



East African Journal of Environment and Natural Resources

eajenr.eanso.org

Volume 6, Issue 1, 2023

Print ISSN: 2707-4234 | Online ISSN: 2707-4242

Title DOI: <https://doi.org/10.37284/2707-4242>

EANSO

EAST AFRICAN
NATURE &
SCIENCE
ORGANIZATION

Original Article

Location Externalities and Residential Tenants Decisions in Nairobi, Kenya

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Article DOI: <https://doi.org/10.37284/eajenr.6.1.1479>

Date Published: ABSTRACT

02 October 2023

Keywords:

*Externalities,
Location
Externalities,
Residential Tenant
Decisions,
Nairobi,
Kenya*

Externalities cover the impacts that one party's activities have on the welfare of others. They arise whenever the actions of one economic agent directly affect another economic agent outside the market mechanism. Externalities affect the quality of residential neighbourhoods either positively or negatively and have a profound effect on residents' locational decisions. This study investigates significant location externalities that influence tenants' locational decisions in Nairobi City, Kenya. Data were obtained from primary and secondary sources. A questionnaire survey on a sample of 347 residential tenants in Nairobi city was carried out and data was analysed using quantitative methods. Findings reveal that environmental, social, and economic factors are the most significant location externalities in the case study area. In particular, anthropogenic noise pollution, crime and insecurity, air pollution, development of shopping malls and urban traffic congestion play a dominant role in influencing tenants' location decisions in Nairobi. The study recommends that the government should develop and implement zoning regulations that separate incompatible land uses. There should be strict enforcement of environmental standards and regulations to control pollution and protect natural resources. Implementing and enforcing strict emission standards for vehicles, industrial facilities, and power plants can significantly reduce the release of pollutants into the air. Shopping mall development should contribute to sustainable urban growth and enhance the overall wellbeing of residents. There is a need to address vehicular traffic in urban areas by investing in and expanding public transportation networks, implementing dedicated bus lanes and priority signalling, and developing safe and well-maintained pedestrian and cycling infrastructure, including sidewalks, bike lanes, and bike-sharing programs to encourage walking and cycling as viable commuting options. The establishment of a strong relationship between the police force and the community can help build trust, improve communication, and create a collaborative approach to addressing social and environmental hazards in residential neighbourhoods in Nairobi. The study contributes to the overall debate towards improving policy on residential real estate development, environmental protection, and social wellbeing within residential communities in urban areas in Kenya.

APA CITATION

Korir, L., Masu, S., Gitau, S. & Kieti, R. (2023). Location Externalities and Residential Tenants Decisions in Nairobi, Kenya. *East African Journal of Environment and Natural Resources*, 6(1), 367-384. <https://doi.org/10.37284/eajenr.6.1.1479>.

CHICAGO CITATION

Korir, Linus, Sylvester Masu, Sarah Gitau and Raphael Kieti. 2023. "Location Externalities and Residential Tenants Decisions in Nairobi, Kenya". *East African Journal of Environment and Natural Resources* 6 (1), 367-384. <https://doi.org/10.37284/eajenr.6.1.1479>.

HARVARD CITATION

Korir, L., Masu, S., Gitau, S. & Kieti, R. (2023) "Location Externalities and Residential Tenants Decisions in Nairobi, Kenya", *East African Journal of Environment and Natural Resources*, 6 (1), pp. 367-384. doi: 10.37284/eajenr.6.1.1479.

IEEE CITATION

L. Korir, S. Masu, S. Gitau & R. Kieti. "Location Externalities and Residential Tenants Decisions in Nairobi, Kenya", *EAJENR*, vol. 6, no. 1, pp. 367-384, Oct. 2023.

MLA CITATION

Korir, Linus, Sylvester Masu, Sarah Gitau & Raphael Kieti. "Location Externalities and Residential Tenants Decisions in Nairobi, Kenya". *East African Journal of Environment and Natural Resources*, Vol. 6, no. 1, Oct 2023, pp. 367-384, doi:10.37284/eajenr.6.1.1479.

INTRODUCTION

The residential real estate market is influenced by various factors, with location being a fundamental determinant of property value and investment performance (Rymarzak & Sieminska, 2012; 2018; Boyle & Kiel, 2001). Location has a significant impact on real property, influencing its value, demand and market dynamics, rental income and investment potential, market segmentation, access to amenities and services, neighbourhood characteristics, potential for future growth and development and overall desirability (Del Giudice et al., 2017; Cordera et al., 2019).

Generally, in economics, externalities refer to the unintended costs or benefits that result from the production or consumption of goods and services. They occur when the actions of one economic agent affect the welfare or utility of another party without being reflected in the market price or compensated through voluntary transactions. Externalities can have both positive and negative impacts and can occur in various contexts, including production, consumption, or even the provision of public goods (Anselin, 2003).

Location externalities, also known as spatial externalities or neighbourhood effects, refer to the impact that the location or spatial characteristics of a property and its environment can have on its value, desirability, and the wellbeing of individuals or communities (Kauko, 2003;

Epstein, 2017). These externalities arise from the presence or absence of certain features, amenities, or conditions in a specific location that affect the utility or costs experienced by individuals beyond the immediate participants in market transactions (Chau & Wong, 2014).

They can be positive or negative and play a crucial role in shaping various aspects of the housing market and urban development (Rossi-Hansberg & Sarte, 2012; Rossi-Hansberg et al., 2010). Examples of positive location externalities include proximity to amenities, good access to transportation networks, employment opportunities, safety and security and good environmental quality. Negative location externalities include pollution and environmental hazards, noise and congestion, social disamenities and a general lack of amenities and services. Externalities affect the quality of residential neighbourhoods and have a profound effect on residents' location decisions (Aluko, 2011; Jensen & Harris, 2008; Zheng et al., 2014).

The objective of this study was to identify significant externalities influencing residential tenants' locational decisions in Nairobi County, Kenya.

LITERATURE REVIEW

Establishing significant locational externalities necessitates investigating how urbanisation and urban growth spillover affect the residential real

estate market. These location externalities differ from one location to another, depending on the geographic, environmental, institutional, social, and economic characteristics of the jurisdiction in question. Consequently, the nature and extent of location externalities will vary from one jurisdiction to another on account of these corresponding variances (Thorsnes, 2002).

Urbanisation and urban expansion take place at disproportionate rates across the globe, with developed countries displaying markedly stable rates in comparison to developing countries, which have relatively higher rates and largely suffer from urban infrastructural inadequacies. The existing literature on urbanisation and urban growth spillovers provides a general classification of location externalities and largely stratifies them into physical, environmental, infrastructural, economic, technological, and social aspects. It is evident from past studies that location externalities have either positive or negative influences on their immediate surroundings (Marona & Wilk, 2016).

The extent of these influences inadvertently varies from one jurisdiction to another depending on scope and magnitude. In the majority of Less Developed Countries (LDCs), particularly Kenya, because of its significance as the study area in Nairobi, location externalities are manifested mainly in physical, environmental, infrastructural, economic, and social elements. From these general classifications, it is reasonable to suggest that the following location externalities play an influencing role (Trojanek & Tanas, 2018).

Environmental Externalities

Illegal dumping of waste is amongst the most severe environmental challenges facing urban areas in least-developed countries and countries in transition. In Kenya, studies have shown that one of the core problems facing the major cities, namely Nairobi, Mombasa, Kisumu and Nakuru, is the unsightly and haphazard discarding of solid waste, including sewage, animal waste and, in some cases, medical waste. Over time, this has

metamorphosed into an unsightly irritant (Schwartz et al., 2006).

The progressive growth of cities, towns, and urban areas in developing countries such as Kenya has largely occurred in line with the general pattern of urbanisation. Consequently, as urban areas have adopted an urbanised structure, especially in predominantly middle-class zones, typical city-life problems such as air pollution and water contamination have become rampant. Over the last two decades, a significant amount of literature and discourse on the management of solid waste and appropriate disposal mechanisms has been generated within both the academic and policy arena. Despite this concerted effort, garbage and litter continue to thrive in many urban areas. Globally, it is seldom acknowledged that air pollution can have detrimental effects on land. Air pollution has the potential to affect human and animal life directly and indirectly; it can affect the plant life on the land as well (Sehreen, 2019).

It is practically impossible to avoid air pollution, so far as real estate is concerned. Though installing air filtration systems to minimise air pollution effects is viable, the associated costs of such an initiative would be enormous when considered on a wider scale. Additionally, it is impractical to confine residents indoors for lengthy periods of time to evade the harmful effects of air pollution. Where the sources of air pollution source are adjacent to the real estate, local governments can limit pollution by imposing restrictions on the offending entities. In the absence of government intervention, legal redress can be sought in court (Somerville, 2009).

Social Externalities

A neighbourhood can generally be defined as a moderately minor spatial sector of a city or town for which several physical and socioeconomic features are measurable. Cities typically encompass an assortment of neighbourhoods including but not limited to the following: deprived neighbourhoods, shantytowns, ghettos, diverse neighbourhoods, racially distinct neighbourhoods, settler neighbourhoods, high-

class neighbourhoods, blue-collar neighbourhoods, underprivileged neighbourhoods, redeveloped areas, gated communities, suburbs, peri-urban areas, and bustling inner cities. Characteristically, some neighbourhoods display inordinate constancy over time (Andersen, 2002).

Neighbourhood decay is usually a function of several negative elements, namely, deteriorating housing quality, the depletion of more wealthy houses, the influx of less affluent families, a hostile and unsafe aura in the streets and a general increase in delinquency, just to mention but a few. When combined, these developments can potentially result in neighbourhood decline over time. The majority of the studies that have focused on the origins of neighbourhood decline have also given due attention to external influences, in particular, international macroeconomic changes (Andersen, 2002).

Stemming from the increase in traffic congestion, city-wide development adopts a leap-frog development pattern whereby only specific segments of the city undergo real estate development, a phenomenon that stunts the growth of commercial real estate. This inhibited development results in modification of the character of city centres. For instance, in Nairobi, new sub-centres, such as Westlands, Kilimani and Hurlingham, have emerged as a result of the congestion and disamenities witnessed in the CBD over the past two decades (Oundo, 2011).

Some of the more common problems faced by residents in the congested areas of metropolitan areas and cities include pollution, low productivity as a result of time lost during commuting, work-life imbalance meted out on the inhabitants from the affected areas, job selection based solely on commute time considerations, difficulties in realising real estate developments on account of spatial inadequacies, real estate price instability and variations, real estate undesirability and general disamenities (Ombongi, 2014; Zhou et al., 2015).

Economic Externalities

There is extensive literature on the influence of infrastructure development and technological improvements on real property values. The economic effect of infrastructural improvements stems from the bid-rent theory of urban economics, which postulates that any enhancement in accessibility or local amenities increases land and property values arising on account of larger output, higher quality of life, and decreased costs of transportation (Bae et al., 2003).

Existing empirical evidence is generally consistent with this view. One weakness with these data, however, is that the background for the majority of these studies is established in countries with well-developed property markets. The resulting implication is that evidence of the influence of infrastructural expansion in developing economies, where most infrastructure ventures are hindered by systemic challenges in development and implementation, is few (Rezai et al., 2012).

Furthermore, there is a likelihood that variances will occur between developed and developing property markets on account of the actualisation of property value appreciation in relation to infrastructure development and enhancements. According to Santos et al. (2010), a considerable proportion of the increase in property values associated with infrastructure projects, such as new metro-rail lines in property markets in developed economies, occurs in the period between the declaration and the beginning of the actual construction of the development. On the one hand, it is plausible that novel transportation infrastructure has the potential to influence residential property values positively as a result of greater accessibility. Similarly, it can potentially improve commercial property values on account of enhanced convenience and likely agglomeration paybacks. Standard location theory, as applied to urban areas, suggests that the lower transportation costs, the higher the land and property values will be (Anatsuksomri & Tontisirin, 2015; Conway et al., 2010).

One way of tackling traffic congestion that has been consistently endorsed is through investment in public transport. In addition, auxiliary measures, such as strict regulations, have been advanced and employed, especially on motor vehicles in the majority of the developed countries. Some of these measures include excluding privately owned cars from specific city zones and roads, street rating and taxation policies applied to office parking bays (Debrezion et al., 2011).

Relationship Between Location Externalities and Tenant's Locational Decisions

Against this background, externalities, whether environmental, social, or economic, have a profound influence on tenants' location decisions in urban residential neighbourhoods. The liveliness and feasibility of urban zones are founded on having good accessibility or convenience. Convenience is a significant determining factor in the location choices for a wide range of land practices and urban residents. To this end, it is critical to evaluate the economic liveliness of urban areas, assessed by the application of property values and data on changes in land use under conditions where accessibility levels have been modified (Duranton & Puga, 2004).

Varying patterns of accessibility in terms of method of transportation, infrastructural delivery, and price have generated immense interest among scholars and decision-makers. There has been a sustained desire to understand how public transport programmes are linked to the growth of traffic congestion and the associated effects on the values of real property and tenants' ability to pay rent. Tenants and residential occupants choose neighbourhoods with reduced air and noise pollution, less vibration and visual disturbance, improved pedestrian wellbeing and latent fiscal redistribution to communal transportation (Dube et al., 2013)

METHODOLOGY

Research Design

A combination of cross-sectional survey and case study designs were used in this study. Kumar (2005) suggests that survey design is perhaps the most appropriate method for investigating social phenomena since it enables researchers to collect unique data from a population too expansive to be studied by observation. Location externalities are a phenomenon emanating from social, economic, and environmental factors; therefore, a survey approach is suitable. The type of data required for this study is a key determinant of study designs employed with a view to addressing the study objectives.

Target Population, Sample Size and Sampling Techniques

The total target population in this study included residential tenants in Nairobi city. Other respondents included valuers, estate agents/property managers, property developers, urban planners, and Nairobi County management officials. To estimate the population of the residential tenants in the study area, the study used the number of households in the study area according to Kenya's national housing and population census statistics of 2019. From the 2019 national census, Nairobi County had 1,506,888 households, and the number of rented residential properties was 1,354,882 (KNBS, 2020).

Generally, findings from large samples are more reliable than those based on smaller samples. Kumar (2005) posits that a larger sample size will generally produce more accurate findings. Thus, the sample should mirror the population in all respects. In this study, Yamane's (1967) simplified formula was used to determine a scientifically reliable sample size at the 95% confidence interval and 0.05 level of significance.

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

Where N = Total population size, n = Sample size, e = Degree of precision (significance).

According to the Kenya Population and Housing Census (2019), Nairobi County had a total of

1,354,882 rented properties. Based on Yamane (1967) therefore;

$$n = \frac{1,354,882}{1 + 1,354,882 (0.05)^2} = 399.99 \text{ households}$$

Hence, a total sample size of 400 households was found to be fit for the selection of study respondents. Mugenda et al. (1999) suggest that it is prudent to obtain as big a sample as is feasibly possible when determining the required sample size. Naturally, time and resource limitations often tend to be a major obstacle in this endeavour. The sample size is often a function of other factors, such as the type of research design used by the researcher, data analyses employed and the accessible target population. According to Gay (1981), as cited by Kieti (2015), Masu (2006) and Murigu (2005), a minimum of 30 cases will suffice for correlation studies with 10% of the accessible target population being adequate for descriptive studies. The study used a stratified random sampling technique to interview residential real estate tenants residing in the study area. Thus, a total of 36 suburbs were surveyed from the study area. From the sample of 400 tenants, 347 responded, resulting in a response rate of 86.75%, which was considered adequate for purposes of analysis.

Data Collection

In this study, data collection was undertaken using a quantitative method to collect pertinent information on significant externalities influencing tenants' locational decisions. The data sought was mainly primary and secondary data. Primary data comprising tenants' perceptions on important location externalities influencing their choice of the suburb was obtained from the survey respondents, while secondary data was obtained from institutional libraries, internet, and public/government offices, mainly from the Nairobi County government and the National Environmental Management Agency (NEMA). The following research instruments were used for data collection:

Structured Observation

Non-participant direct observation of residential neighbourhoods in the study area was done in a structured manner, and data was recorded in the process of observations using a notebook. The unit of observation was the existing residential properties and their proximity to amenities and services, among other factors that may influence their demand and rental values. The effective demand and market rental value was used as a proxy measure of tenants' location decision. The structured observation method is preferable because it eliminates bias and is not easily influenced by past events or future aspirations. Besides, it is not dependent on the respondent's willingness to participate in a study, unlike the questionnaire method (Kothari, 2004). Consequently, structured observation was used to gather data relevant to the study objectives, namely, identifying and ranking significant location externalities influencing tenants' locational decisions in the study area.

Semi-Structured Self-Administered Questionnaires

A questionnaire is a proforma with a set of well-sequenced questions relevant to the study objectives. Schedules/self-administered questionnaires are more appropriate where the respondents are not well educated (Kothari, 2004). Schedules are faster and ensure that the data collected is complete and has no omissions/unanswered questions. They also enable high response rates and make a combination of different methods and personal contact possible (Kumar, 2005). This study used schedules due to the above reasons to collect data from residential real estate tenants.

Data Analysis and Presentation

The analysis of positive and negative location externalities was carried out by presenting the typical externalities identified through literature review to the study respondents to select the ones that are applicable in the area of study. The respondents were then asked to use a numerical horizontal scale of 1 to 4 to rank the location

externalities in their order of importance with respect to their influence on the choice of the residential suburb, whereby 1 = Not Important; 2 = Less Important; 3 = Important and 4 = Very Important. Several researchers have used and recommended a horizontal scale of 1 to 4 to represent two extremes; 'not important' and 'very important', respectively. Essentially, the effects of location externalities are either positive or negative. Therefore, having a very wide horizontal scale, e.g., 1-5 or 1-10, can cause confusion among the respondents (Alreck & Seattle, 1995; Murigu, 2005; Talukhaba, 1999, as cited in Kieti, 2015). In so doing, the significant location externalities influencing tenant locational choice were identified and ranked in their order of importance. Identification of significant location externalities was done using the mean scores and the critical Z-values.

Firstly, to further analyse and determine significant location externalities that influence tenant location decisions, the study used the sample mean ($\bar{X}= 2.5$), that is the middle point of the 1- 4 numerical score, to act as a decision point, whereby any location externality whose mean score was found to be below this point was not significant, and any location externality with a mean score equal to or above this point was major or significant in influencing tenant locational choice. Masu (2006), Murigu (2005), Talukhaba (1999), all cited in Kieti (2015), have used similar approaches.

Thus, all the 30 location externalities had two assumptions: that all the location externalities are not significant in influencing tenant locational choice, and all the drivers are significant in influencing tenant locational choice in the study area. A location externality with a mean score of about 2.5 is average and important. At this point, the insignificant location externalities were dropped for purposes of subsequent further data analysis. Insignificant location externalities are those with a mean score below 2.5.

Secondly, the identification of significant location externalities influencing tenant locational decisions was further carried out using Z-scores.

Z-test is a statistical test used to determine whether two means are different. This test is best used when the sample size is large (greater than 30 cases) because under the central limit theorem, as the number of samples gets larger, the samples are almost normally distributed, a key requirement for the Z-test.

Besides, for each significance level, the Z-test has a single critical value, which makes it more convenient to use than the t-test, which has a separate critical value for each sample size and is best suited for small sample sizes (Kingoriah, 2004). Z-test was therefore used after setting the confidence level at 95%. According to Masu (2006), as cited in Kieti (2015), confidence levels help reduce chances of identifying a particular externality to be significant when it is insignificant (Alpha error or type I error) or concluding that a particular externality is insignificant while it is significant (Beta error or type II error).

Since the analysis of location externalities influencing tenant locational decisions was only meant to provide policy direction to urban managers, the confidence level was set at 95%. Thus, Z-test analysis provided a decisive way of identifying significant externalities influencing tenant locational decisions in the study area. Z-test was performed only on the average/moderate and the major significant location externalities as analysed using the population mean score. The formula for computing the Z-value calculated for each average/moderate and the significant location externalities is shown below, as suggested by Abdi (2007).

$$Z = \frac{(\bar{X} - \mu)}{(\delta / \sqrt{n})} \quad (2)$$

Where: Z = calculated Z-value, \bar{X} = sample mean for each variable (location externality), μ = population mean score (2.5 for study population), δ = standard deviation, n = sample size (347 cases for this study)

Accordingly, the critical Z-value at a 95% confidence level is 1.65. This was used as a decision point, whereby the Z-value calculated for

each driver was then compared with the critical Z-value at 95% confidence level in a one-tailed Z-test. Where the Z-value calculated for each driver was greater than the critical Z-value at a 95% confidence level, the researcher was confident that the specific location externality was significant in influencing tenant locational choice. Therefore, since the critical Z-value (one-tailed test) at a 95% confidence level is 1.65, any location externality that had a calculated Z-value less than 1.65 was decisively considered to be less significant in influencing tenant locational choice and vice versa.

RESULTS

Significant Location Externalities Influencing Tenant Locational Decisions

From the review of the literature and the results of the field survey, 30 typical location externalities were identified as possible influencers of tenant locational choice in the study area (see *Table 1*). The location externalities in Nairobi County are naturally either positive or negative and were therefore hypothesised to either positively or negatively influence residential tenant choice when deciding where to reside within Nairobi City.

Table 1: Typical Location Externalities

No	Location Externality	Category	Type of Externality
1	Access to internet connectivity	Economic Externality	Positive
2	Aircraft noise pollution	Economic Externality	Negative
3	Electricity supply disruptions	Economic Externality	Negative
4	Industrial effluent	Environmental Externality	Negative
5	Industrial noise pollution	Environmental Externality	Negative
6	Intermittent water supply	Economic Externality	Negative
7	Light pollution	Economic Externality	Negative
8	Proximity to shopping mall	Economic Externality	Positive
9	Proximity to transport terminus	Economic Externality	Positive
10	Urban traffic congestion	Environmental Externality	Negative
11	Vehicular noise pollution	Environmental Externality	Negative
12	Air pollution	Environmental Externality	Negative
13	Biodiversity loss	Environmental Externality	Negative
14	Illegal dumpsite	Environmental Externality	Negative
15	Proximity to construction waste/debris	Environmental Externality	Negative
16	Proximity to landfill	Environmental Externality	Negative
17	Stream/river pollution	Environmental Externality	Negative
18	Ambient noise pollution	Environmental Externality	Negative
19	Anthropogenic noise pollution	Environmental Externality	Negative
20	Availability of refuse collection services	Environmental Externality	Positive
21	Crime and insecurity	Social Externality	Negative
22	Moral decadence	Social Externality	Negative
23	Provision of street lighting	Social Externality	Positive
24	Proximity to hospital	Social Externality	Positive
25	Proximity to open space	Social Externality	Positive
26	Proximity to the police station	Social Externality	Positive
27	Proximity to public primary school	Social Externality	Positive
28	Proximity to the religious establishment	Social Externality	Positive
29	Proximity to slum/informal settlement	Social Externality	Negative
30	Quality of road network	Social Externality	Positive

Source: Survey Results, 2023

Significant location externalities influencing tenant locational decisions as identified by the use of population mean score are presented in *Table 2*.

Table 2: Identification of Significant Location Externalities Using Mean Scores

Location Externality	Rating (On a 4-point scale)	Frequency (Count)	Percentage (%)	Mean Score (\bar{X})
Anthropogenic noise pollution	1	8	2.3%	3.646
	2	11	3.2%	
	3	77	22.2%	
	4	251	72.3%	
Crime and insecurity	1	3	0.9%	3.582
	2	17	4.9%	
	3	102	29.4%	
	4	225	64.8%	
Air pollution	1	8	2.3%	3.559
	2	12	3.5%	
	3	105	30.3%	
	4	222	64.0%	
Proximity to shopping mall	1	9	2.6%	3.372
	2	15	4.3%	
	3	161	46.4%	
	4	162	46.7%	
Urban traffic	1	18	5.2%	3.354
	2	36	10.4%	
	3	98	28.2%	
	4	195	56.2%	
Electricity disruptions	1	6	1.7%	3.352
	2	17	4.9%	
	3	173	49.9%	
	4	151	43.5%	
Vehicular noise pollution	1	23	6.6%	3.326
	2	30	8.6%	
	3	105	30.3%	
	4	189	54.5%	
Intermittent water supply	1	20	5.8%	3.285
	2	48	13.8%	
	3	92	26.5%	
	4	187	53.9%	
Illegal dumping	1	12	3.5%	3.280
	2	18	5.2%	
	3	178	51.3%	
	4	139	40.1%	
Proximity to public primary school	1	21	6.1%	3.268
	2	43	12.4%	
	3	105	30.3%	
	4	178	51.3%	
Proximity to transport terminus	1	22	6.3%	3.242
	2	47	13.5%	
	3	103	29.7%	
	4	175	50.4%	
Access to an internet connection	1	7	2.0%	3.213
	2	53	15.3%	
	3	146	42.1%	
	4	141	40.6%	
	1	5	1.4%	2.697

Location Externality	Rating (On a 4-point scale)	Frequency (Count)	Percentage (%)	Mean Score (\bar{X})
Proximity to a police station	2	145	41.8%	
	3	147	42.4%	
	4	50	14.4%	
Proximity to hospital	1	14	4.0%	2.686
	2	146	42.1%	
	3	122	35.2%	
	4	65	18.7%	
Proximity to slum/informal settlement	1	7	2.0%	2.663
	2	155	44.7%	
	3	133	38.3%	
	4	52	15.0%	

Source: Survey Results, 2023

By analysing the 30 location externalities using population mean scores, it was not possible to decisively identify those that were significant in influencing tenant location choice in the study area. This arose out of the fact that confidence levels had not been factored in. The addition of confidence levels was important because their inclusion would assist in minimising the possibility of committing errors, specifically type 1 and type 2 errors. By using the Z-value test for statistical significance on location externalities, the probability of committing these errors was reduced.

Normally, the Z-test provides a decisive way of either accepting or rejecting the null hypothesis in statistical research (DeVore, 2017). In this respect, all the location externalities with an overall rating equal to or greater than the sample mean, in this case ($\bar{X} = 2.5$), are considered significant in influencing tenant locational choice in Nairobi County. Consequently, the Z-value test was conducted on all the location externalities, which were significant in terms of their influence on tenant locational choice.

They included anthropogenic noise pollution ($\bar{X} = 3.646$), crime and insecurity ($\bar{X} = 3.582$), air pollution ($\bar{X} = 3.559$), proximity to shopping mall ($\bar{X} = 3.372$), urban traffic ($\bar{X} = 3.354$), electricity supply disruptions ($\bar{X} = 3.352$), vehicular noise pollution ($\bar{X} = 3.326$), intermittent water supply

($\bar{X} = 3.285$), illegal dumping ($\bar{X} = 3.280$), proximity to public primary school ($\bar{X} = 3.268$), proximity to public transport terminus ($\bar{X} = 3.242$), availability of internet connection ($\bar{X} = 3.213$), proximity to police station ($\bar{X} = 2.697$), proximity to hospital ($\bar{X} = 2.686$) and proximity to slum/informal settlement ($\bar{X} = 2.663$).

Thus, all location externalities whose mean score rating was equal to or more than the population mean score ($\bar{X} = 2.5$) are significant in influencing tenant locational decisions in the study area. A z-test was performed on the location externalities, which were significant and average in terms of their influence on tenant locational choice and are shown in *Table 1* above. *Table 2* below shows the results of the Z-test for each of the location externalities with a mean score rating equal to or more than the sample mean (2.5).

The below data has revealed that 12 out of the 15 location externalities have calculated Z-values greater than the critical Z-values at a 95% confidence level. These 12 factors were found to be significant in the extent to which they influence tenant locational choice amongst residential households within Nairobi County. Similarly, the remaining location externalities are ranked in order of their significance with respect to their influence on tenant locational choice in the study area.

Table 3: Identification of Significant Location Externalities Using Critical Z-Values and Calculated Z-Values

Location Externality	Mean Ranking	Critical Z Value at 95% CI	Calculated Z Value	Hypothesis Testing	Remarks
Anthropogenic noise pollution	3.646	1.65	6.72	Fail to accept H_0	Factor is significant
Crime and insecurity	3.582	1.65	6.49	Fail to accept H_0	Factor is significant
Air pollution	3.559	1.65	6.38	Fail to accept H_0	Factor is significant
Proximity to shopping mall	3.372	1.65	5.58	Fail to accept H_0	Factor is significant
Urban traffic	3.354	1.65	5.41	Fail to accept H_0	Factor is significant
Electricity disruptions	3.352	1.65	5.50	Fail to accept H_0	Factor is significant
Vehicular noise pollution	3.326	1.65	5.27	Fail to accept H_0	Factor is significant
Intermittent water supply	3.285	1.65	5.07	Fail to accept H_0	Factor is significant
Illegal dumping	3.280	1.65	5.14	Fail to accept H_0	Factor is significant
Proximity to public primary school	3.268	1.65	4.99	Fail to accept H_0	Factor is significant
Proximity to transport terminus	3.242	1.65	4.86	Fail to accept H_0	Factor is significant
Access to internet connectivity	3.213	1.65	4.79	Fail to accept H_0	Factor is significant
Proximity to police station	2.697	1.65	1.63	Accept H_0	Factor is not significant
Proximity to hospital	2.686	1.65	1.52	Accept H_0	Factor is not significant
Proximity to slum/informal settlement	2.663	1.65	1.36	Accept H_0	Factor is not significant

Source: Survey Results, 2023

DISCUSSION

The important location externalities influencing tenant locational decisions in the study area, as ranked by the respondents and Z test, are discussed below.

Anthropogenic Noise Pollution

Anthropogenic noise pollution was rated by the respondents as the most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.646$, $Z = 6.72$). According to the respondents, it 'often' emanates from bars, nightclubs, pubs, and social gatherings, religious establishments and bus parks

at 42.7%, 39.5% and 35.2%, respectively. It is a negative location externality imposed on individuals or properties located near sources of noise. In the case of anthropogenic noise pollution, activities such as road traffic, industrial operations, construction sites, or airports generate noise that can extend beyond the immediate vicinity of the source.

This noise can disrupt the peace, tranquillity, and quality of life for individuals residing or working in nearby locations. It can also affect property values, as potential buyers or tenants may perceive the noisy environment as less desirable. The negative effects of anthropogenic noise

pollution are not fully internalised by those responsible for creating the noise. The costs associated with noise, such as health impacts, decreased productivity, reduced property values, or the need for noise mitigation measures, are often borne by individuals or properties near the noise source (Solymani et al., 2021; Otiso, 2003).

Crime and Insecurity

Crime and insecurity were rated by the respondents as the second most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.582$, $Z = 6.49$). According to the respondents, they 'often' emanate from robbery, burglary, larceny, and motor vehicle theft at 44.1%, 43.2%, 47.8% and 31.4% respectively. Crime and insecurity impose negative effects on individuals and properties in specific geographic areas. In the context of crime and insecurity, certain areas may experience higher levels of criminal activities, such as theft, violence, or drug-related offences.

These activities can result in a range of negative consequences, including physical harm, psychological distress, reduced quality of life, and property damage. Additionally, the perception of high crime rates can also lead to reduced property values and lower investment in affected areas. The negative effects of crime and insecurity are not fully internalised by those engaged in criminal activities. Instead, individuals and properties located in high-crime areas bear the costs of increased security measures, reduced mobility, fear, and potential victimisation.

Air Pollution

Air pollution was rated by the respondents as the third most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.559$, $Z = 6.38$). According to the respondents, this 'often' emanates from domestic combustion, motor vehicle exhaust and particulate matter at 34.0%, 39.2% and 40.6%, respectively. Air pollution is a negative location externality because it affects individuals and properties located near pollution sources or in areas where pollutants accumulate.

In the case of air pollution, activities such as industrial emissions, vehicle exhaust, or the burning of fossil fuels release pollutants into the air.

These pollutants can disperse and travel over long distances, affecting the air quality of surrounding areas. Individuals residing or working near pollution sources or in areas with poor air quality may experience adverse health effects, such as respiratory problems, allergies, or cardiovascular issues. The negative effects of air pollution, including health impacts and reduced quality of life, are not fully internalised by those responsible for the emissions. Instead, individuals and properties located in polluted areas bear the costs in terms of their health, wellbeing, and potential medical expenses.

Development of Shopping-Malls

The development of shopping malls and major shopping outlets was rated by the respondents as the fourth most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.372$, $Z = 5.58$). The development of shopping malls can have both positive and negative location externalities, depending on the specific context and characteristics of the area. The presence of a shopping mall can stimulate economic growth by attracting businesses, creating job opportunities, and generating tax revenue for the local economy.

This can have positive spillover effects on nearby businesses, resulting in increased economic activity and development in the surrounding area. The development of a shopping mall can enhance the desirability of the surrounding area, leading to increased property values. The presence of a well-designed and well-maintained shopping centre can attract more residents, businesses, and investments, contributing to overall appreciation in property prices. Shopping malls often offer a variety of amenities, including retail stores, entertainment venues, restaurants, and recreational spaces. The availability of these amenities can enhance the quality of life for

nearby residents and provide convenient options for shopping, dining, and leisure activities.

Urban Traffic Congestion

Urban traffic congestion was rated by the respondents as the fifth most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.354$, $Z = 5.41$). Traffic congestion is a negative location externality because it imposes costs and negative effects on individuals and properties located in congested areas, even if they are not directly contributing to the congestion themselves. Congested areas experience increased travel times, causing delays and reducing efficiency for individuals commuting or transporting goods. People residing or working in congested locations may spend more time in traffic, leading to reduced productivity, increased stress, and diminished quality of life.

These time costs are incurred by individuals in the congested area, even if they are not responsible for the traffic congestion. Congestion results in increased vehicle emissions and energy consumption, contributing to air pollution, greenhouse gas emissions, and environmental degradation. The negative environmental impacts, such as poor air quality and climate change, affect the health and wellbeing of individuals in the congested area and beyond. Congestion places a burden on transportation infrastructure, such as roads and public transportation systems. The need for expanded infrastructure, maintenance, and upgrades to accommodate increasing traffic volumes imposes costs on society, including taxpayers, even if they do not directly contribute to the congestion. Traffic congestion in one area can spill over to adjacent areas, affecting the mobility and wellbeing of individuals and properties in those locations.

Electricity Supply Disruptions

Electricity supply disruptions were rated by the respondents as the sixth most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.352$, $Z = 5.50$). According to 49.3% of the respondents,

these interruptions are frequent. Electricity supply disruptions are a negative location externality because they impose costs and negative effects on individuals and properties in specific geographic areas. Electricity disruptions can have significant economic costs for businesses, industries, and households in the affected area. Power outages can disrupt production processes, halt operations, and result in financial losses. Businesses may experience decreased revenue, spoilage of perishable goods, or damage to sensitive equipment. These economic costs are borne by the entities in the affected area, even if they are not responsible for the disruption.

Vehicular Noise Pollution

Vehicular noise pollution was rated by the respondents as the seventh most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.326$, $Z = 5.27$). According to the respondents, this 'often' emanates from motorcycle taxis (*bodabodas*), passenger cars, minibuses (*matatus*) and buses at 30.3%, 32%, 35.7% and 36.6% respectively. Vehicular noise pollution is a negative location externality because it imposes costs and negative effects on individuals and properties located near roads or in areas with high traffic volumes.

Vehicular traffic generates noise, including engine noise, tire noise, and honking, which can disrupt the peace and quiet of nearby residential areas or workplaces. Individuals residing, working, or conducting activities in these locations may experience annoyance, sleep disturbance, reduced concentration, and overall diminished quality of life due to noise pollution. Prolonged exposure to vehicular noise can have adverse health effects. Studies have shown that excessive noise can lead to increased stress levels, cardiovascular problems, hearing impairments, and mental health issues. The health impacts of vehicular noise are borne by individuals residing or working in areas with high traffic volumes or noisy transportation infrastructure.

Intermittent Water Supply

Intermittent water supply was rated by the respondents as the eighth most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.285$, $Z = 5.07$). According to 57.9% of the respondents, intermittent water supply is a frequent occurrence. Intermittent water supply is a negative location externality because it imposes costs and negative effects on individuals and properties located in areas with unreliable or irregular access to water. Intermittent water supply can cause inconvenience and disruptions in daily activities that depend on a reliable water source.

Individuals in affected areas may face challenges in accessing clean water for drinking, cooking, sanitation, and other household needs. Businesses, hospitals, and educational institutions may also be negatively impacted by interruptions in water supply, affecting their operations and services. Inadequate access to water due to intermittent supply can pose health risks and impact hygiene practices. Limited water availability can lead to poor sanitation and hygiene conditions, increasing the risk of waterborne diseases and compromising public health. Individuals may have to rely on alternative, less safe water sources or modify their behaviours to cope with the intermittent supply, potentially affecting their wellbeing.

Illegal Dumping of Domestic Solid Waste

Illegal dumping of domestic solid waste was rated by the respondents as the ninth most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.280$, $Z = 5.14$). According to 39.2% of the respondents, illegal dumping of domestic refuse is a frequent occurrence. Illegal dumpsites are a negative location externality because they impose costs and negative effects on individuals, properties, and the environment in the vicinity of the dumpsites. Illegal dumpsites often contain hazardous materials, chemicals, and non-biodegradable waste. Improper disposal of these substances can lead to soil contamination, water pollution, and air pollution.

Properties located near illegal dumpsites may experience decreased values due to the negative perception associated with the presence of waste and the potential health and environmental risks. The proximity to an illegal dumpsite can deter potential buyers or tenants, leading to reduced demand and lower property prices. Illegal dumpsites are often unsightly and emit unpleasant odours, negatively impacting the aesthetic appeal and quality of life in the surrounding area. The visual blight and noxious smells can diminish the overall liveability and attractiveness of the neighbourhood, affecting the wellbeing and satisfaction of individuals residing or operating businesses nearby.

Proximity to Public Primary Schools

Proximity to public primary schools was rated by the respondents as the tenth most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.268$, $Z = 4.99$). Proximity to public primary schools is a positive location externality because it can have several beneficial effects such as wellbeing and convenience on individuals and properties in the surrounding area. Living or operating a business near a primary school provides convenient access to educational facilities. Parents and guardians can easily drop off and pick up their children, reducing travel time and enhancing the overall convenience of daily routines. Proximity to primary schools also allows for easier participation in school-related activities and events.

Proximity to public primary schools offers increased educational opportunities for children in the area. They have easier access to quality education, with reduced commuting time and expenses. Being closer to a school can enhance children's involvement in extracurricular activities, such as sports, arts, and clubs, contributing to their overall educational development. Primary schools serve as community hubs, bringing together students, parents, teachers, and other stakeholders. Living near a school fosters a sense of community and social cohesion, as individuals have more

opportunities to interact, collaborate, and engage in school-related initiatives. This can contribute to a stronger neighbourhood bond and a supportive social environment.

Proximity to Transport Termini

Proximity to transport termini was rated by the respondents as the eleventh most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.242$, $Z = 4.86$). Proximity to transport termini, such as bus stations, train stations, or airports, is a positive location externality because it can have several beneficial effects on individuals and properties in the surrounding area. Living or operating a business near transport termini provides convenient access to various modes of transportation. Individuals in the area can easily access public transportation networks, making commuting and travelling more efficient and convenient.

Proximity to transport termini reduces travel time and offers greater flexibility in choosing transportation options. Being close to transport termini enhances connectivity to other areas, including neighbouring towns, cities, or even countries. It provides individuals with opportunities for work, education, leisure, and access to a wider range of services and amenities. This increased connectivity can enhance economic opportunities and social interactions. Proximity to transport termini can positively impact local economic activity. It can attract businesses, commercial establishments, and tourism-related services, leading to job creation and economic development. The availability of convenient transportation options can also attract investors and stimulate economic growth in the surrounding area.

Access to Internet Connectivity

Access to internet connectivity was rated by the respondents as the twelfth most important location externality influencing the decision to reside in a particular suburb within the study area ($\bar{X} = 3.213$, $Z = 4.79$). Access to internet connectivity in residential areas is a positive location externality

because it can have several beneficial effects on individuals and properties in the surrounding area. Internet connectivity enables individuals in residential areas to easily communicate with others, access information, and engage in online activities. It facilitates communication through email, social media, video calls, and instant messaging platforms.

Individuals can stay connected with family, friends, and colleagues and access a wealth of knowledge, resources, and educational opportunities available on the Internet. Reliable internet connectivity in residential areas opens economic opportunities for individuals and businesses. It enables remote work, freelancing, online entrepreneurship, and e-commerce activities. Access to the internet allows individuals to participate in the digital economy, access online job platforms, and engage in online learning and skill development, potentially enhancing their earning potential and economic wellbeing.

CONCLUSION AND RECOMMENDATIONS

Based on the survey respondents' rating of the thirty (30) location externalities identified in the literature review by use of population mean scores and critical Z-test, it is evident that twelve (12) location externalities significantly influence tenant locational decisions in the study area. Arranged in descending order of importance, they include anthropogenic noise pollution, crime and insecurity, air pollution, proximity to shopping malls, urban traffic congestion, electricity supply disruptions, vehicular noise pollution, intermittent water supply, illegal dumping, proximity to public primary school, proximity to transport terminus and access to internet connectivity.

The study has revealed that environmental, social, and economic externalities are the most significant location externalities influencing tenant locational decisions in the study area. Based on the first five most significant locational externalities influencing tenant locational

externalities, the study makes the following recommendations.

The government of Kenya should develop and implement zoning regulations that separate incompatible land uses, such as industrial activities away from residential areas. This will help reduce negative externalities like pollution and noise that can impact nearby communities. The government should also enforce environmental standards and regulations to control pollution and protect natural resources.

The establishment of a strong relationship between the police force and the community can help build trust, improve communication, and create a collaborative approach to addressing crime. Community policing involves officers working closely with residents to identify and address security concerns.

Implementing and enforcing strict emission standards for vehicles, industrial facilities, and power plants can significantly reduce the release of pollutants into the air. This includes regulations on particulate matter, nitrogen oxides (NO₂), sulphur dioxide (SO₂), volatile organic compounds (VOCs), and other pollutants.

Addressing vehicular traffic in urban areas requires a combination of policies and strategies that encourage efficient transportation options, reduce congestion, and promote sustainable urban mobility. The government of Kenya should invest in and expand public transportation networks, including buses, subways, trams, and light rail, to provide efficient alternatives to private vehicles.

The government of Kenya should implement dedicated bus lanes and priority signalling to ensure that public transportation remains reliable and efficient. Develop safe and well-maintained pedestrian and cycling infrastructure, including sidewalks, bike lanes, and bike-sharing programs, to encourage walking and cycling as viable commuting options.

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