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Relaxation of Plot Ratio and Lot Size and the Triggering of Gentrification in the Industrial Area of Nairobi

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Abstract

Industrial gentrification as defined by Smith is the movement of capital driven by the growing difference between the potential value of inner urban properties and their underlying land values (Smith, 1979; Lees, 2018; Smith, 2007). To shed light on the processes and interests at play, this paper establishes how spatial development plans and zoning policies systematically led to gentrification in the industrial area of Nairobi. To do this, the paper employs an extensive literature review by examining various spatial development plans and policies that have been implemented in the industrial area of Nairobi since the 1948 Master Plan to date. Key informant interviews and field surveys were conducted to complement the findings. The paper illustrates that gentrification in the industrial area of Nairobi is mainly policy-led through the rationalization of plot ratio and increased densities, which inadvertently led to opportunities in real estate development and other forms of land uses. The study recommends redevelopment of the industrial area of Nairobi through regularization to include mixed-use development and implementation of existing development plans.

Keywords: Gentrification, zoning policies, plot ratio, lot size, industrial area, Nairobi

INTRODUCTION

Industrial gentrification is defined by Smith as the transfer of capital and indicates the widening gap between the potential value of inner-city properties and their underlying land prices (Smith, 1979; Smith, 2007; Lees, 2018). Industrial gentrification is influenced by government policies and regulations at the national, regional, and local levels. Ambani et al. (2023), claim that the state and relevant planning authorities may promote policies that encourage industrial gentrification (Curran, 2004; Curran, 2007; Ley, 1996). They contend that the state and local planning authorities support, stimulate or initiate the city's socio-spatial reorganization. In addition, changes in market policies, redevelopment plans, regeneration programs, and land use policies all contribute to industrial gentrification (Curran, 2007; Benton, 2014; Wrona, 2020; Schlichtman, Hill, & Patch, 2013).

This paper seeks to unravel how the policy change encouraged gentrification in the industrial area of Nairobi. The paper examines the process and drivers of gentrification in the industrial area of Nairobi, showing how existing development policies including the 1948 Nairobi Master Plan, the 1973 Nairobi Metropolitan Growth Strategy, the 2004 Zoning Ordinances, and the Nairobi Integrated Urban Development Master Plan (NIUPLAN) of 2014 have contributed to this process. The rest of the paper is organised as follows: section two presents a synthesis of the literature reviewed that links spatial development policies with gentrification. Section three presents the theoretical underpinning of the paper based on rezoning theory. Section four presents the methodology employed in the study while section five presents the results. Section six discusses the study findings before drawing conclusions and recommendations in sections seven and eight respectively.

THEORY

Policies as Drivers of Industrial Gentrification

According to Ambani et al (2023), the state and relevant planning authorities may promote policies that trigger industrial gentrification since they act

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as sponsors, catalysts, or instigators of the socio-spatial restructuring of the city (Curran, 2004; Curran, 2007). Concomitantly, changes in market policies, redevelopment plans, regeneration strategies, and land use policies all contribute to industrial gentrification (Benton, 2014; Curran, 2007; Ambani, Ayonga, Ngayu, & Wamuchiru, 2023; Schlichtman, Hill, & Patch, 2013). For example, in Williamsburg-Brooklyn in New York, policy decisions like Williamsburg's 2005 rezoning, permitted more residential and commercial buildings that attracted developers and investors to the previously industrial neighbourhood (Curran, 2007; Curbed New York, 2018). At the same time, the city preferred corporate offices and support services over manufacturing, viewing industrial activities as a nuisance (Curran, 2007). The industrial gentrification in Williamsburg was further encouraged by the mayor who supported the conversion of vacant industrial spaces into homes after three years of non-use. This rezoning policy gave landowners ample opportunity to entice speculators who eventually displaced the initial industrial use (Curran, 2007; Delalović, 2019). It is thus clear that local development policies that shape development may initiate gentrification of older use to new use of urban space (Wrona, 2020).

Tracing Gentrification in the Industrial Area of Nairobi

The establishment of the Industrial Area of Nairobi began in the early 1900s (Mitullah, 2004). The area, once a railway depot, quickly developed into an active industrial and manufacturing zone (Ogonda, 1992; Ogot & Ogot, 2020). The industrial activities were driven by the necessity to create more job opportunities and support Kenya's thriving economy (Ogendi & Kumar, 2019). Notable developments in this area include textile mills, tanneries, and food processing facilities (Mwaura & Iravo, 2019). Since then, the industrial sector has evolved through time and space to encompass a wide range of manufacturing and industrial activities, including printing, packaging and automotive assembly (Mwaura & Iravo, 2019). The development of the industrial sector has been facilitated by government programs and policies aimed at promoting industrialization and economic growth (Mwaura & Iravo, 2019; Ogendi & Kumar, 2019).

The 1948 Master Plan for a Colonial Capital was the first development policy to designate the current location of the Nairobi industrial area (White, Silberman, & Anderson, 1948; Wanjiru-Mwita & Giraut, 2020). The master plan envisaged the creation of an industrial zone to promote economic growth and development in the city. The plan proposed that the industrial zone be located to the east of the central business district, near the railway line and the Nairobi River. It sits on approximately 2784 acres or 11.27 Km^2 as illustrated in **Figure 1.**

The master plan recognized the importance of separating industrial activities from residential and commercial areas to minimize pollution and noise. It also identified the need for a comprehensive transportation system to facilitate the movement of goods and people to and from the industrial zone. While the plan was developed during the colonial era, its vision and principles remain relevant to contemporary urban planning and development of the city.

Upon the expiry of the 1948 master plan, the Nairobi Metropolitan Growth Strategy of 1973 was formulated to guide the growth and development of the city to the year 2000. Part of the proposals in the Strategy was to allow the progressive spread of industries to other towns within the city's metropolitan area such as Athi River and Thika (Mireri, 1992). Since then, a good number of industries have relocated to Mlolongo and Athi River along Mombasa Road (Mireri, 1992). However, the 1973 Metropolitan Growth Strategy was not fully implemented due to budgetary constraints and weak enforcement of the policies by the city planning authority. Consequently, in the year 1979, the Town Planning Committee of the city approved the rationalization and increment of development densities in the city. As such, plot coverages were increased from 75% to 80% as the minimum plot-size for industrial use was maintained at 0.04 hectares (City Council minute No. 36 of 16th July 1979). The revised plot ratios/coverages and plot sizes have encouraged gentrification in the industrial area of Nairobi.

According to ETH Studio Basel (2008) the dysfunctional railway line in the industrial area, which was the primary source of transportation for manufacturing industries, has pushed all the burden onto the road. As a result, the industries are relocating to places such as Athi River and the

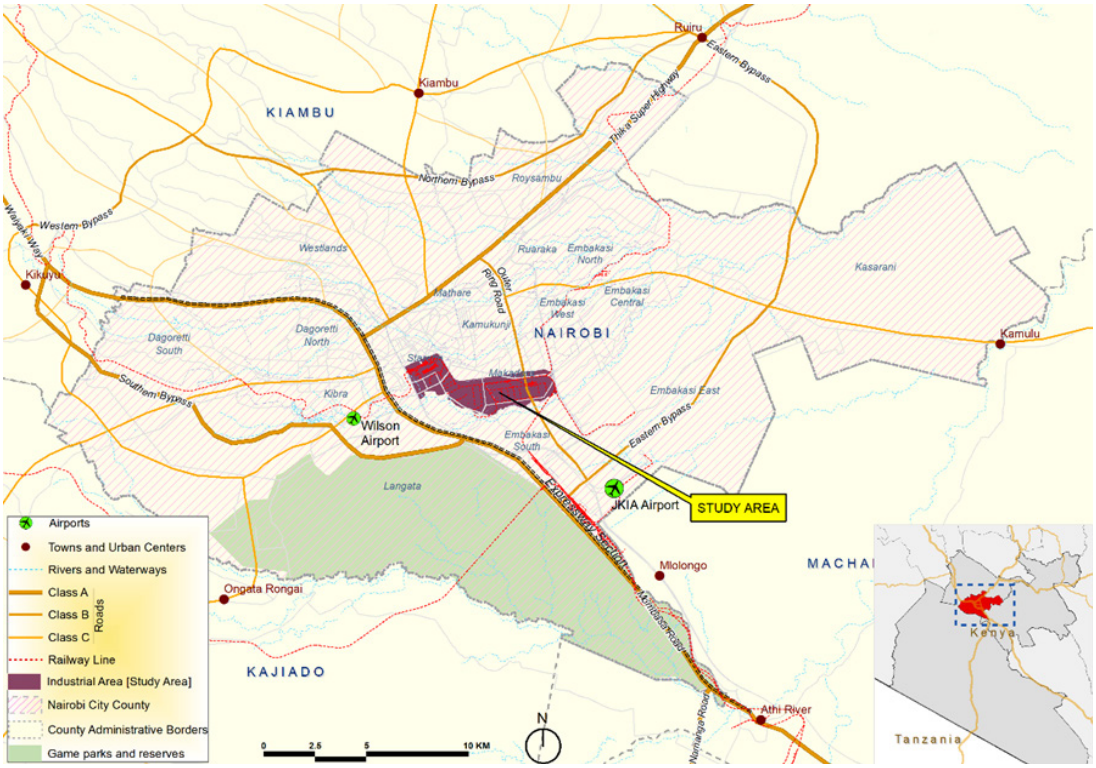

FIGURE 1
Industrial Area of Nairobi as zoned in the 1948 master plan
Source: Authors, 2024

Eastern Bypass for easy access and transfer of raw materials and finished products. Macharia (2019) points out that poor infrastructure and high land costs have seen the industrial area of Nairobi lose its attractiveness as the desired manufacturing locus in the country, making industrial developers seek alternative sites within and outside the city.

More than 50 years later, after the Nairobi City Development Ordinances and Zones were formulated in 2004 to guide development control applications and approvals within the city. Industries and go-downs were the designated land uses in the industrial area in the policy. The permitted ground coverage was 80, while the plot ratio was 300. The minimum area of parcel allowed for industrial development was 0.05 hectares – thus promoting gentrification in the industrial area of Nairobi (ETH Studio Basel, 2008).

In 2014, the Nairobi Integrated Urban Development Master Plan (NIUPLAN) was formulated to guide sustainable urban development and improve living conditions based on the integrated urban development for Nairobi. The NIUPLAN designates Zone 9 and 9E for exclusive industrial purposes and go-downs as earlier provided for in the 2004 development ordinances. In addition, NIUPLAN advocates for the decentralization of industries through the establishment of satellite industrial centres. It stipulates that industries that are labour-intensive and operate on a large scale could find it more convenient to operate outside of Nairobi. NIUPLAN revised the regulations of 2004 by relaxing plot ratios (a maximum of four floors for apartments), thus proposing the redevelopment of the existing industrial area for new urban function. NIUPLAN's key strategies were a comprehensive development control mechanism (comprising land development control, building control, and technical standard) and urban development schemes (including change and improvement of land conditions and securing necessary public spaces). The plan proposed infrastructure and facility renovations, such as new street lighting and roads besides encouraging mixed-use development. The NIUPLAN focused on spatial organization of land uses and not development control guidelines - a direct influence on the gentrification of the industrial area of Nairobi.

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Theoretical Framework on Process of Industrial Gentrification

This paper explores the use of the zoning theory to understand the process of industrial gentrification. In urban planning, zoning theory involves dividing cities into distinct zones based on land use, typically including residential, commercial, and industrial areas. This approach aims to regulate development and prevent incompatible land uses, such as locating factories next to residential neighbourhoods (Claeys, 2004; Rothwell, 2009; Fische, 1999).

Land use planning, which is the process of regulating the use of land, is mainly carried out by local governments, using zoning as their most pervasive tool (Knack, Meck, & Stollman, 1996; Hall, 2002). Other tools involved in land use planning in countries like the United States include comprehensive plans, subdivision ordinances, site plan approval requirements, and the use of eminent domain to acquire titled properties. A functional zoning system requires a state-enabling act authorizing cities and counties to adopt zoning ordinances, the adoption of zoning ordinances by each city or county, a zoning administrator to enforce the zoning ordinances, and local government commissions or boards, including a board of adjustment and planning com-mission to make recommendations. For example, some of the famous provisions of the stand-ards of the Zoning Enabling Act in the United States of America are: zoning is to protect the health, safety, morals or general welfare of the community; it governs the location and use of buildings, structures and land; it does so by a comprehensive plan; zoning must be uniform throughout each district or zone; zoning ordinance is issued by City council after public hear-ings (Knack, Meck, & Stollman, 1996; Claeys, 2004).

The importance of zoning theory to industrial gentrification stems from its power to modify the urban landscape and determine which regions are desirable. If zoning regulations are relaxed or outdated, industrial zones may become appealing to developers and investors. This might result in rezoning and the conversion of industrial spaces into other alternative land uses such as resi-dential or commercial, increasing property values and displacing existing residents. Frequently when a landowner wants to change the way their land is being used, they will also need to change the way the zoning impacts on that parcel of land. Three types of actions change zoning impact including rezoning, variance and conditional use permit (Claeys, 2004; Knack, Meck, & Stollman, 1996; Rothwell, 2009; Smith, 2007). Critics of zoning policies have realized that it is not in all cases that zoning is accompanied by comprehensive planning. In some cases, planners view zoning as a burdensome, time-consuming, and highly technical distraction from what they consider their primary planning function -envisioning the future. Traditional zoning seems to play a limited role in the diversity of possible strategies.

This theory suggests that rezoning might have triggered gentrification in the industrial zone of Nairobi.

RESEARCH METHODS

The paper advanced a proposition that 'gentrification' in the Industrial Area of Nairobi 'was triggered by shifts in policy' especially changes that were made in plot ratios and relaxation of minimum lot size. The proposition states that: '*there has been a systematic policy-led desire to optimize the use of space and maximize both profit and revenue streams for individuals and the county*'. The inquiry collected evidence from industrial and non-industrial investors, key informant interviews from relevant institutions such as Nairobi City County, and participant observations. Mixed methods were employed to analyze the data and a t-test was used to substantiate the advanced proposition. Specifically, the paper attempts to gauge how much zoning poli-cies have influenced gentrification in the industrial district of Nairobi. The samples selected were parcels of land, business/office space, 2-bedroom residential apartments, revenue streams for the county, and professional experts' earnings. The non-industrial activities were used to compare their average incomes to that of industrial entities. using the t-test method allowed for a clear comparison of income generated from different land-use activities, providing empirical evidence of the profit-driven nature of industrial gentrification. The costs of operations were assumed to be constant. The unit of measurement was 0.05Ha of plot sizes of the various non-industrial entities and the incomes generated per month. The results are discussed below.

RESULTS

Explanation for Gentrification in the Industrial Area of Nairobi

Review of plot sizes from 1HA to 0.05HA

The original land size for industrial plots in the Industrial Area of Nairobi was 2.5 acres (1 Ha). However, this was changed to 0.05 Ha by the 2004 zoning ordinance. Subsequently, developers began to engage in land subdivisions to earn more money. They discovered that they could divide the industrial plot into smaller sections without facing any legal penalties. Industrial plot owners applied for land subdivisions, which produced about 20 new subplots of 0.05 Ha each. The land owners retained one plot measuring 0.05Ha. to accommodate the original industrial premises/ building/godown. This allowed the developers to continue their regular activities while benefitting from the new income generated by the additional plots. Once the developer sells the extra 19 subplots, the extra money can be used to add capital to their business and even buy cheaper and bigger land in peri-urban areas for relocating some of their industrial activities.

It was established that the initial net income obtained per month from the original industrial plot was 10,000,000 shillings (as per the average monthly sales by 67% of industrial investors), which is still the same amount obtained from the plot retained for industrial production.

The amount obtained from selling one of the subplots is approximately 12,500,000 shillings (approximately 100 million per acre and 12,500,000 per 0.125 acres/0.05 hectares). Based on records from a real estate agency in Nairobi, the income from selling additional plots of land was Ksh 237,500,000 shillings (1,796,792 USD). These plots are seen as catalysts for gentrification. The t-test values used to calculate the variations in income resulting from the land speculation were tabulated as shown in **Table 1**.

The following formula was used to calculate the t-statistic. For ease of calculation, only the first significant figures were used.

$$t = \frac{(\sum D)/N}{\sqrt{\frac{\sum D^2 - \left(\frac{(\sum D)^2}{N}\right)}{(N-1)(N)}}}$$

Where: -

1. The "ΣD" is the sum of X-Y
2. ΣD2: Sum of the squared differences
3. (ΣD)2: Sum of the differences, squared.
4. N is the number of observations = 5
5. N-1 is the degree of freedom = 4
6. Significance level is 95%

TABLE 1
t-test calculations for land speculation

Zone	Average Value of industrial plot per acre (Shillings)	Value of Average Income per 0.05 Ha/0.1235 Acre before Subdivision (x)	Value Average Income after Subdivision (19 subplots) (y)	x-y (D)	$(x-y)^2$ D^2
Zone 3	130,000,000	16,055,000	305,045,000	-288,990,000	-83,515,220,100,000,000
Zone 7	100,000.000	12,350,000	234,650,000	-222,300,000	-49,417,290,000,000,000
Zone 5	40,000,000	4,940,000	93,860,000	-88,920,000	-7,906,766,400,000,000
Zone 9	120,000,000	14,820,000	281,580,000	-266,760,000	-71,160,897,600,000,000
Zone 2	120,000,000	14,820,000	281,580,000	-266,760,000	-71,160,897,600,000,000
Sum	510,000,000	62,985,000	1,196,715,000	-1,133,730,000	-283,161,071,700,000,000
Mean	414,000,000	12,597,000	239,343,000	-226,746,000	

Source: Adopted from valuation comparables of Industrial Area of Nairobi 2010-2019

$$t = \frac{-1133730/5}{\sqrt{-283,161,071,700-(-1133730^2/5)/(5-1)5}}$$

$$t = \frac{-226746}{\sqrt{-283,161,071,700-(-257068742580)/20}}$$

$$t = \frac{-226746}{\sqrt{1304616456}}$$

$$t = -226746/-36119.47 = \mathbf{6.278}$$

Using the t-table in **Table 2**, with a degree of freedom of 3, and a significance level of 0.05, the critical value is 3.182.

Since the calculated t-value of 6.278 was found to be greater than the critical value of 3.182, the null proposition was rejected and the alternative version was upheld.

Before subdivision, the original industrial plot generated a monthly income of 10,000,000 shillings. However, upon subdivision and sale of nineteen (19) subplots for non-industrial activities, the new income soared to 237,500,000

TABLE 2
An excerpt of the critical values of a t-test statistic

Critical values of *t* for two-tailed tests

Significance level (α)

Degrees of freedom *(df)*	.2	.15	.1	.05	.025	.01	.005	.001
1	3.078	4.165	6.314	12.706	25.452	63.657	127.321	636.619
2	1.886	2.282	2.920	4.303	6.205	9.925	14.089	31.599
3	1.638	1.924	2.353	3.182	4.177	5.841	7.453	12.924
4	1.533	1.778	2.132	2.776	3.495	4.604	5.598	8.610
5	1.476	1.699	2.015	2.571	3.163	4.032	4.773	6.869
6	1.440	1.650	1.943	2.447	2.969	3.707	4.317	5.959
7	1.415	1.617	1.895	2.365	2.841	3.499	4.029	5.408
8	1.397	1.592	1.860	2.306	2.752	3.355	3.833	5.041
9	1.383	1.574	1.833	2.262	2.685	3.250	3.690	4.781
10	1.372	1.559	1.812	2.228	2.634	3.169	3.581	4.587
11	1.363	1.548	1.796	2.201	2.593	3.106	3.497	4.437
12	1.356	1.538	1.782	2.179	2.560	3.055	3.428	4.318
13	1.350	1.530	1.771	2.160	2.533	3.012	3.372	4.221
14	1.345	1.523	1.761	2.145	2.510	2.977	3.326	4.140
15	1.341	1.517	1.753	2.131	2.490	2.947	3.286	4.073
16	1.337	1.512	1.746	2.120	2.473	2.921	3.252	4.015
17	1.333	1.508	1.740	2.110	2.458	2.898	3.222	3.965
18	1.330	1.504	1.734	2.101	2.445	2.878	3.197	3.922
19	1.328	1.500	1.729	2.093	2.433	2.861	3.174	3.883
20	1.325	1.497	1.725	2.086	2.423	2.845	3.153	3.850
21	1.323	1.494	1.721	2.080	2.414	2.831	3.135	3.819
22	1.321	1.492	1.717	2.074	2.405	2.819	3.119	3.792
23	1.319	1.489	1.714	2.069	2.398	2.807	3.104	3.768
24	1.318	1.487	1.711	2.064	2.391	2.797	3.091	3.745
25	1.316	1.485	1.708	2.060	2.385	2.787	3.078	3.725
26	1.315	1.483	1.706	2.056	2.379	2.779	3.067	3.707
27	1.314	1.482	1.703	2.052	2.373	2.771	3.057	3.690
28	1.313	1.480	1.701	2.048	2.368	2.763	3.047	3.674
29	1.311	1.479	1.699	2.045	2.364	2.756	3.038	3.659
30	1.310	1.477	1.697	2.042	2.360	2.750	3.030	3.646

Source: Shaun, T. (2022).

shillings.

Infiltration of Non-industrial Land uses in the Industrial Zone of Nairobi

The changes in minimal plot sizes have led to an increase in development applications for non-industrial land use, deviating from the original zoning standards. This is evident through the construction of highrise office and commercial buildings, in contrast to the traditional one-storey industrial developments and go-downs typically found in the industrial area. Several office developments have sprung up, such as the Lumgalunga shopping mall. This four-storey building features 20 business units per floor and serves as a hub for various purposes like offices, restaurants, banks, and smaller businesses including the Textbook Centre, as shown in **Figure 2**.

Other significant developments in the area encompass residential apartments, affordable hous-ing, nightclubs, educational institutions, informal businesses, hospitals, religious centres, and research/training centres such as Kenya Industrial Research and Development Institute (KIRDI) demonstrated in **Figure 3.**

FIGURE 2
LungaLunga square shopping mall along LungaLunga Road
Source: Field Survey, 2022

FIGURE 3
High-rise buildings and mixed-use development - KIRDI along Lusaka Road
Source: Field Survey, 2022

Figure 4 shows development approvals done in the years 2013 to 2019 as related to various applications for non-industrial, auxiliary, and industrial land use.

It is also evident that the establishment of non-industrial businesses is on an upward trajectory growing at an accelerating pace as compared to industrial establishments, particularly in the last decade (refer to **Figure 5**). For instance, non-industrial business entities such as commercial wholesale and retail businesses stand at 62%, service centres at 12% and education and training facilities at 11%. Other non-industrial land uses comprise of residential and religious uses at 5% each. Arts and cultural activities were the least uses of land within the study area.

As illustrated with the analysis of building approvals data, using a relational join, changing land use in the industrial area of Nairobi from 2013 to 2019 is due to developers investing

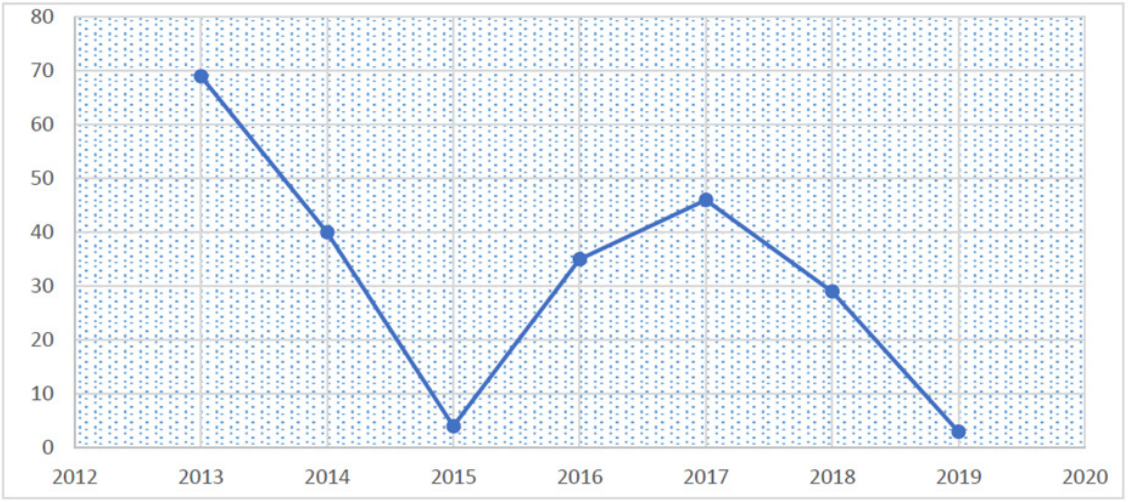

FIGURE 4
Number of development approvals from 2013 to 2019
Source: Nairobi County Government, 2022

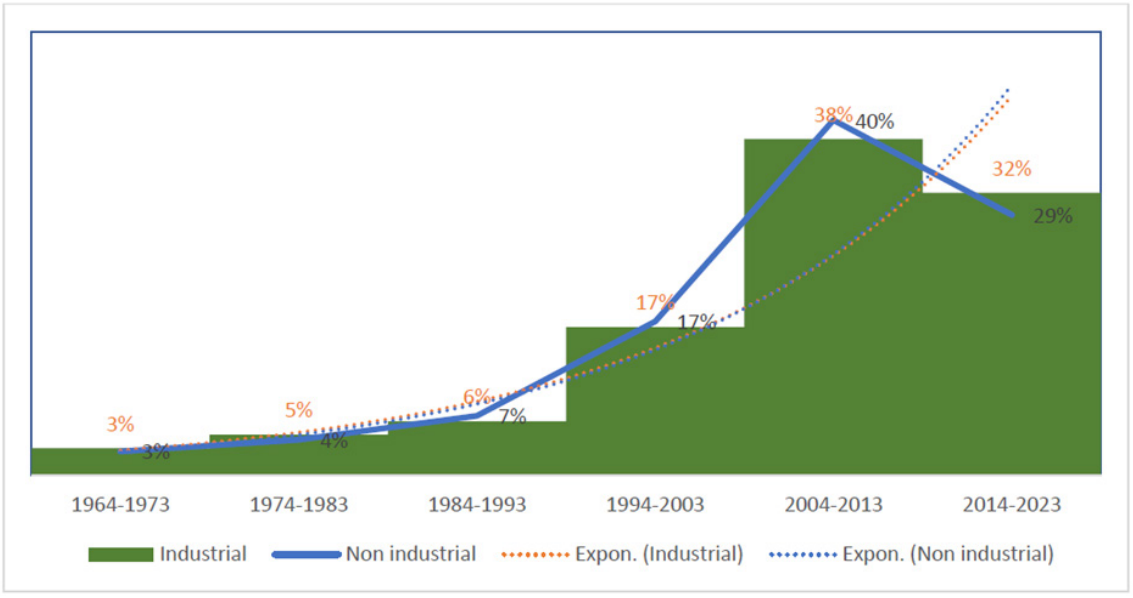

FIGURE 5
Growth of industrial and non-industrial investments
Source: Field Survey, 2022

in commercial, residential, and educational properties. This is further demonstrated in **Figure 6** and **Figure 7**.

The investigation aimed to further verify whether there is a difference in income earned by industrialists and income earned from investing in different land uses across all 19 subplots. The study revealed that the average area per unit square is 400 square feet (0.0037 hectares or 0.01 acres), with each unit fetching 29,000 shillings per month (65-80 shillings per square foot). The comparison

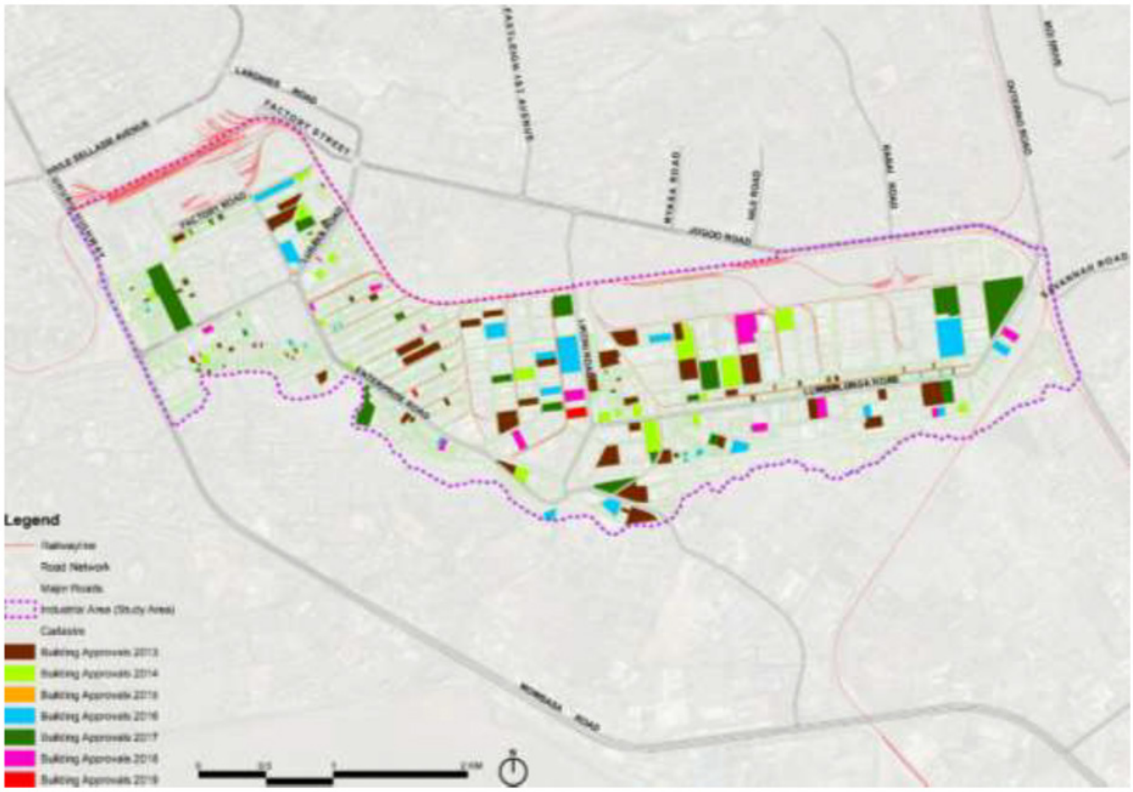

FIGURE 6
Land use transformation from 2013 to 2019
Source: Adopted from UREPI, 2019

FIGURE 7
Land use transformation along enterprise road
Source: Field Survey, 2022

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was carried out using a t-test statistic from the average income obtained from the industrial use and that of the business/office use. For ease of calculation, the study used values per square feet, because the charges are calculated per square feet. In this case, the study compared the value of land per square foot if under industrial use (1-level) and the amount charged per floor per square foot if under a highrise non-industrial/commercial. The average value of land per acre was converted to square feet to match the data obtained from the sampled commercial/business developments as calculated in **Table 3**.

The formula in 5.1 was applied to calculate the t-score which was 3.63

Using the t-table in **Table 2,** with a degree of freedom of 3, and a significance level of 0.05, the critical value is 3.182.

Since the calculated t-value of 3.63 is greater than the critical value of 3.182, the null proposition was rejected and the alternative version was upheld.

Pull factors that explain infiltration of non-industrial uses into the industrial zone

According to evidence from the field survey, the pull factors that explain the infiltration of auxiliary and non-industrial land uses are shown in **Table 4**.

It is clear from the above data that the pull factors for incoming land uses, viewed as gentrifiers include proximity to the Central Business District (15%), labour force (10%) complimentary activities (15%), and nearness to market (22%). From the field evidence, other factors that also played a role in the attraction of non-industrial land uses into the zone, include better infrastructure (9%), efficient transport services (7%), and proximity to raw materials (3%).

Push factors that explain infiltration of non-industrial uses into the industrial zone

The evidence from key informants recorded in **Table 5** shows that most of the old industries had relocated from the Industrial Area of Nairobi to other areas due to the need for more operational space.

Based on the information in Table 5, the industries that have been moved are now utilizing larger operational areas (more than 2 hectares), and have access to new amenities such as storage facilities that were not available in the industrial area of Nairobi. They are also benefitting from improved infrastructure, including better roads, and have access to a more favourable environment with improved waste management, all without

TABLE 3
t-test calculations for commercial/business developments

Commercial/ Office Development	Average Value per Acre (Shillings)	Value per Square Feet if under Industrial Use (x)	Value per Floor per Square Feet if under a Highrise Commercial/Office Building (y)	x-y (D)	$(x-y)^2$ D^2
Lungalunga Square	100,000,000	2295	585,200	-582905	-339,798,239,025
PJ Place	70,000.000	1606	312,000	-310394	-96,344,435,236
SMK Business Centre	70,000,000	1606	960,000	-958394	-918,519,059,236
KCB Building	70,000,000	1606	336,000	-334394	-111,819,347,236
Sum	310,000,000	7113	2,193,200	-2,186,087	-1,466,461,080,733
Mean/Average	**77,500,000**	**1778**	**548,300**	**-546,521.75**	

Source: Field Survey, 2022

TABLE 4
Pull Factors Influencing Gentrification in the Industrial Area of Nairobi

Category	Factors for Gentrification in Industrial Area	Industrial	Non-industrial
Pull Factors	Proximity to Central Business District (CBD)	0%	15%
	Need to locate near complementary industries	16%	15%
	Need to locate near raw materials	16%	3%
	Needed additional operation space	15%	3%
	Nearness to the market	19%	22%
	A ready source of labour here	16%	10%
	Invasion by other activities in my former location	0%	1%
	Urban decay in the previous location	2%	3%
	Better infrastructure	9%	9%
	Attracted by better transport service	7%	7%
	Others….	0%	12%
	Total	**100%**	**100%**

Source: Field Survey, 2022

TABLE 5
Reasons for relocation of industries from the Industrial Area of Nairobi

Name of Industries that Relocated	Place of Current Relocation	Area Occupied while in the Industrial Area of Nairobi (Ha)	Area Occupied in Current Location (Ha)	Facilities in Current Location that are Missing in Industrial Area of Nairobi	Infrastructure in Current Location that is Better than those in Industrial Area of Nairobi (Specify)	Environmental Factors that are More Favourable in Current Location (Specify)
Aziz Tanneries Ltd	Njiru-Kangundo Road	0.8094	2.0234	-Bigger space for heavy-duty machinery -No Traffic Congestion	-Access to Road Network (Expressway, Thika Superhighway, Kangundo Road -availability of water -Good electricity supply	-Own effluent treatment -Able to monitor discharge unlike when in the Industrial Area of Nairobi
Global Mark Foods Limited	Infinity Industrial Park-Eastern Bypass			-Enough packing space	-Enclosed and highly guarded secure area, with a police post within the park	-Less traffic -Enough spacing
Complast Industries	Syokimau			-Bigger space for production -Bigger storage space	-Standard Gauge Railway - Mombasa Road	

Source: Field Survey, 2022

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the proliferation of slums. Consequently, the former industrial workers' socio-economic fabric is destabilized by breaking their otherwise already-established relationships with their former employers and fellow employees. County officers interviewed for this study mentioned the emergence of new modern storage facilities, as aspects prompting the need for industries to relocate to find space to install similar facilities.

Opportunity for revenue collections by planning authorities executing development approvals

Support for subdivisions and change of use applications are generating more revenue through gentrification than they would if all the land is maintained for purely industrial use. The policy change results in increased revenue for the Nairobi City County Government (NCCG) as it benefits more from subdividing and densifying the industrial area of Nairobi, compared to maintaining the initial industrial plots. The annual land rate is 50,000/- (4166.70/- per month) per business (county charges for office blocks as per the NCC Consolidated Reference Booklet for fees 2013-2023) on the plot. **Table 6** demonstrates the scenarios based on the field observations.

From the average 20 business/office units multiplied by 50,000/- annual rate multiplied by 6 floors, means 6,000,000 shillings per subplot. The twenty (20) subplots will therefore fetch the county a total revenue of 114,050,000 shillings. **Table 7** shows the t-test calculation values:

The formula in 5.1.2 was used to calculate the t-score, which was 3.317

Using the t-table in **Table 2**, with a degree of freedom of 11, and a significance level of 0.05, the critical value is 2.201

Since the calculated t-value of 3.317 is greater than the critical value of 2.201, the null proposition is rejected and the alternative is upheld.

Opportunity for Increased Earnings for Professional Experts Executing Development Applications

What is the likely reaction of professional experts to a policy shift in the Industrial Area of Nairobi? The professionals support the subdivisions and change of use applications to get more income because they charge higher fees in the Industrial Area of Nairobi (due to its proximity to parcels in the CBD) than they would get for offering the same services in the far-flung areas (peri-urban zones) that now end up as destinations for the relocated industries. Moreover, the extra plots from subdivisions also bring them extra income.

Professional registered planners charge a fee of approximately 200,000 shillings for preparing proposed subdivision plans in the Industrial Area of Nairobi, which could be higher depending on the number of subdivisions. A licensed surveyor charges a professional fee of 3% of the land value for processing the subdivision scheme deed plans. For a change of use/extension of use development applications, a registered planner charges approximately 200,000 shillings, while a licensed surveyor charges 3% of land value for processing the deed plans for the same (processing subdivision scheme deed plans for a land value of Kshs 30,000,000/- would result in a fee of Kshs 900,000).

DISCUSSION

The 1948 master plan established the industrial landscape in Nairobi by designating the industrial zone within the city. Subsequent transformations and gentrification started setting in with policy changes. In the 1973 Nairobi Metropolitan Growth Strategy, there was deliberate policy

TABLE 6
Enhanced revenue streams for Nairobi City County Government

Scenarios	Value by County (Rates in Shillings)	Value for Commercial/ Office Highrise Buildings
Bigger Plots under industrial use	50,000	0
Smaller sub-plots under different uses	50,000 x 20 = 1,000,000	1 M x 6 = 6,000,000

Source: Field Survey, 2022

TABLE 7
Enhanced revenue streams for Nairobi City County Government

Month	Average Revenue for Industrial Plot before Subdivision (x)	Average Revenue from 19 Subplots after Subdivision (y)	x-y (D)	$(x-y)^2$ D^2
1	50,000	114,000,000	-113,950,000	-12984602500000000
2	50,000	114,000,000	-113,950,000	-12984602500000000
3	50,000	114,000,000	-113,950,000	-12984602500000000
4	50,000	114,000,000	-113,950,000	-12984602500000000
5	50,000	114,000,000	-113,950,000	-12984602500000000
6	50,000	114,000,000	-113,950,000	-12984602500000000
7	50,000	114,000,000	-113,950,000	-12984602500000000
8	50,000	114,000,000	-113,950,000	-12984602500000000
9	50,000	114,000,000	-113,950,000	-12984602500000000
10	50,000	114,000,000	-113,950,000	-12984602500000000
11	50,000	114,000,000	-113,950,000	-12984602500000000
12	50,000	114,000,000	-113,950,000	-12984602500000000
Sum	**600,000**	**1368000000**	**-1367400000**	**-15581522300000000000**

Source: Field Survey, 2022

encouragement of mixed-use development, the decentralization of industrial zones within the city, and the relocation of industries to areas outside the city such as Athi River and Thika. Similarly, the NIUPLAN of 2014 advocates for the relocation of industries to areas outside the city. These policy strategies combined with the use of outdated zoning ordinances and guidelines of 2004 have encouraged NCCG to be quiet on policy implementation and enforcement on matters of development control. The resultant outcome is diminishing industrial land use that paves the way for gentrifiers in the process of industry relocation and incoming non-industrial developments, thus destabilizing the industrial workers' socio-economic life.

Policy changes set in a chain reaction that led to several other subsequent actions and spatial transformations in the industrial zone. Specifically, changes in minimum lot size, plot coverage and plot ratio as prescribed in the zoning ordinance of 2004 inadvertently led to opportunities in real estate development such as land subdivision, speculation, and change of use. Eventually, the area witnessed an increment of investments in office spaces, business malls, residential apartments, auxiliary industries, churches, affordable housing programs, hotels, and nightclubs. This shift in development trends explains how gentrification occurred in the industrial area of Nairobi.

In search of higher investment returns through subdivision and conversion to non-industrial activities with increased densities, developers made rational decisions to subdivide their industrial plots. As a result, new land developers bought the smaller and more affordable plots and invested in alternative land uses beyond the industrial sector. This led to a significant increase in change of use and building approval applications from industrial to space-optimizing office/commercial and other land uses in the industrial area of Nairobi. The t-test analysis revealed a significant difference in income between the original incomes earned by industrial landowners and those accruing from offices and residential high-rise apartments. This significant variation between the original income and subsequent ones highlighted the inevitability of developers creating extra spaces to accommodate alternative auxiliary and non-industrial land uses in the industrial area of Nairobi, including business/offices, malls, schools or residential apartments.

The same policy change created a financial

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boom for the Nairobi City County Government, which resulted in increased revenue streams for the County as they profited from approvals of new subdivisions, change of use, extension of lease, and payment of annual rates. The collected revenue is partly used by NCCG to improve social amenities and infrastructure in the city, including the industrial zone. In parallel, the policy changes increased earnings for professionals such as registered physical planners, licensed surveyors, and architects who prepared various development applications including subdivision plans, survey plans, building plans, and environmental impact assessments and audit reports.

The spiral effect of various decisions and development options undertaken by all the actors including county government, original industrial owners, and new investors was to inadvertently precipitate the intrusion and infiltration of several gentrifiers to the hitherto serene and main industrial district of Nairobi. It is thus evident to say that gentrification in the industrial zone has been perpetuated in three ways. First, the lack of implementation and enforcement of existing development plans. Secondly is through a legal vacuum created by lapse of development plans and outdated zoning policies. Thirdly, the policy rationalization and reactionary planning measures informed by market forces shape development decisions in the event of a devoid of a plan-led development.

CONCLUSION

The study concludes that gentrification in the industrial zone was triggered by the change in policy in the form of rationalization and an increase in development densities in the city, which occurred in 1973, 2004, and 2014. Specifically, the study found that policy change precipitated land speculations where developers began optimizing space use by introducing non-industrial and auxiliary land uses that fetched more profits per unit area than that made by purely industrial land use. This means that policy changes were instigated by the planning authorities due to loopholes in the development plans and outdated zoning policies as well as weak implementation and enforcement of development plans. Additionally, the policy lapse meant that market forces shaped land uses in the industrial area of Nairobi, given the absence of development plans or outdated zoning policies.

RECOMMENDATIONS

This paper recommends updating and formulation of rezoning policies for the Industrial Area of Nairobi to avoid lapses in development plans and outdated zoning policies. The rezoning policy will help guide inclusive and sustainable development. Both existing and new policies must be implemented to counter the current development trend in Nairobi's industrial area. There is a need to link all development plans and spatial zoning policies with industrialization.

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