherwise	positive	World Bank (2012)

Mud/cement walls	MCW	1=YES 0=Otherwise	negative	World Bank (2012)
Wood walls	WTW	1=YES 0=Otherwise	negative	World Bank (2012)
Mud/ Wood walls	MW	Yes =1 0=Otherwise	negative	World Bank (2012)
Iron sheet roof	RIS	Yes =1 0=Otherwise	positive	World Bank (2012)
Tile roof	RTL	Yes =1 0=Otherwise	positive	World Bank (2012)
Concrete roof	RC	Yes =1 0=Otherwise	positive	World Bank (2012)
Earth floor	FE	Yes =1 0=Otherwise	negative	World Bank (2012)
Cement floor	FC	Yes =1 0=Otherwise	negative	World Bank (2012)
Tiles floor	FT	Yes =1 0=Otherwise	positive	World Bank (2012)
Plinth area	PA	Continuous	positive	World Bank (2012)
Number of rooms	NR	Continuous	positive	World Bank (2012)
Number of bathrooms	NBR	Continuous	positive	World Bank (2012)
House has a kitchen	HK	Yes =1 0=Otherwise	positive	World Bank (2012)
Connected to electricity	CE	Yes =1 0=Otherwise	positive	World Bank (2012)
House has Individual piped water	HIPW	Yes =1 0=Otherwise	positive	World Bank (2012)
House has shared piped water	HSPW	Yes =1 0=Otherwise	positive	World Bank (2012)
Availability of transportation services	ATS	Yes =1 0=Otherwise	positive	World Bank (2012)
Paved access roads	PAR	Yes =1 0=Otherwise	positive	World Bank (2012)
Gravel access roads	GAR	Yes =1 0=Otherwise	positive	World Bank (2012)
Tarmacked access roads	TAR	Yes =1 0=Otherwise	positive	World Bank (2012)
Drain available	DA	Yes =1 0=Otherwise	positive	World Bank (2012)
Streets lights Available	SLA	Yes =1 0=Otherwise	positive	World Bank (2012)
Time taken to work	TTW	Continuous	negative	World Bank (2012)

House near a park (with 20 mins walk)	HNP	Yes =1 0=Otherwise	positive	World Bank (2012)
Safety	SFT	Yes =1 0=Otherwise	positive	World Bank (2012)
Garbage dumping	GD	Yes =1 0=Otherwise	negative	World Bank (2012)
Floods	FLD	Yes =1 0=Otherwise	negative	World Bank (2012)

3.4 Diagnostic Tests

3.4.1 Normality tests

A normality test was done to determine whether the data was drawn from a normally distributed population. The assumption that underlies normality is that the data must roughly fit a bell curve shape before doing any analysis. The null hypothesis assumes that population is normally distributed. The study therefore will use the Shapiro–Wilk test.

3.4.2 Multicollinearity tests

Multicollinearity is present when an explanatory variable is correlated with another independent variable. It occurs when the study has factors that are a bit redundant. The presence of multicollinearity increases the coefficients of standard errors. Such a scenario could be problematic as coefficients for some explanatory variables may be found not to be significantly different from zero. This study used the variance inflation factor (VIF) to test for multicollinearity. If no factors are correlated, the VIFs will all be 1.

3.4.3 Heteroskedasticity test

Heteroskedasticity is a systematic change in the spread of the residuals over the range of measured values. It mainly occurs due to the presence of an outlier in the data. The outlier in heteroskedasticity means that the observations are either small or large with respect to other observations present in the sample. It can also occur due to the omission of variables from the model.

Depending on the nature of the heteroskedasticity, significance tests can be too high or too low. Besides, the standard errors are biased with the presence of heteroskedasticity, which in turn leads to bias in test statistics and confidence intervals. To test for heteroskedasticity, the Breusch-Pagan test was used. This test involves using a variance function and using a $\chi 2$-test to test the null hypothesis that heteroskedasticity is not present against the alternative hypothesis that heteroskedasticity is present.

3.5 Data Sources

The study used secondary data collected by the World Bank in Kenya. It is based on a state of cities baseline survey 2012-2013. The survey was carried in fifteen urban areas in Kenya and covered household socioeconomic characteristics, tenure status, rents, and infrastructure services.

CHAPTER FOUR: RESULTS ANS DISCUSSIONS

4.1 Model Results

The table below presents the model estimation results. The study only discusses those variables that exhibited significant results.

Table 2: Model Results

lnRentAmt	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Safety2	.021	.01	2.08	.038	.001	.041	**
NoofBathrooms	0	0	0.06	.95	0	0	
FloorMaterial4	-.167	.325	-0.51	.607	-.803	.469	
FloorMaterial3	-.596	.036	-16.77	0	-.665	-.526	***
o.FloorMaterial2	0	.	.	.	.	.	
FloorMaterial1	-.906	.042	-21.32	0	-.989	-.823	***
RoofMaterail5	.571	.064	8.93	0	.446	.697	***
o.RoofMaterail4	0	.	.	.	.	.	
RoofMaterail3	.771	.054	14.32	0	.665	.876	***
RoofMaterail2	.721	.058	12.54	0	.609	.834	***
RoofMaterail1	.6	.044	13.51	0	.513	.687	***
Wallmaterial6	.097	.025	3.94	0	.049	.145	***
Wallmaterial5	-.124	.029	-4.27	0	-.18	-.067	***
o.Wallmaterial4	0	.	.	.	.	.	
Wallmaterial3	-.108	.028	-3.85	0	-.164	-.053	***
Wallmaterial2	.317	.02	15.76	0	.277	.356	***
Wallmaterial1	.207	.021	9.84	0	.166	.248	***
Streetlightslamps	.07	.011	6.25	0	.048	.093	***
Drainage	.077	.012	6.65	0	.054	.1	***
privatewaterComp	.12	.01	11.63	0	.099	.14	***
privatepipedwater	.309	.015	20.90	0	.28	.338	***
RoadAcess4	.041	.044	0.95	.344	-.044	.127	
RoadAcess3	-.069	.042	-1.65	.099	-.151	.013	*
o.RoadAcess2	0	.	.	.	.	.	
RoadAcess1	-.039	.041	-0.94	.346	-.119	.042	
Electricity connection	.496	.013	39.08	0	.471	.521	***
NFactory3	.014	.022	0.62	.538	-.03	.058	
o.NFactory2	0	.	.	.	.	.	
NFactory1	-.047	.037	-1.28	.202	-.12	.025	
Garbgedump3	.004	.013	0.32	.751	-.022	.03	
o.Garbgedump2	0	.	.	.	.	.	
Garbgedump1	-.044	.015	-2.86	.004	-.074	-.014	***

Mudslide3	.041	.017	2.50	.012	.009	.074	**
o.Mudslide2	0	.	.	.	.	.	
Mudslide1	.029	.026	1.12	.262	-.022	.08	
Fld3	-.029	.014	-2.14	.033	-.056	-.002	**
Fld2	-.018	.015	-1.21	.227	-.047	.011	
o.Fld1	0	.	.	.	.	.	
TrsporttoCBD	.107	.015	7.01	0	.077	.136	***
Nearpark	.038	.014	2.72	.007	.011	.066	***
Kitchen1	.429	.016	26.87	0	.398	.461	***
Timetowork1	0	0	0.84	.403	0	0	
NumberofRooms	.136	.006	24.66	0	.125	.147	***
Constant	6.43 9	.078	82.85	0	6.287	6.592	***

Mean dependent var	7.528	SD dependent var	0.802
R-squared	0.680	Number of obs	9155.000
F-test	553.248	Prob > F	0.000
Akaike crit. (AIC)	11587.122	Bayesian crit. (BIC)	11843.516

*** *p<.01, ** p<.05, * p<.1*

The study sought to understand the effect of environmental, location, and structural factors on rental prices paid by low-income earners in 14 towns in Kenya. The table above shows the empirical model results. All the regressed factors accounted for 67.98% of the effects on the amount of rent paid, as indicated by Adjusted R-squared.

4.2 Results discussions

Safety/Security- This was a binary variable where people included in the study indicated if their neighborhoods are considered secure or not. Security is among the factors that determine the value of properties. As per our study results, safety showed a significant positive correlation with the rent amount at a 5% significant level. *Ceteris Paribas*, the secure the area, the more rent the houses attract. If the area is considered secure, the amount of rent is likely to increase by 2 %.

Streetlights/streetlamps- Streetlights enhance security at night. Neighborhoods with working streetlights are considered secure, and people are more likely to choose to live there. The regression results indicate that streetlights are among the major factors influencing the amount of rent houses attract in different towns. Streetlights showed a significant positive correlation with the amount of rent paid in different areas at a 1% significant level. This means installing security/streetlights will likely increase the rent by 7.05 %, other factors held constant.

Drainage -Among important town infrastructures is the drainage. Dwelling structures without proper drainage poses a serious risk to residents. The model results show that drainage, a binary variable, showed a significant positive relationship with the amount of rent that residents paid at a 1% significance level. Therefore, installing drainage infrastructure in an area that had none will likely increase the rent amount paid by 7.69%, other factors held constant. The study findings are similar to the findings of (Morais and Cruz, 2015).

Electricity connection- Electricity is considered a major driver of rent in urban areas. Electricity connection was a binary variable assuming one if connected and 0 otherwise. The model results reveal that electricity connection significantly influenced the amount of rent paid at a 1% significance level. *Ceteris Paribas*, if a dwelling structure is connected to electricity, the rent is most likely to increase by 49.6 %. Ahned (2015) and Miller (2014) had a similar result where he found that the electricity connection affected the rental prices.

Access to transport services- People in most towns work away from where they live, and thus access to transportation is key to choosing where to live and how much to pay. The estimation

results indicated a significant positive relationship between access to transportation and the amount of rent paid at a 1 % significant level. When an area is opened to transportation services, there is a likelihood of the rent increasing by 10.65%, other factors held constant.

Proximity to a Park- The study sought to determine what happens if a house is situated near a park (within 20 mins walk). The results showed a positive influence on the amount of rent when houses are situated near a park at a 10% significance level. Holding other factors constant, nearness to park is likely to increase rent by 3.84 %.

Kitchen- A considerable numbers of urban dwellings are constructed with an inbuilt kitchen unit. Having a separate inbuilt kitchen unit is among the factors people look out for when deciding to rent a house. The analysis found that the kitchen is likely to positively influence the amount of rent at a 1% significance level. Holding all other factors constant, the inclusion of a separate inbuilt kitchen unit in a house will likely increase the rent amount by 42.92 %.

Access to roads- Road access is paramount in deciding where to live and how much to spend on rent. It is not only access to roads that influences house values but also the type of road access. We compared the effect of access by not paved or earth road, Paved (stone or brick), Gravel or murram and Tarmacked roads. We created dummy variables for these types of access. Using the paved (stone/brick) road as the base, we found no significant difference in all other types of road access compared to the base (paved road). This means that houses that are accessed with tarmacked road will unlikely attract more rental prices compared to paved roads.

In-house private piped water and piped water in the compound – Water is a vital determinant that tenants look at before agreeing to rent a house. In high-end and middle-income areas, water is piped into the house, and people do not need to travel to look for it. Houses with in-house piped water tend to attract higher rental prices. The model results showed that having piped water in the house has a significant positive relationship with the rent amount at a 1% significant level. There is a likelihood of rent increasing by 11.97% if the house has in-house private piped water, other factors held constant.

Similarly, having piped water in the compound and not necessary in the house has a significant positive influence on rental prices at a 1 % significant level. The amount of rent that a house is likely to attract when there is piped water to the compound is likely to be 30.93% higher than having no water in the compound, holding all other factors constant. Morais and Cruz (2015) in Brazil and Chaurmurt et al. (2014) in Rwanda had similar results.

Floods- An area that experiences floods during the rainy season is unlikely to attract many tenants, and those who might come will be willing to pay lower rent amounts. The level of the flood was classified as severe, mild, and not a problem. Flooding affects the amount of rent negatively. Using severe flooding as the base, there was no significant difference between the effects of severe flooding and mild flooding on rent values, although both affected the rent negatively. However, there was a significant negative difference between the effect of no flooding problem at all and severe flooding at a 5% significance level. Moving from severe flooding to no flooding will only affect the rent amount negatively by 2.94 %, which is a smaller negative effect.

Proximity to a garbage dump- A dumpsite will affect property values. Dumpsites affect the surrounding with a foul smell, environmental pollution, among other effects that can lead to health problems. Houses near dumpsites are expected to have lower values compared to those far away from it. We classified the effect of dumpsite as severe, mild, and not a problem at all. The results show that using mild as the base variable; there is a significant negative difference between a severe dumpsite at a 10% significance level. This means areas with severe dumpsite nearby, will have rent values go down by 4.42% compared to mild dumpsite effects.

Proximity to a factory- Factories pose a health problem through the noise, air, and water pollution, among others. Houses near a factory, holding all other factors constant, are expected to have lower rent values. Ranking the effect as severe, mild and not a problem at all, and using mild as the base dummy variable, we found no significant difference between the effect of severe and no problem at all factory effect. This means the effect of severe and mild factor effects will have the same influence on rental prices.

Number of Rooms- Depending on household members and composition, among other things, people consider the number of rooms in a house. Other factors held constant the number of rooms will positively and significantly influence the amount of rent the house will attract. The model results found this to be true at % significance level. *Ceteris Paribas*, an addition of one room, is likely to increase the amount of rent by 13.59 %. It was, however, noted that the number of bathrooms did not affect rental prices. Mbugua (2014) and Mongare (2017) found that the number of rooms positively influenced rental prices.

External Wall Materials- The material that the dwellings external wall is made of is believed to affect house rent value positively or negatively. The analysis considered six wall materials stone, brick/block, mud/wood, mud/cement, wood only, and corrugated iron sheet. Using wood/cement as the base variable, the results show that there is a significant positive difference between house values with mud/cement, stone, brick/block, and corrugated iron sheets at 1%. Changing external wall material to stone, brick/block, or corrugated iron sheets will likely increase rent by 20.67%, 30.66%, and 9.66% in the same order, other factors held constant. However, we found a significant negative difference between the effect of wood/cement as wall material and mud/wood and wood only at a 1% significance level. *Ceteris Paribas*, Changing the wall from wood/cement to mud/wood and wood only will likely lower the rent values by 10.84% and 12.36%, respectively. These results are similar to the findings of (Ahned 2015).

Floor materials - Four types of floor material were considered in this study; earth/clay, tiled floor, cement, and wood. Using tiled floors as the base dummy variable, we find that there exists a significant negative difference between the effect of the tiled floor and earth/clay and cement at a 1 % significance level. Holding other factors constant, changing the floor material from tiled to earth or cement will likely lower the rent value by 90.59 % and 59.58%, respectively.

Roof materials – The analysis considered five types of roofing materials: corrugated iron, clay tiles, concrete, asbestos sheet, and makuti (thatch**).** Using the asbestos sheet as the base dummy variable, we find that there exists a significant positive difference between the effect on rent for house roofed with asbestos and all the other four roofing materials at a 1 % significance level. *Ceteris Paribas*, changing the roofing material from asbestos to corrugated iron, clay tiles, and

concrete or makuti will likely increase rent value by 59.56 %, 72.14 %, 77.06%, and 57.01%, respectively This finding is similar to the findings of (Ahned 2015)

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

This chapter discusses the conclusions and recommendations drawn from the study results.

Several studies have concluded that, urban infrastructure affects the rental prices. Morais and Cruz (2015), Chaumert et al. (2014) found infrastructural facilities such as piped water and drainage to affect Brazil and Rwanda's rental prices positively. Such urban infrastructure is critical in bettering the living standards of people's living and working in the cities and towns in the country. However, considerable parts of towns and cities in Kenya lack such infrastructure; either they are inadequate or in deplorable conditions such as access roads, drainage, and sewerage systems.

The key findings to this research are that one the type of access road does not influence the rental amount significantly as long as there is access to transportation. Access to water within the compound and to individual houses have a greater impact on rent amounts paid. This shows that the problem of water shortages has a greater effect on the living conditions of the urban population. In this regard, it's worth mentioning that from the study, both national and local governments should focus more fiscal resources to provision of water and sanitation passable access roads, and convenient transportation for all urban residents. Governments should not invest heavily on say tarmac roads while ignoring the main problem which is access to clean and adequate water.

Although the study was mostly interested in the effect of urban infrastructure on rental prices in several towns in Kenya, other factors like structural, environmental, and location factors were included in the analysis. The study found that neighborhood factors like safety determine the amount of rent. Moreover, structural factors such as roofing material, external wall material, floor material, having an in-house kitchen, and rooms also influence rent prices.

The study also concluded that the availability of drainage systems, working streetlights/ lamps, having piped water in the house or the compound, electricity connection, and transport availability to the central business district is vital determinants of rental prices. Finally, environmental factors play an important role in influencing rental prices in towns and cities. Proximity to a park, garbage dumpsite, factory, and occurrences of floods also affect rental prices.

Therefore, city and town planning should incorporate environmental, infrastructural, and structural factors, among other factors, when designing city plans. These factors affect the house values and rental prices, especially to the low-income tier populations in the urban areas.

The Government and other stakeholders in the real-estate sector should consider subsidizing the construction materials to bring down the cost of the building. One way to do so is zero rating the importation of such materials that cannot be produced locally. However, in an event that these materials can be sources locally, the tax on them should be reduced or exempted. This will go a long way in addressing affordable housing for either homeownership or long-term tenancy among the middle- and lower-income populations.

There should be a legislation to protect the tenants from rent hikes when the state builds infrastructure. Such actions should protect them from being driven away from where they live to cheaper areas but instead empower them.

Housing is among the big 4 agenda for the current administration in Kenya. It is also among the goals towards sustainable cities in the SDGs. To narrow the gap between demand and supply of

housing in Kenya, the government needs to effectively come up with legislations and incentive framework to attract private developers to develop houses that can fit the economic capabilities of the poor. For instance, a person must be able to pay not more than the current rent they pay towards owning a house.

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