Urban Proximity and Its Influence on Peri Urban Land Use Pattern: A Case of Kimilili Town, Bungoma County, Kenya

James Kwemoi Kimtai[1]
Dr. Joash W.S. Mabonga[2]
Nalyanya Wasike[3]

[1]jemokm@gmail.com
[2]jsmabonga@yahoo.com
[3]nwasike@mmust.ac.ke

[1]https://orcid.org/0000-0002-7195-9097
[2]https://orcid.org/0000-0002-2729-1624
[3]https://orcid.org/0000-0003-4225-8360

[1,2,3]Department of Geography, Masinde Muliro University of Science and Technology, Kenya

ABSTRACT

Urbanisation has caused unprecedented land use changes around urban settlements, leading to enormous socio-economic impacts on peri-urban residents. The spatial growth of urban settlements beyond designated boundaries into the urban fringes has resulted in the transformation of prime agricultural land into commercial and residential uses, effectively altering traditional land use patterns. The objective of this study was to establish the influence of proximity to urban settlements on peri-urban land use patterns. The study adopted a descriptive research design. Both quantitative and qualitative data was collected from both primary and secondary data sources. Data were collected using questionnaires and focus group discussions from a sample of 384 respondents randomly selected from the target population. The data was analysed using Pearson product moment correlation and simple regression analysis techniques. The study established a statistically significant relationship between distance from Kimilili town's central business district and peri-urban land use change ($t = 17.544$, $p<0.05$). This implied that a unit increase in distance from the CBD would result in a variation in land use activities by 46.9%. The study concluded that the proximity of households to Kimilili town has a profound influence on how they use their land. The findings of the study will be useful in addressing challenges associated with urban sprawl in small and medium towns and propose a framework and guide for land use planning in Kimilili's peri-urban area and other small and medium towns in Kenya.

Key words: Kimilili Town, Land Use Pattern, Peri Urban, Proximity, Urbanization

I. INTRODUCTION

One of the main effects of the geographic expansion of urban areas globally is the transformation of primary agricultural land in the urban fringes to residential and commercial use (Cobbinah & Amoako, 2012; Mandere et al., 2010). Increased encroachment of population into peripheral urban areas puts pressure on available urban land to accommodate the ever-growing urban population (Oyugi, 2017). This causes a rising need for homes, businesses, factories, and institutional facilities. It also catalyses land subdivision for purposes of inheritance. This in turn causes rapid land use changes, including urban sprawl and the proliferation of informal settlements. The changes in periurban land use result in the shrinkage of periurban land mass to units that are unviable for agricultural production, characteristic of periurban households.

This has resulted in the transformation of prime agricultural land into urban uses. Mutua (2015), in his study on the effect of urban development on the livelihoods of indigenous households in lower Kiandani, Machakos municipality, attributed the motivation of peri-urban residents to change the use of their land, especially away from agriculture, to proximity to an urban settlement.

The expansion of towns has a significant impact on the peri-urban zone, which is characterised by its transitional nature. This area experiences the most pronounced effects of urban growth and development. The peri-urban area encompasses a wide range of land uses, resulting in a diverse composition of various groups, such as indigenous populations, farmers, migrants, recreational users, industrial users, natural resource users, developers, and investors (Thuo, 2010). According to Lasisi et al. (2017), the concept of an urban peri-region encompasses a geographical area characterised by the dynamic and complex interplay between urban and rural land use patterns.

According to Amoateng et al. (2013), these regions frequently exhibit unregulated physical expansion trends, leading to the progressive conversion of valuable agricultural land on the periphery into residential and commercial properties.

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Bid-rent theory

Alonso (1964) improved the theory after a traditional English economist first proposed it in an agricultural context. This theory claims that land users compete for sites closer to the city centre because of the Central Business District's superior accessibility, agglomeration economies, and prospects of high profit margins. Based on the bid rent theory, land uses near the city centre pay a higher rent, which decreases with distance from the city centre. Therefore, only land users that can afford higher rents, such as high-end retailers or service providers, will be willing to pay the highest prices to locate in the Central Business District. The schematic diagram in Figure 1 below explains how rents vary with distance from the central business district to the periphery.

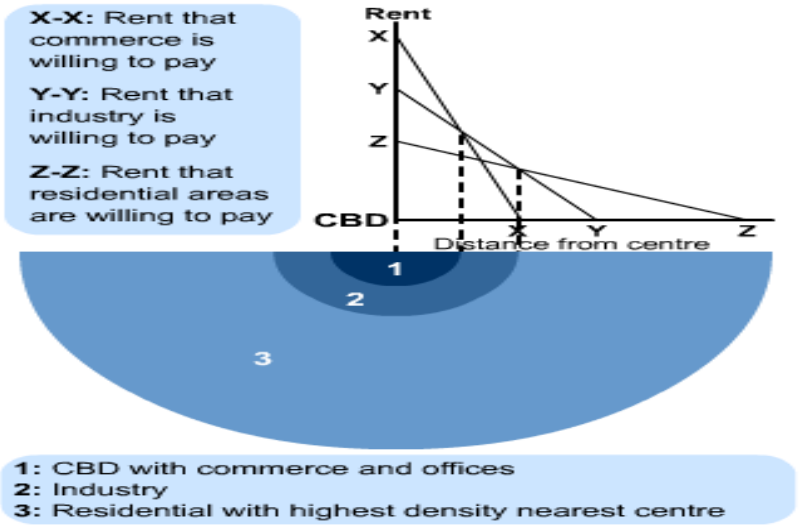

Figure 1
Bid Rent Curve
Source: https://www.s-cool.co.uk/a-level/geography/urban-profiles/revise-it/central-place-and-bid-rent-theories

2.1.2 Concentric Zone Model

This theory, which was modelled on the basis of the city of Chicago by Ernest Burges (1925), was an improvement over Von Thunen's location theory. The model portrays land use patterns in concentric rings radiating outward from the Central Business District, with each zone including distinctly different land uses. These zones are the Central Business District, the transition zone, low-class housing, middle-class housing, and high-class housing. Below is a diagram (Fig. 2) that serves as a visual summary of how land uses radiate outward from the Central Business District of an urban settlement.

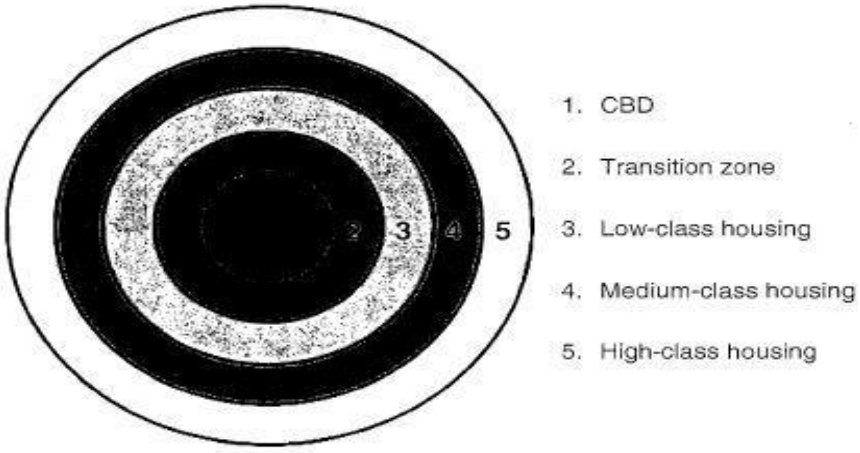

Figure 2
Concentric Zone Model
Source: Waugh, 2002

The two theories agree that ease of access is the most important factor in determining optimal use of urban space, and this in effect influences the pattern of urban land use. The proximity of land to the Central Business District boosts both its productivity and value. Thuo (2010), in a study conducted on the Nairobi urban fringe, attributed rapid land conversions to low returns from farming and a high demand for housing facilities. Studies by Afriyie et al. (2013) in peri-urban Kumasi and Omondi et al. (2017) in peri-urban Kisumu arrived at similar conclusions. The aforementioned studies support the theories by Burges (1925) and Alonso (1964), who postulate land uses as a function of proximity and rent differential from the Central Business District.

From the studies, it can be argued that land close to an urban settlement is generally considered more rewarding for residential and commercial development. Pribadi and Panleit (2015), however, hold a contrary view. In their study on the dynamics of urban agriculture during the rapid urbanisation of the Jabodetabek metropolitan area, the authors posit that agricultural land use can still persist in the wake of urban expansion around fast-growing urban centers. Although land prices may be very high around the town centre, increased demand for high-priced perishable foods grown close to major towns offers vital commercialization opportunities for agricultural products, resulting in higher profitability. It is possible to specialise in higher-value horticultural crops and increase the intensity of urban agriculture if farmers are located closer to and have easier access to the growing needs of urban consumers (Moustier & Renting, 2015).

2.2 Empirical Review

The change in periurban land use results in the shrinkage of periurban land mass to units that are unviable for agricultural production. This has driven periurban residents out of cultivation (Abbas & Afua, 2013; Mandere et al., 2010). For instance, in a study conducted by Abbas and Afua (2013), the authors observed that the number of farming households in Peri urban Kumasi, Ghana, went down from more than 89% in 1986 to 40% in 2013. On the other hand, a study of peri-urban Nyahururu by Mandere et al. (2010) revealed that the percentage of households dependent on farming for their primary income had dropped from 90% in 1960 to 49% in 2010.

The studies above have shown that while agriculture remains a major economic field in urban areas, its economic worth diminishes dramatically on account of the decline in the percentage of households that make farming their primary source of income. This could be attributed to overlapping land uses: residential, commercial, recreational, manufacturing, public use, transport, etc. (Abbas & Afua, 2013).

Mutua (2015) examined how peri-urbanisation has affected the incomes of native families in peri-urban Machakos using a sample of 50 respondents. Mutua attributed the motivation of peri-urban residents to change the use of their land, especially away from agriculture, to proximity to an urban settlement. Thuo (2010) conducted a similar study on the Nairobi urban fringe and concluded that rapid land conversions are attributed to low returns from farming and high demand for housing facilities. Studies by Afriyie et al. (2013) in peri-urban Kumasi, and Omondi et al. (2017) in peri-urban Kisumu arrived at similar conclusions.

Agglomeration economies offer significant prospects for individuals residing in peri-urban areas. According to Oduro (2014), the expansion of urban areas has resulted in a widespread rise in the need for products and services. In the peri-urban area of Accra, Oduro et al. (2014) conducted a study and discovered that various types of businesses, such as retail establishments and personal services like hairdressing and dressmaking, as well as industrial activities including food processing, saw milling, metal fabrication, and cement block manufacturing, are flourishing due to the city's expansion. The researchers discovered that women tend to engage in small trading and personal services, like hairdressing, as significant means of sustaining their livelihoods. This is especially notable given that women typically do not partake in the more profitable land leasing enterprise, even if they come from families who own land.

In a study conducted in peri-urban Kumasi, Abbas and Afua (2013) discovered that households transitioned from land-based livelihood activities to non-land-based income-generating activities. The research conducted by Lupala (2015) in peri-urban regions of Dar es Salaam and Thuo (2010) in peripheral parts of Nairobi city exhibits a comparable trend to the one identified in peri-urban areas of Kumasi. The communities are drawn to engage in non-farm work options due to their exposure to the urban monetary economy, which is a significant factor resulting from their proximity to urban settlements (Abbas & Afua, 2013).

The literature studied indicates that not all households transition to non-farm employment in response to the challenge of diminishing agricultural land. According to a study by Oduro et al. (2014), farmers who had access to arable land implemented agricultural intensification as a way to adjust to changes in peri-urban land use. According to

Ng'ayu (2015), individuals residing in peri-urban areas were found to be involved in the cultivation of fast-maturing horticulture crops, specifically vegetables and fruits, with the intention of selling them in the market. Additionally, the individuals were involved in the practices of poultry farming, dairy farming, and pig farming (Thuo, 2013). The intensification of agricultural practices serves to enhance food accessibility for peri-urban dwellers while also generating supplementary revenue for households. Nevertheless, this practice might result in the depletion of soil nutrients, necessitating the use of substantial quantities of fertilizers. The aforementioned factor subsequently leads to an increase in production expenses, rendering agriculture economically unsustainable over an extended period of time (Mandere et al., 2010; Oduro et al., 2015).

III. METHODOLOGY

3.1 Study Area

Kimilili town is located in the administrative region of Bungoma County. The geographical coordinates of the town are 00° 47' latitude north of the equator and 34° 43' longitude east of the prime meridian. Kimilili is situated approximately 500 kilometres to the west of Nairobi and 300 kilometres to the North of Kisumu. The town is situated on the lower inclines of Mount Elgon, positioned at an altitude of approximately 1,700 metres above sea level. It has a modest amount of precipitation on a yearly basis. The majority of the land in the vicinity of Kimilili town is used for agricultural purposes. The map of the study area is delineated in Figure 3 below.

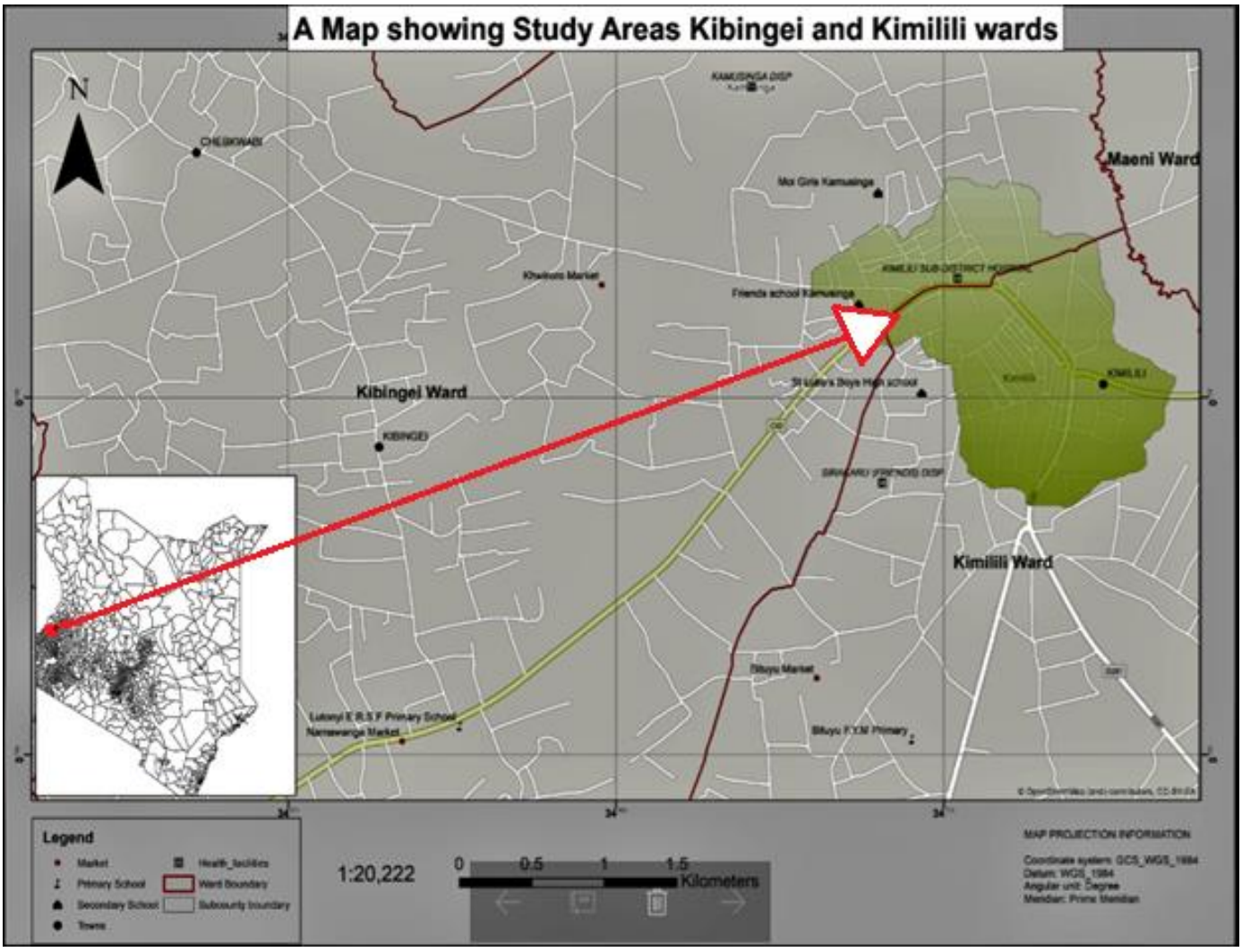

Figure 3
Location of the Study Area
Source: ISUDP Kimilili (2020)

3.2 Methods of Data Collection

The study's primary data gathering instruments included questionnaires and focus group discussions.

3.2.1 Questionnaires

The questionnaires included both open-ended and closed-ended items in varying proportions. Data was collected through a questionnaire to provide quantifiable primary data.

3.2.2 Focus Group Discussion

Focus group discussions were meticulously designed using a structured approach to provide insight into land use changes in the town's peri-urban area. Focus group discussions were held at the sublocation level and comprised six to eight people, including native landowners and immigrants.

3.2.3 Methods of Data Processing and Analysis

Data analysis involves examining the obtained information from a survey or experiment drawing and drawing inferences and deductions (Kombo & Tromp, 2018). Quantitative and qualitative data from open-ended questions were analysed and presented in narrative and numerical formats, respectively. Pearson product moment correlation and regression analyses were used to demonstrate the strength of association between proximity to the Central Business District and peri urban land use. A regression analysis was conducted to find out the contribution effect of distance from the Central Business District on urban land use. Measures of central tendency and dispersion, like mean and standard deviation, were used to describe the data.

IV. FINDINGS

The objective of this study was to determine the influence of urban proximity on peri-urban land use patterns in Kimilili town, Bungoma County, Kenya. The corresponding null hypothesis, therefore, was that there was no relationship between distance from the Central Business District and urban land use activities. The distance was rated as 0-0.5km, 0.6-1km, 1.1-2.0km, 2.1-3km, and 3km or more, and then compared against the corresponding response on land use activities. Preliminary descriptive statistics were computed on this data and summarised in Table 1 below.

Table 1

Percentage Change in Land Use Activities from the Town Center

Land Use Activities	0-0.5 km (%)	0.6-1km (%)	1.1-2.0km (%)	2.1-3km (%)	3km or more (%)
Agriculture	8.6	16.5	26.4	24.2	24.3
Residential	16.3	15.6	22.9	22.1	23.1
Commercial	42.9	28.6	12.3	5.5	10.7
Agriculture/Residential	0.4	17.4	27.1	28.5	26.6
Agriculture/Commercial	10.5	16.7	16.9	18.0	37.9
Residential/Commercial	22.2	13.1	27.2	27.4	10.1

The results in Table 1 above revealed that agriculture recorded the lowest percentage in the inner periurban zone closer to the town's Central Business District but increased steadily with distance away from the town centre. Land use for residential purposes increased outward from the Central Business District, with the highest concentration of housing units in the mid-periurban zone (1.1 km–3 km) from the Central Business District. Contrary to this, results on land use for commercial activities decreased with distance from the town centre. The peri-urban area closer to the CBD recorded the highest percentage of land use for commercial purposes.

To find out if there was any statistically significant relationship between distance from the CBD and peri-urban land use pattern, Pearson product moment correlation was performed. Table 2 below summarises the findings.

Table 2

Pearson Product Moment Correlation Results Between Distance from The CBD and Land Use Activities.

Correlation		Distance from town centre	Land use activities
Distance from Town centre	Pearson Correlation	1	.469
	Sig. (2-tailed)		.000
	N	369	369
Land use activities	Pearson Correlation	.469	1
	Sig. (2-tailed)	.000	
	N	369	369

The results of this test showed a positive correlation between distance from Kimilili's town centre and periurban land use activities (r = 0.469, P =.000, N = 369), implying that a unit increase in distance from the Central Business District would result in a 46.9% variation in land use activities. Since P<.000, there is no evidence to support the null hypothesis with 95% certainty. This means that distance from the Central Business District has a bearing on the urban land use pattern.

In order to establish the relationship between the size of the land and land use activities, a regression analysis was done, and the findings are as illustrated in Tables 3 to 5.

Table 3

Coefficient of Determination Results between Distance from the Town Center and Land Use Activities

	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.469[a]	.220	.217	.30650
	a. Predictors: (Constant), Distance from the town centre			

From the results, a coefficient of determination value (R^2) of 0.220 was obtained, implying that distance from the Central Business District accounted for up to 22% of the variance in per-urban land use activities, other factors notwithstanding. These findings indicate that there is a great variance in household land use activities as one moves from the Central Business District into the periphery. It must therefore be taken into consideration while designing a planning framework to guide sustainable urban development. These results corroborate the findings by Afriyie et al. (2013) and Mutua (2015), who describe land use activities around urban settlements as location-specific. Ernest Burgess, in his concentric ring model (1923), observed a systematic variation and spatial distribution of land uses from the Central Business District towards the outer, peripheral areas of an urban settlement.

So as to establish the relationship between distance from the town centre and land use activities, a one-way ANOVA test was carried out at 365 degrees of freedom and at the 0.05 level of significance. The results are summarised in table 4 below.

Table 4

ANOVA Results between Distance from the Town Center and Land Use Activities

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	10.229	4	2.557	129.323	.000
Within Groups	7.198	364	.020		
Total	17.427	368			

From the results in Table 5 below, it is evident that distance from the town centre is a significant predictor of per-urban land use activities (t = 17.544, p<0.05). The null hypothesis was therefore rejected. This therefore implies that distance from the town centre influences land use activities in peri-urban areas.

Table 5
Regression Coefficient Results between Distance from Town Center and Land Use Activities

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.698	0.016		105.469	.000
Distance from town centre	0.117	.007	.469	17.544	.000
a. Dependent Variable: Land use activities					

The findings of this study further indicate a high concentration of commercial functions in the town's central business district. Commercial activities are depicted by functions such as banking, the hotel industry, supermarkets, retail outlets, petrol stations, and pharmaceutical shops. These activities strive to make as much profit as possible; hence, they will pay the highest possible rent to be close to the Central Business District (Alonso, 1964). The author further argues that agricultural activities decrease closer to the CBD because they generate low bid rent, a similar view expressed by Thuo (2010) and Cobbinah et al. (2015).

Pribadi and Panleit (2015), however, argue that agricultural land use can still persist in the aftermath of urban expansion around fast-growing urban centres. Greater proximity to and ease of access to the Central Business District can temporarily avail new opportunities for intensification of periurban agriculture with a focus on high-value horticultural crops such as vegetables and fruits and zero grazing of dairy cows (Thuo, 2010; Moustier and Renting, 2015).

Plate 1
Vegetable and Fruit Farm

It is, however, imperative to note that the intensification of rural agriculture by households near urban settlements largely depends on their economic endowment (Owens, 2016). In the study carried out in peri-urban areas

of Nakuru city, Kenya, Wilkom et al. (2016) found out that small-scale on-site farming is a practice common among poor households as a survival strategy that helps to secure land. This strategy is a common practice in East African cities and is utilised as a transitional measure prior to residential construction and other non-farming developments.

Plate 2

Residential House under Construction Indicating Peri Urban Land Use Change

V. CONLUSION & RECOMMENDATIONS

5.1 Conclusions

This study was guided by Ernest Burgess's (1923) concentric ring theory and David Ricardo's bid rent theory. These theories attempted to explain the pattern of land use types progressively from the urban core towards the peripheral areas. The findings revealed a shift in periurban land use from predominantly agricultural use to residential, commercial, and other urban uses. It can therefore be concluded that proximity to an urban centre has a significant influence on the urban land use pattern.

5.2 Recommendations

The study recommends that physical development efforts in urban areas should embrace the basic tenets of development growth management. They should anticipate the rapid development that characterises urban areas and make provisions for directing and managing it. The study also recommends the development of a policy framework that recognises the role of urban agriculture as part of the urban green ecosystem and as part of the overall urban spatial structure of urban settlements.

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