

**NEXUS BETWEEN INFRASTRUCTURE PUBLIC POLICY PLANNING,
LAND SPECULATION AND DEVELOPMENT IN (GREATER) EASTERN
BYPASS, KIAMBU COUNTY, KENYA**

HANNAH WANJIRU KINUTHIA (MEPM)

N85/37554/2016

**A RESEARCH THESIS SUBMITTED IN FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF DEGREE OF DOCTOR OF
PHILOSOPHY IN ENVIRONMENTAL PLANNING AND MANAGEMENT IN
THE SCHOOL OF SPATIAL PLANNING OF KENYATTA UNIVERSITY**

NOVEMBER 2022

DECLARATION

This thesis is my original work and has not been submitted for a degree or award in any other university or for any other award. No part of this work should be reproduced without prior permission of the author and/or Kenyatta University.

Signature  Date 4/11/2022

Kinuthia Hannah Wanjiru

Department of Spatial and Environmental Planning

SUPERVISORS

We confirm that this thesis was carried out by the candidate under our supervision

Signature  Date 07/11/2022

Dr Sammy Letema

Department of Spatial and Environmental Planning

Kenyatta University

Signature  Date 11/11/2022

Dr Christine Majale

Department of Spatial and Environmental Planning

Kenyatta University

DEDICATION

This research work is dedicated to my dear parents, John and Mary Kinuthia for their encouragement and prayers. It is also dedicated to my lovely husband Nicasio Ileri and our son Ivan Munene.

ACKNOWLEDGEMENTS

This research work was made possible by input of several people. Special thanks to my two supervisors, Dr Sammy Letema and Dr Christine Majale for their relentless support and guidance in this research and preparation of manuscripts. I am grateful to members of staff in Environmental Planning and Management Department, Kenyatta University, for their guidance and positive criticism through the research process.

My sincere gratitude to German Government that funded my studies through German Academic Exchange Service (DAAD) In-country/In-region scholarship. I also appreciate my employer Kirinyaga University for giving me the opportunity to pursue my PhD in Kenyatta University. Special thanks to Land Registrar and staff in Thika Registry for the support offered during data collection.

Special appreciation to former Managing Director Kenya Urban Roads Authority, Engineer Mwatu, who together with staff in KURA supported me during data collection process. I also acknowledge my research assistants for carrying out fieldwork diligently. Thanks to my seniors in the course, Dr David Mugendi, Dr Purity Muthoni, Dr Patricia Mwangi and Dr Halima Mangi for the invaluable counsel through the research process.

TABLE OF CONTENTS

DECLARATION	Error! Bookmark not defined.
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	x
LIST OF TABLES	xii
LIST OF ACRONYMS AND ABBREVIATIONS	xiii
ABSTRACT	xiv
CHAPTER ONE: INTRODUCTION	1
1.1 Background of the Study.....	1
1.2 Statement of the Problem.....	4
1.3 Research Questions	6
1.4 Main Objective.....	6
1.5 Specific Objectives.....	6
1.6 Research Hypothesis	7
1.7 Significance of the Study	7
1.8 Conceptual Framework	9
1.9 Research Limitations.....	12
1.10 Definition of Terms.....	13
1.11 Thesis outline	14
CHAPTER TWO: LITERATURE REVIEW	15
2.1 Land Speculation.....	15
2.2 Drivers of Land Speculation	17
2.2.1 Structural Land Speculation.....	21
2.2.2 Land Developers	22

2.2.3 Expectations in Land Speculation.....	23
2.3 Impact of Public Policy on Infrastructure Planning on Land Speculation.....	24
2.4 Economic Explanation of Land Speculation.....	26
2.5 Land Speculation and Land Uses.....	29
2.6 Peri-urban Land Speculation and Development Patterns.....	32
2.7 Land Speculation and Land Prices.....	36
2.8 Infrastructure Development and Land Speculation.....	42
2.9 Measurement of Land Speculation.....	44
2.10 Strategies to Control Land Speculation.....	45
2.10.1 Land and Property Tax.....	47
2.10.2 Capturing Rising Land Values.....	50
2.10.3 Agricultural Land Preservation Policies.....	52
2.11 Land Governance and Speculation in Kenya.....	53
2.12 Theoretical Framework.....	57
2.12.1 Political Economy Theory.....	57
2.12.2 Urban Regime Theory.....	60
2.12.3 Axial Theory.....	62
2.12.4 Bid Rent Theory.....	63
2.13 Research Gap.....	64
CHAPTER THREE: RESEARCH METHODOLOGY.....	65
3.1 Introduction.....	65
3.2 Area of Study.....	65
3.2.1 Location of Study Area.....	65
3.2.2 Historical Background of (Greater) Eastern Bypass Area.....	67
3.3 Research Design.....	70

3.4 Sample and Sampling Procedures	71
3.4.1 Target Population	71
3.4.2 Sampling Procedures.....	71
3.4.3 Sample Size.....	74
3.5 Data Collection.....	77
3.5.1 Nature and Sources of Data.....	77
3.5.2 Primary Data Collection Techniques	78
3.5.3 Secondary Data Collection Techniques	80
3.6 Data Analysis	81
3.6.1 Use of Geographic Information Systems	81
3.6.2 Analysis of Adequacy of Amenities and Utilities.....	87
3.6.3 Analysis of Land Prices	87
3.6.4 Analysis of Influence of Public Policy Planning on Land Speculation	90
3.6.5 Inferential Statistics.....	90
3.6.6 Factor Analysis of the Construct.....	94
3.7 Ethical Requirement.....	94
CHAPTER FOUR: RESULTS AND DISCUSSION	95
4.1 Introduction	95
4.2 Influence of Infrastructure Public Policy Planning on Land Speculation in (Greater) Eastern Bypass	95
4.2.1 Infrastructure Public Policy Planning in the (Greater) Eastern Bypass	95
4.2.2 Land Subdivision in (Greater) Eastern Bypass	99
4.2.3 Land Transfer in (Greater) Eastern Bypass.....	105
4.2.4 Land Buying Enterprises in (Greater) Eastern Bypass	108

4.2.5 Does Infrastructure Public Policy Planning Influence Peri-Urban Land Speculation in (Greater) Eastern Bypass?	120
4.3 Land Development Pattern in (Greater) Eastern Bypass Peri-Urban Area.....	123
4.3.1 Land Use/Cover Change in (Greater) Eastern Bypass Area	123
4.3.2 Land Development Patterns in (Greater) Eastern Bypass Area	127
4.3.3 Measure of Subdivision Distances along (Greater) Eastern Bypass Area	133
4.3.4 Leapfrog Development in (Greater) Eastern Bypass Area	137
4.4 Land Prices in (Greater) Eastern Bypass Area.....	140
4.4.1 Trend in Speculative Gain.....	142
4.4.2 Does Change in Distance Influence Land Prices in (Greater) Eastern Bypass?	144
4.5 Public Programmes and Development Patterns in (Greater) Eastern Bypass.....	149
4.5.1 Distribution of Utilities and Amenities in (Greater) Eastern Bypass Area.....	149
4.5.2 Adequacy of Utilities and Amenities in (Greater) Eastern Bypass.....	156
4.5.3 Influence of Public Programmes on Land Development Pattern.....	158
4.6 Reflection on Theories	161
CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS	165
5.1 Introduction	165
5.2 Summary of Findings.....	165
5.3 Conclusion	169
5.4 Recommendations	171
5.5 Areas for Further Study.....	172
REFERENCES	173

APPENDICES	187
Appendix 1: Questionnaire for Land Enterprises.....	187
Appendix 2: Land Enterprises Interview Schedule.....	191
Appendix 3: Interview Schedule to Planning Authority (KURA).....	193
Appendix 4: Interview schedule to Kiambu County Planners/FGD guide	194
Appendix 5: Observation Checklist	195
Appendix 6: Factor Analysis of Constructs in Hypothesis Testing	196
Appendix 7: Memo on Land Subdivision in Kiambu County	197
Appendix 8: Research Permit and Authorization from NACOSTI	198
Appendix 9: Research Authorization from KURA	200

LIST OF FIGURES

Figure 1-1. Conceptualization of peri-urban land speculation	11
Figure 2-1. Land values and distance from the city (Pipkin et al., 1983).....	18
Figure 2-2. Rent from land with development of housing over time.....	27
Figure 3-1. Location of (Greater) Eastern Bypass Area	67
Figure 3-2. Sampled subdivided parcels along (Greater) Eastern Bypass.....	73
Figure 4-1. Greater) Eastern Bypass as part of bypasses in Nairobi Metropolitan.....	96
Figure 4 -2. Land subdivision trend in (Greater) Eastern Bypass.....	101
Figure 4-3. Land subdivision intersecting the proposed Greater Eastern Bypass	102
Figure 4-4. Trend of land transfers in (Greater) Eastern Bypass.....	107
Figure 4 -5. Land parcel ownership structure in (Greater) Eastern Bypass.....	109
Figure 4-6. Period of time land enterprise had existed	110
Figure 4-7. Correlation between quantity of land subdivided and existence of land enterprise in Greater Eastern Bypass	111
Figure 4-8. Trend of land enterprises in (Greater) Eastern Bypass	113
Figure 4-9. Sources of capital for land enterprises to finance land business	118
Figure 4-10. Land Use/Cover change for 2000-2020	124
Figure 4-11. Land use/cover trends between 2000 and 2020	126
Figure 4-12. Distribution of reserved land in (Greater) Eastern Bypass	128
Figure 4-13. Land development pattern in (Greater) Eastern Bypass 2000-2020	130
Figure 4-14. Average distance from subdivided plots to the Eastern Bypass	134
Figure 4-15. Number of subdivided parcels against change in distance along (Greater) Eastern Bypass	135
Figure 4-16. Average distance from subdivided plots to the Link Road.....	136
Figure 4-18. Leapfrog measure in (Greater) Eastern Bypass	138
Figure 4-19. Mean prices per acre in (Greater) Eastern Bypass	141
Figure 4-20. Trend in Speculative gain in (Greater) Eastern Bypass	144

Figure 4-21. Land prices against distance from (Greater) Eastern Bypass 2008-2018..... 148

Figure 4-22. Distribution of public schools and other amenities in (Greater) Eastern Bypass 151

Figure 4-23. Electricity distribution and motorable access roads in the (Greater) Eastern Bypass 152

LIST OF TABLES

Table 2-1. Various researches quantification of land speculation	45
Table 3-1. Characteristics of land subdivision along (Greater) Eastern Bypass.....	75
Table 3-2: Sample size for land transactions along (Greater) Eastern Bypass	76
Table 3-3. Sample sizes for land transfer data in (Greater) Eastern Bypass.....	77
Table 3-4: Remotely sensed data and their characteristics	83
Table 4-1. Characteristics of land subdivision in (Greater) Eastern Bypass.....	103
Table 4-2. Characteristics of land transfers in (Greater) Eastern Bypass	107
Table 4-3. Correlational analysis between quantity of land subdivided and period land enterprise existed in (Greater) Eastern Bypass	112
Table 4-4. Model summary of regression between period of time a land enterprise knew about the bypasses and quantity of land subdivided in (Greater) Eastern Bypass area.....	121
Table 4-5. Regression coefficients of period of time a land enterprise knew about the bypasses and quantity of land subdivided along (Greater) Eastern Bypass	122
Table 4-6. Correlational between leapfrog measure and number of subdivided parcels	140
Table 4-1. Speculative gain per 0.03Ha along 500m buffer of (Greater) Eastern Bypass.....	143
Table 4-8. Regression of plot prices against distance in (Greater) Eastern Bypass....	144
Table 4-9. Land set apart for public uses in (Greater) Eastern Bypass Area	149
Table 4-10. Adequacy of utilities and amenities in (Greater) Eastern Bypass	157

LIST OF ACRONYMS AND ABBREVIATIONS

CIDP	County Integrated Development Plan
ETM	Enhance Thematic Mapper
GIS	Geographic Information System
KPLC	Kenya Power and Lighting Company
KNBS	Kenya National Bureau of Statistics
KML	Keyhole Mark-up Language
KURA	Kenya Urban Road Authority
RUIWASCO	Ruiru Juja Water and Sewerage Company
RoK	Republic of Kenya
MoLPP	Ministry of Lands and Physical Planning
NASA	National Aeronautics and Space Administration
NLC	National Land Commission
OLI	Operation Land Imager
RCMRD	Regional Centre for Mapping of Resources for Development
SACCO	Savings and Credit Cooperative Organization
SSD	Sentinel Satellite Data
TIRS	Thermal Infrared Sensory
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

ABSTRACT

Accessibility to land, government programmes and efficiency of land market shapes urban growth. Land speculation accompanies public policy planning in infrastructure development in peri-urban areas and results into increase in land subdivision, which leads to conversion of marginal agricultural land into residential and urban use. Though viewed as part of natural urban growth; land speculation has been widely criticized as leading to leapfrog development, uncontrolled and mixed land uses in peri-urban areas. Land speculative strategies are becoming widespread in Kenya with transport corridors being hotspots. The government has initiated numerous transport infrastructure developments around the country as means to spur economic growth. However, little is known on the impact of public policy planning on land speculation and the effect of speculation on land development and prices in peri-urban areas of Kenya. This study therefore examines peri-urban land speculation and its implication on land development in (Greater) Eastern Bypass area. The study uses case study design in which (Greater) Eastern Bypass area, located in the peri-urban of Nairobi and comprising one developed and two planned roads, was selected to illuminate the phenomenon of land speculation. Data on land subdivisions, transfers and enterprises between 2005 and 2018 for (Greater) Eastern Bypass area was collected along with information on planning of the bypasses. Analysis in trend of subdivisions, transfers and enterprises before, during and after public policy planning is used to measure the extent of land speculation. Key informants' interviews were used to obtain information on planning of (Greater) Eastern Bypass while 35 questionnaires were administered to land enterprises to obtain data on land prices and role of enterprises in peri-urban land speculation. Satellite images and shape files are used to conduct land use/cover, leapfrog measure and development patterns analysis as indicators of land development. The data is statistically analysed, discussed and findings displayed in tables and figures. Findings reveal that the number of land subdivisions, transfers and enterprises increased tremendously slightly before and after public notification of (Greater) Eastern Bypass. This implies that there is significant influence of public policy planning on peri-urban land speculation along (Greater) Eastern Bypass. The analysis of land use/cover reveals that grassland is the predominant land cover, suggesting that after subdivision land is no longer used for farming but is kept idle awaiting development. Speculative subdivisions cause leapfrog development characterized by cluster and dispersed development before public infrastructure are developed. Development of basic infrastructures triggers linear and continuous development along the abutting land. While planning of Greater Eastern Bypass and Link Road triggered increase in land prices, construction of Eastern Bypass caused 25% more increase in land prices. The study concludes that there are aspects of public policy planning that trigger land speculation; the period before and slightly after public notification is characterized by increased land subdivisions and transfers. Lack of prior land use planning and enforcement of land laws incentivises land speculation and irregular subdivision, which prompts leapfrog development. The study recommends that infrastructure planning should be accompanied by land use planning to control speculative subdivision and guide peri-urban land development.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The backdrop of urban development is land use policy (Clawson, 2013), which is critical in infrastructure development, land use and environmental planning (McConnell *et al.*, 2006). Urban planning as a policy toolkit is used by developers to drive the commodification of land through subdivision and speculation (Jimu, 2017), which may contravene the use of planning as a tool for equitable housing provision (Sisson *et al.*, 2018). Enrolling services of private property in urban planning pushes housing through rezoning and subdivision towards peri-urban areas, which makes speculative developers place more housing land than the system can handle; leading to a property boom followed by a bust (Sisson *et al.*, 2018). Urban planning is disrupted by land speculation, where the plan for developing urban infrastructure is geared towards the extension of urban plans and urban sprawl control (Triantafyllopoulos, 2017). Ineffective land policies coupled with related policies in urban and regional planning have contributed largely to land speculation in urban and peri-urban areas (Clawson, 1962; Thontteh & Babarinde, 2018). Land use policies, enforcement of planning standards, building regulations and zoning bylaws safeguard urban areas from chaotic development and guide infrastructure provision (Clawson, 2013). Planning tools are used as both corrective and preventive measures for promoting effective and proper land use and urban development.

Urban planning increasingly involves redeveloping existing urban areas, through the extension of transport infrastructure and services to peri-urban areas

(Triantafyllopoulos, 2017). The objective of developing roads and other public infrastructure is to make more land accessible and available for development (Colsaet *et al.*, 2018). Infrastructure-led development comes with high demand for land and the daunting process of consolidating and acquiring the land needed for development (Sisson *et al.*, 2018). The purchase of development land (land banking) is often expensive, but public policy initiatives can avail peri-urban land to urban development without land banking (Stanley, 2017). Fragmented land management attributed to land speculation can constrain infrastructure development, exacerbate unplanned urban growth and increase urban sprawl (Dewar, 2007; Clawson, 2013). Ineffective legal and regulatory frameworks that govern land registration, valuation, acquisition and land use control often distort urban land market (Byamugisha, 2013; Hall *et al.*, 2015).

Land speculation signifies an aspect of time horizon where investors hold land in anticipation of future development opportunities or an increase in land value, which, unfortunately, deters land accessibility in the process (Clawson 1962; Archer 1973; Brzezicka 2016; Stanley 2017; Laurans & Levrel 2018). Globally, it has influenced development and land use pattern in major cities and frontier areas such as Phoenix in the United States of America and Pearl River Delta in China (Clawson *et al.*, 1962; David 1981; Smith *et al.*, 1997; Dewar 2007; Stanley 2016; Gul *et al.*, 2018). Growth in Chinese eco-cities, which is driven by land speculation, local entrepreneurship and property sales, reveals the dynamism in the property market motivated by land finance (Shiuh-Shen 2013). In addition, the economic effect of land speculation confirms that it entwines various sectors of the economy from transportation, real estate, banking and construction to tourism (Gemedda *et al.*, 2020). In Sub-Saharan African cities, land

speculation is a factor of land ownership structure, political structures, ineffective state policies, and bank financing practices (Rakodi 2003; Byamugisha 2013; Ilesanmi 2016; Thontteh & Babarinde 2018; Gameda *et al.*, 2020). Land and property speculation often result from the interplay between urban planning, global capital and increasing financialisation (Hall *et al.*, 2015; Sisson *et al.* 2018). Information asymmetry in locations of planned infrastructure is a major factor that gives speculators an advantage over the unsuspecting players (Cho *et al.*, 2016). Land speculation is widely viewed as leading to leapfrog development, uncontrolled development, mixed land uses and increased cost of social services and transportation (Clawson *et al.*, 1962; Archer 1973; Lalloo 2002).

Kenya's Vision 2030 is the blueprint guiding infrastructural development to promote connectivity through a network of roads, railways, airports, waterways, ports and telecommunication (RoK, 2007; Abdu *et al.*, 2016). Major infrastructural development programs have been actualized in the last decade through the allocation of 20% of the country's budget (Abdu *et al.*, 2016). Infrastructure development comes with significant changes in the social, economic and physical environment in an area (Schmid 1970; Clawson 2013) and is a major driver of land speculation and land development in Kenya (Abuya *et al.*, 2019). The abnormal land transaction activities seen before and after public notification of government developments can be countered through policy measures to control the land market and other externalities (Cho *et al.*, 2016). Weak development control and land use planning in Kenya's peri-urban areas (Ayonga, 2015) creates an incentive for speculating peri-urban land characterized by subdivision of land into unplannable units, overproduction of residential plots, and mixed land uses (Njiru,

2016). Land speculators take advantage of existing interstices in land policy and related policies that guide land development in Kenya (Napier *et al.*, 2013). The Land Policy in Kenya (MoLPP, 2016), developed between 2008 and 2015, aims at addressing issues on land ownership, land use and the development process (Kanyinga, 2009). However, the undertones and overtones in control over and access to resources especially land have remained politicised as a means to retain power and expand political influence (Boone, 2012). The problem of land speculation being embedded in government initiatives and programs is experienced globally (Stanley, 2017) and is not unique to Kenya's current situation (Bassett, 2018) especially (Greater) Eastern Bypass. However, there is no land restriction on the planned infrastructural corridors espoused in Kenya's Vision 2030 over the last two decades nor systematic studies carried out on peri-urban land speculation and its implication on land development; which this thesis addresses using (Greater) Eastern Bypass as a case.

1.2 Statement of the Problem

The peri-urban land market in Kenya has risen in the last decade due to the increased population and demand for housing (Omboi, 2011). The predominant peri-urban land use is agriculture and the decision to convert to other land uses is driven by a myriad of social, economic and political factors which change land development patterns (Mather, 1986; McGregor & Simon, 2012). Land administration in Kenya has been devolved to county governments to enhance development and resource utilization (Hall *et al.*, 2015). However, most of the county governments are grappling with numerous land issues ranging from administration of titles, conservation, utilization, compensation, development and land use control (Bush, 2017).

Agricultural land in peri-urban areas in Kenya rarely has high economic prices; but its value rises when development projects such as the building of roads are publicly notified (Oyugi & K'Akumu, 2007). Land brokers, investors and agents who access information on infrastructure development before public policy notification buy peri-urban land, subdivide, hoard the land and retail it later at higher prices (Cho *et al.*, 2016). This profiteering creates ground rent that is tied in with negative externalities such as a considerable increase in land purchase prices, which brings unnecessary additional costs to society (Du & Peiser, 2014). In addition, the lack of systematic land use planning on proposed transport corridors prompts speculative and uncontrolled land subdivisions which are preceded by leapfrogged and disorganized land development. Land speculation has been viewed as the major cause of undesirable sprawled development in the urban fringe (Zhang *et al.*, 2020). Mwende (2013) alleges that land prices have been rising faster than construction costs due to speculative buying and hoarding of land, consequently making project implementation in Kenya expensive due to the high cost of acquiring land for development. Lee (1990) further argues that an increase in land cost due to speculation curtails and decreases construction activities in an economy hence delaying land development in urban and peri-urban areas.

Land speculation has been an integral part of the infrastructure and land development in Kenya (Abuya *et al.*, 2019), characterized by speculative activities such as the subdivision of agricultural land. Although planning and development control is mostly practiced in Kenya's major cities (Ayonga, 2015); inadequate land use control creates an incentive for speculating peri-urban land. The entrenching of land speculation in government institutions and planning authorities encumber the process of infrastructure

development and land use planning globally and in Kenya. Earlier studies conducted in Kenya have not analysed land speculation in light of public policy on infrastructure planning, despite being perceived as a driver of peri-urban land speculation. The research explores how peri-urban land speculation influences land development using the (Greater) Eastern Bypass area as a case study.

1.3 Research Questions

- a) Is there a correlation between public policy on infrastructure planning and land speculation?
- b) How does land speculation affect development patterns?
- c) How does land speculation affect land prices?
- d) What option exists in mitigating the negative effects of land speculation?

1.4 Main Objective

The key objective of this study is to investigate the influence of public policy on infrastructure planning on land speculation and the effect of land speculation on land development in the peri-urban area of (Greater) Eastern Bypass

1.5 Specific Objectives

- a) To investigate the linkage between public policy on infrastructure planning and land speculation in (Greater) Eastern Bypass from 2005 to 2018.
- b) To examine the impact of land speculation on development patterns in (Greater) Eastern Bypass from 2000-2020.
- c) To determine the dynamics of land prices in (Greater) Eastern Bypass from 2005 to 2018.

- d) To assess the influence of public programmes on land development patterns in (Greater) Eastern Bypass.

1.6 Research Hypothesis

H0 There is no significant influence of infrastructure planning on peri-urban land speculation in (Greater) Eastern Bypass

H0 There is no significant change in land prices in the (Greater) Eastern Bypass due to the presence of land speculation.

1.7 Significance of the Study

The rapid spread of suburbs across the areas that were previously rural landscapes needs prior planning to reduce haphazard growth and associated urban problems (Mundia & Aniya, 2006; Ravetz *et al.*, 2013). The process of suburbanization is significant and requires to be well understood by planners and policymakers as the background for land development (Thuo, 2013a; Clawson, 2013). This research, therefore, aimed at identifying the implication of peri-urban land speculation in Kenya through a case study approach. The results of the research will inform local and national policymaking to enhance urban land development and management. Weak land tax policies and tax administration in African countries encourage the speculative accumulation of land (Byamugisha, 2013).

Limiting building density or uses allowed in certain areas through zoning may limit the supply of land; but periodic land market assessment by the local and national government is necessary to reduce the bottlenecks limiting land development and urban growth (Roebeling & Hendrix, 2010; Dowall, 1995), which this study contributes to.

The urban land market determines how land is used, the location of activities, the nature of the built environment and urban spatial form (Napier *et al.*, 2013); whereas government policy on land dictates investment patterns in urban areas (Olima & Obala, 1998). Thus, land price assessment can help in identifying land speculation hot spots and introduce measures to capture an increase in value (Cho *et al.*, 2016).

Land speculation has influenced undesirable development patterns of major urban areas in Kenya (Musyoka, 2013). Actors in the land market are diverse and have divergent objectives, expectations and strategies (Omboi, 2011). Land market outcomes and attributes such as entry and exit should be controlled by local and national government policies and public decisions about infrastructure investment (Capozza & Helsley, 1989; Napier *et al.*, 2013). In Kenya where local controls for use of land are not stringent, the land is kept vacant with the expectation of highly valued future development (Ayonga, 2015). Competition among land users set prices and determines the pattern of land use activities in an urban area (Musyoka, 2013). Land remains underutilized because revenues can be generated without building on the land (Razak *et al.*, 2018).

Although land speculation is perceived to be a form of investment, it has long-term effects seen during land development. Land speculation is worth studying in Kenya as it illuminates the connections between public policy planning, contributors of speculation and its influence on land development and prices. In addition, land speculation accompanies the extension of urban infrastructure into the peri-urban areas and thus influencing land development. The way growing cities utilize land and how the population acquires, regulates and trades land has important consequences on a city's

socio-political, spatial and economic character (Napier *et al.*, 2013). This study will, therefore, contribute towards the regulation of the land market, assessment of policy implications on land speculation and inform land use policy implementation to mitigate peri-urban land speculation.

1.8 Conceptual Framework

Land speculation can be conceptualised as a nexus between theory and public policy planning (Figure 2-5). Stanley (2016), Lalloo (2002) and Logan and Molotch (1976) explain land speculation in terms of the urban regime and political economy theory where urban politics and growth coalitions influence land development while structural speculation manipulates government decisions on infrastructure investments for private gain. Land policy intervention affects access and land supply and where the administrative systems are ineffective, the policies give rise to evasion of land regulation that serves the interest of the political elite and powerful property owners; thereby incentivising structural land speculation (Clawson, 2013; Thontteh & Babarinde, 2018; McConnell *et al.*, 2006). Land speculators withhold land for some time awaiting the change in values occasioned by the construction of transport infrastructure, change in zoning entitlement and rising urban population (Stanley, 2017). Speculative investors leverage accessing crucial information on proposed public infrastructure to ensure they acquire land along the transport corridor before public notification (Cho *et al.*, 2016). Cognitive speculative investors' behaviour is seen during the early stages of public infrastructure planning (Figure 1-1), where they collaborate with the planning authority to influence the location and alignment of roads and other infrastructures (Lalloo, 2002). After the acquisition of land, land speculators explore options of gaining from the land through either selling it to other

land entrepreneurs or subdividing and selling the plots (Thontteh & Babarinde, 2018). Land speculation is spurred by confidence in the expectation of perceived return from land sales (Malpezzi & Wachter, 2005) and compensation before the construction of infrastructure. Land speculators buy land before public notification of the planned infrastructure with an aim to hoard and sell the land when the construction of road infrastructure begins. Cho *et al* (2016) explain that land prices increase sharply after public notification of planned road infrastructure while Clawson (2013) notes that planning and onset of transport infrastructure trigger fragmentation and conversion of peri-urban land.

The axial theory explains why land speculators target areas with the potential to grow majorly along new transport corridors where the change of land use from agriculture to urban use is predictable. Cho *et al* (2016) highlight transport corridors as hotspots for land speculation characterized by spatial clustering of speculative land transactions. Economic and Bid Rent theories have been used to explain why land closer to the city is withheld for future high-valued uses while development extends to marginal land. Land speculators buy agricultural land whose speculative value decreases with an increase in distance from the city and has the potential to develop. This prompts leapfrog development in the peri-urban, which is characterized by low value and low-density development (Sargent, 1976; Schmid, 1970; Zhang *et al.*, 2017). Speculative subdivision of peri-urban land results in expansive vacant land that is kept idle to await the provision of essential amenities by the local authority (Colsaet *et al.*, 2018). It takes the intervention of local authorities to develop policies that will encourage infill development in leapfrogged areas such as downzoning to increase density per parcel of land (Zhang *et al.*, 2017).

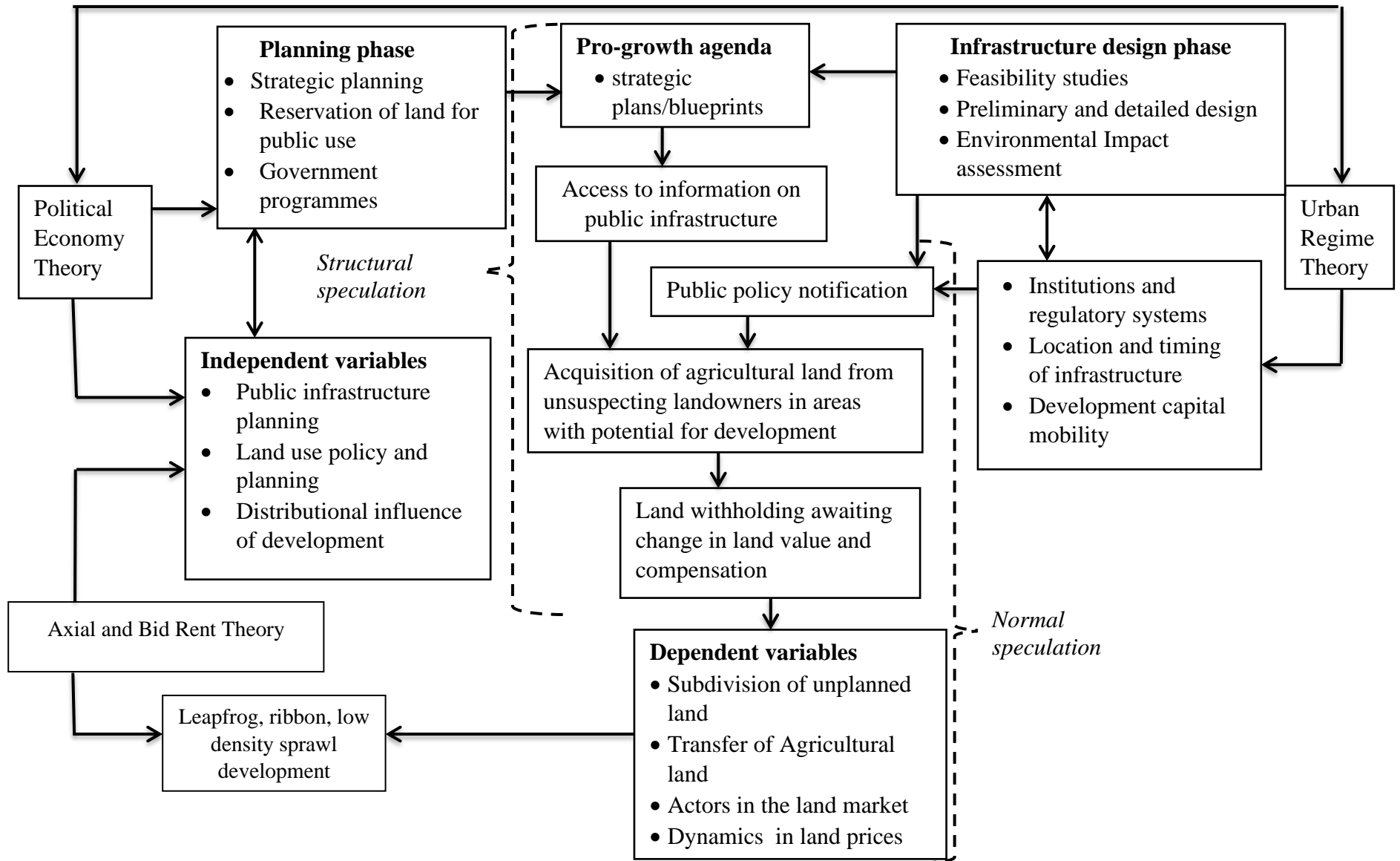


Figure 1-1. Conceptualization of peri-urban land speculation (Author's synthesis)

1.9 Research Limitations

Access to information on land in Kenya is impeded by structural systems because of the sensitive and emotive nature of land and land issues. Obtaining data on land transfers and subdivisions is held with a lot of suspicions. Clearance with the local Criminal Investigation Unit was sought to ensure that data collected was only used for research purposes and for land officers to have trust and allow access to data. The area along (Greater) Eastern Bypass where the study was carried out has experienced many land disputes; this explained why access to land data was treated with a lot of caution.

Land data, which comprised land subdivision, transfers and transactions for the period 2005-2018, obtained from Thika Land Registry was manually retrieved; hence, the process of acquiring data for the study period was difficult and tedious. Data on subdivision was retrieved from handwritten registers of which some were tattered, illegible, and therefore required a lot of time to put the pieces together. Data on transfers was obtained from Green Cards that were stored in files chronologically from the oldest to the most recent. However, the process of retrieving the old files from the archive was time and energy consuming because of the disorganised storage of files.

The study adopted two study periods, which resulted in time, constrain in collecting data to cover the periods. The period between 2005 and 2018 is used to study the planning of (Greater) Eastern Bypass and the trend in land prices. This period represents a time when the planning of the (Greater) Eastern Bypass was initialized in line with Kenya Vision 2030 and Millennium Development Goals. The second study period, 2000-2020, is used to study development patterns where land use/cover is used as an indicator of

development. This period is used to examine development patterns along (Greater) Eastern Bypass before, during and after public policy planning.

Accessing senior officials from institutions such as Kenya Urban Roads Authority (KURA) was difficult due to the bureaucratic systems. Some of the officials were available for a short period; hence, there was limited time for an in-depth interview on issues related to structural land speculation.

Obtaining data on land transactions from the land registry was difficult since the data was not segregated according to regions and parameters such as the location of a parcel to distance from the roads were not recorded. To overcome this hurdle, parcel numbers were used to locate/ shape file maps were used to assist in establishing parcel location to roads in the study area.

1.10 Definition of Terms

Land speculation is an economic phenomenon that accompanies the urbanisation process (Zhang *et al.*, 2020) and the development of infrastructure in peri-urban areas (Cho *et al.*, 2016; Triantafyllopoulos, 2017).

Peri-urban areas-transitional zones where urban and rural activities are juxtaposed and modification of landscapes induced by human activities happen (McGregor & Simon, 2012)

Public policy-Institutionalised proposal or course of action by the government to address a real-world problem faced in a country or a region (Schmid, 1970).

1.11 Thesis outline

This thesis is structured into five chapters. Chapter one covers the background of the study, problem statement, research question and objectives, hypotheses, study significance, justification, conceptual framework and limitations of the study. Chapter two covers a literature review on land speculation, strategies for controlling land speculation, land governance in Kenya, theoretical framework and research gaps. Chapter three covers research methodology which entails a description of the area of study, research design, sample size and sampling procedures, data collection and analysis and research ethical requirements. Chapter four present results and discussion per objective majoring on land as well as reflection on theories. Chapter five gives a summary of findings, conclusion, recommendations and areas for further study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Land Speculation

Land speculation is an economic phenomenon that accompanies urbanization process (Zhang *et al.*, 2020) and the development of infrastructure in peri-urban areas (Cho *et al.*, 2016; Triantafyllopoulos, 2017). It is an advanced strategy used by speculators to hoard land anticipating future high returns (Gul *et al.*, 2018). Land speculation is viewed to cause economic dislocations and social conflict that creates land bubbles, which treat real estate as an investment held out of use (Malpezzi & Wachter, 2005; Triantafyllopoulos, 2017). The effects of peri-urban land speculation are seen when there is an excessive land subdivision, construction occurs on marginal sites, capital is diverted into speculation rather than production, and the banking system is one enabler of speculation is highly leveraged (Clawson, 1962; Curtis, 2014; Cho *et al.*, 2016). The impact of externalities such as rising urban population, pent-up demand for land and the desire for business profiteering compels land investors to consider withholding the land for some time to allow its value to appreciate before selling at market price (Thontteh & Babarinde, 2018). To break even and avoid making a loss the land investor has to master the game of risk-return trade-off. Land speculation capitalizes on short-term gains (Cho *et al.*, 2016) resulting in increased property prices, reduced supply of land ready for development, and sometimes encumbers the ability of the poor to acquire land (Xiao & Park, 2010). It is a suburbanization process that fills the ownership gap between original non-urban agricultural or other low-intensity land use and urban high-intensity use (Squires, 2002; Clawson, 2013). Though lending liquidity to the land market, it makes less land available to developers and promotes urban sprawl in the intermingled

land (Elias & Gillies, 1964; McGregor, 2014). Land speculation has been viewed as a fundamental cause of both micro and macroeconomic disturbances due to delays in development and the highest best use for the anticipated price increase and profit maximization (Clawson, 2013; Brzezicka, 2016).

Land speculation effect may be more prominent in peri-urban areas compared to rural areas due to numerous urban influences such as easy change of zoning plans, the extension of urban infrastructures like roads into the peri-urban and the availability of cheap agricultural land (Deng *et al.*, 2009; Triantafyllopoulos, 2017; Thontteh & Babarinde, 2018). In places where the speculative effects are strong, they dominate the market power (Dewar, 2007). Peri-urban land speculation is viewed as unproductive, absorbing capital and entrepreneurship skills without commensurate public gain (Clawson, 1962; Brown *et al.*, 2007). Thontteh & Babarinde (2018) further describe land speculation as a function of ineffectual land policies and incompetent land deals, which takes place in peri-urban areas. The effectiveness of land policies determines and guides the economic and social practices on land development. Lack of enforcement of planning standards, zoning bylaws, building regulations and other development controls incentivize peri-urban land speculation and can leave disordered development in the urban fringe (Abuya *et al.*, 2019). Land speculation is characterized by the massive acquisition of land in the peri-urban within a given period which is later followed by excessive residential subdivisions and an increase in land transactions (Napier *et al.*, 2013). Acquisition of land can sometimes be land deals that circumvent the legal land acquisition process (Byamugisha, 2013; Thontteh & Babarinde, 2018). These land deals undergo numerous changes starting from negotiation status, intention to acquire land,

and procurement process to certification (Thontteh & Babarinde, 2018). The value of peri-urban land is often leveraged on anticipated public investment, which is likely to trigger an increase in land prices (Stanley, 2016). Land developers and investors look out for such land in the peri-urban, which is marginal, low-priced, cultivated, or uncultivated (Clawson, 1962, 2013). It is assumed cultivation and farming extend to other unproductive areas to pave way for expected urban uses such as housing. However, since development does not take place immediately this land is withheld for a period for higher prices (Filatova *et al.*, 2009). The main reason for buying and speculating marginal land is the confident expectation of future enhanced land values, which results from development (Filatova *et al.*, 2009). The consequence of peri-urban land being withheld from use or the full use it is capable of pushes the margin of the city further from the centre and leaps of scattered development emerge which lead to increased cost of providing infrastructure, transport and utilities (Clawson, 1962; Archer, 1973; Gameda *et al.*, 2020). As developers and investors move into the outer part of the peri-urban to buy cheaper land which they anticipate the value will increase, the land then bears a speculative value attached to it. Three dimensions of time, land use and density (Stanley, 2017) define both short and long-term speculation.

2.2 Drivers of Land Speculation

The land is a heterogeneous good because of its different characteristics and different uses triggered by different dynamic processes (Capozza, 1976; Fujita, 1989; Cavailhes, 2003). The phenomenon of land speculation has negative impacts on the quality of life; the underutilization of land contributes to a vicious cycle of inner cities underdevelopment by developing property values (Morandé *et al.*, 2010). It is

necessary, therefore to know the forces behind land speculation and the existence of vacant land in urban areas since it will be useful to generate appropriate public policies to deal with negative effects (Evans, 2008). Forces that are behind land values are behind land speculation too (Capozza, 1976; Malpezzi & Wachter, 2005; Colsaet *et al.*, 2018).

In determining growth in the urban fringes, speculative alchemists manipulate catalysts of raw land speculation and development and counter constrains imposed by them (Sargent, 1976; Kim & Lee, 2000). Speculative agents can be viewed as an independent "profit centre" that determines the nature and value of land due to a myriad of decisions made by agents relating to costs of holding land, which is related to its proximity to the city than its agricultural value (Sargent, 1976). The price of land in the peri-urban as perceived by the farmer is made up of two components; the value of agricultural use and speculative use related to potential urban development (Kittrell, 2012; Sargent, 1976). Closer to the city the value of raw land speculation is higher than farming and as the distance increases from the city (Pipkin *et al.*, 1983) the speculative value decreases and ceases at distance A from the city where no urban development is anticipated

(Figure 2-1)

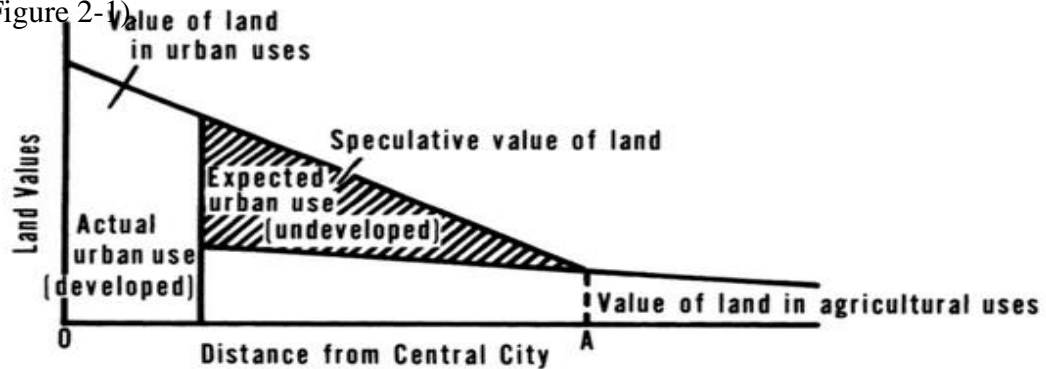


Figure 2-1. Land values and distance from the city (Pipkin *et al.*, 1983)

Land taxation has been used to reduce the negative externalities produced by idle and vacant land though the effectiveness of taxing non-use is questionable as a way to correct land externality (Wyatt, 1994; Bird & Slack, 2005; Foldvary & Minola, 2017). In addition, rising taxes based on the enhanced value of agricultural land for urban use increases operating costs. However, it is the higher returns on capital invested in development rather than the speculation cost, that land agents and developers pursue (Emanuel & Andrea, 2017).

Land speculation has been intertwined with land development in American history (Connor, 1954; Dewar, 2007; Stanley, 2016), where the prevalence of speculative land sales in the development of the nineteenth-century American frontier has largely been documented (Bahl, 1968; Raymon, 1973; Lindeman, 1976; Foldvary, 1998; Evans, 2008; Laloo, 2002; Gul *et al.*, 2018). Subdivision of farmlands and excessive land speculation in the United States of America in the early 1920s led to an increased number of vacant plots and leapfrog land development (Dewar, 2007; Connor, 1954). The collapse of the land boom left more than 335,260 vacant lots estimated to be sufficient to take care of probable urban growth for 30 years (Feagin, 1982). Land speculation then was perceived as a lottery in which the grand prizes are enticing and under the influence of the boom, psychological men are willing to take the risk even when the probability of making a profit is too low (Whitten, 1936; Connor, 1954). In India, land speculation amplifies class and caste inequalities by creating an involuntary dynamic agrarian change that impoverishes the rural poor (Levien, 2012). The institution of private land ownership in Kenya has encouraged the holding of land for

speculative purposes, resulting in land being barely released for purposes of planned development (Gatauwa & Murungi, 2015).

Dependence of urban regimes on local land, given the lack of geographical substitutability, introduces weariness in regimes' bargaining power and allows private agents to leverage and exploit public information about development initiatives (Logan, 1976; Lalloo, 2002; Ho & Kwong, 2002; Logan & Molotch, 2007; Stanley, 2016; Triantafyllopoulos, 2017). Land speculative value is embedded in land's relative spatial position and often generated by leveraging institutional power (Lalloo, 2002). Triantafyllopoulos (2017) highlighted land ownership structure, state policies and bank financing practices as aspects producing synergies that encourage land speculation. Logan & Molotch (2007) typifies land speculators as: a) serendipitous entrepreneur those who become rent collectors by inheriting property or some other fortuitous circumstances, b) active entrepreneur are those who anticipate changes in the value of the property and speculate on the future of particular spots and use social networks to gain information about national government initiatives (Stanley, 2016), and c) structural entrepreneur are those who intervene to change relationships between places and obtain special advantages for properties they hold. Structural speculators directly manipulate government decisions on zoning, infrastructure investments and other initiatives to privilege their private properties (Lalloo, 2002; Stanley, 2017). Participants in land speculation practices can further be grouped into three levels (Thontteh & Babarinde, 2018); a) informed speculators who have access to public and private information and are in charge of land allocation, b) uninformed speculators possess public information and are either developers or investors, and c) private purchasers are individuals who are

not information driven. Key actors in the urban land market in Kenya include developers, land owners, financiers and local estate agents (Ayonga, 2015) with each having a specific role in land speculation. Land developers pursue public information to assess areas to target for investment, while banks and other financing institutions give attractive offers to developers, to reap from speculative investment (Gatauwa & Murungi, 2015). A landowner with access to public information on potential investment can hold their land until they can accrue maximum benefit resulting from the development of infrastructure or other triggers of land value (Mason, 2009).

2.2.1 Structural Land Speculation

Land speculators can leverage government power for private gain and interests (Laloo, 2002; Stanley, 2016). Structural land speculators predict development trends and strategically invest in places with rising land value and use political and economic power to ensure the government regulatory power and investment is channeled into raising the value of their private holdings (Mickey, 1997; Shiu-Shen, 2013; Stanley, 2017). Logan & Molotch (1976) drawing heavily from regime theory describe how growth separates the elite from the ordinary people living and working in the city where the growth elite pursue to increase aggregate rents and gaps related to wealth. Strategies in structural land speculation are founded upon using political connections to obtain public rights at a discount and later gain some profit (Stanley, 2016). The public nature of public policy allows active speculators to enter local markets before government initiatives are implemented and price rises (Laloo, 2002; Logan & Molotch, 1976; Shiu-Shen, 2013), hence active speculation is accompanied by structural speculation. Active speculators more often use local social networks and connections in government

to obtain advanced knowledge of public and private investments that may cause a rise in values in specific areas. Armed with prior information, the active speculators target land investments to capitalize on upward market trends (Laloo, 2002; Stanley, 2017).

2.2.2 Land Developers

Agriculturalists and intervening owners are the principle pre-development actors in the peri-urban areas (Clawson, 1962; Lindeman, 1976). They make decisions on the retention or release of the great bulk of raw land held speculatively. Their actions in manipulating the land market are greatly influenced by developers, who are key agents for expressing demand by the general public for suburban locations (Archer, 1973; Razak *et al.*, 2018). The developer has two significant roles in urban development, as an assembler of land with numerous separate ownerships and creator of an actual subdivision that give form to several earlier speculative decisions (Archer, 1973; Du & Peiser, 2014; Gul *et al.*, 2018). Apart from speculating land, the developer has a greater influence in determining the direction and shape of residential growth and also changing the scale and pattern of land ownership (Heim, 2001). The pattern of urban fringe development is determined by the interaction of the land speculators (the supply side) with the developers (the demand side) (Cartier, 2001; Clawson, 2013). For large-scale developers, the reality of fragmented ownership coupled with higher prices of land close to the urban centres and existing housing developments infringes on developers' master plan hence forcing them to locate their new planned communities towards the outer part of the city (Archer, 1973; Razak *et al.*, 2018; Shiu-Shen, 2013; Sisson *et al.*, 2018). Although proximity to paved roads, freeways, shopping centres and other residential tracts are key locational considerations to the developer, research has shown that the

high cost of land close to urban areas has forced developers to shift to rural areas where land is prematurely developed and the role of utility installations, local streets improvements and construction of dwellings is left to the developer (Knaap *et al.*, 2001; Brzezicka, 2016; Sisson *et al.*, 2018; Gameda *et al.*, 2020).

2.2.3 Expectations in Land Speculation

Several models have been developed to model how expectations are formed in land speculation (Ottensmann, 1977; Malpezzi & Wachter, 2005). The understanding expectation is central to comprehending the phenomenon of land speculation (Ottensmann, 1977). Myopic expectations, perfect foresight, rational expectations and adaptive expectations are the common models used to explain expectations in land speculation (Malpezzi & Wachter, 2005; Ottensmann, 1977; Thontteh & Babarinde, 2018). Myopic expectation assumes that the investors are 'flying blind' going forward while perfect expectation assumes that people know the future such as the likely development of infrastructure that will trigger demand for accessible land. Rational expectations state that people use all available information to make an optimal forecast about the future while adaptive expectations assume that people are backward-looking and the future is likely to be like the recent past (Kim & Lee, 2000; Brzezicka, 2016). In perfect expectation, it is assumed that investors have perfect information, which they use to make decisions before investing while in rational expectation the investor optimizes on available information that can help in forecasting the future (Malpezzi & Wachter, 2005). The rational expectation is viewed as more formidable compared to perfect expectation with the argument that best estimates of future prices can be made based on all available information. The changes in asset prices over time should be

unpredictable hence the need for gathering available information in the market to assist in forecasting. On the other hand, the hypothesis that the expected price levels are based on the past values of the actual price is termed adaptive or backward-looking expectations (Ottensmann, 2006; Philip, 2013). Individuals look at past inflation experiences to be able to predict outcomes hence generating adaptive expectations. Myopic pricing and adaptive expectations do not take into account the probable future negative pricing events hence estimation of low-frequency events and collapse in real estate prices is limited (Gemedda *et al.*, 2020). A bubble is generated when there is a tendency to underestimate the probability of low-frequency shocks depicted through available information about the prevailing market.

2.3 Impact of Public Policy on Infrastructure Planning on Land Speculation

Snapshot surveys have been carried out to exhibit ways in which state policies have a definite effect on land speculation (Sheehan, 1982; Jones *et al.*, 1994; Knaap *et al.*, 2001; Foldvary & Minola, 2017; Kanasugi & Ushijima, 2017). Such surveys looked into spatial and temporal distinct public policies, which aimed at discovering the extent and mechanisms by which policies can influence the speculative increase in land prices (Jones *et al.*, 1994; Philip, 2013). Bahl (1968) notes that the limitation in assessing the valorisation impact of public policy on land values is to isolate all project effects from all other factors that might influence land values. The use of control where prices of land are compared between locations where public policy is present and one where it is absent worked only as an indicator that public policies have a general impact on land value (Jones *et al.*, 1994; Dowall, 1996; Philip, 2013). Installation of public projects usually occurs after intense political debate and approaches to assessing the

effectiveness of the public policy on land value and uses do not take into account the length of time required in initiating, negotiating and installing a given project (Foldvary, 1998; Rakodi, 2003; Philip, 2013). In addition, the valorisation effect of public policy can be determined by the size of public investment, the nature of policy and the spatial relationship of the policy to the area (Philip, 2013). However, an empirical study carried out in Washington showed that the announcement of a new rail investment caused a significant change in land values, even before the actual construction of the rail began (Knaap *et al.*, 2001).

The proposition that the announcement of plans for infrastructure development can influence change in land values has been supported by many researchers (Cho *et al.*, 2016; Kanasugi & Ushijima, 2017). However, the implication is how markets react to the information content of the plans (Stanley, 2016). Foldvary (1998) argues that the announcement of plans in areas that are fully developed has limited effect and at most will only cause a sorting effect where those who value proximity to transportation will outbid others for property along station areas. When plans for infrastructure in undeveloped areas are announced, the timing and character of development are affected (Cho *et al.*, 2016). Planning by the local government can affect the urban development process by changing expectations, increasing land prices and thus discouraging premature low-density development in future light rail areas (Knaap *et al.*, 2001). Based on the work by Intriligator & Sheshinski (1986) infrastructural plans serve as a means by which local government signals their intended action to developers. The landowners informed by the plans anticipate an increase in accessibility around stations and bid up land values. These increase in land values, occurs before the establishment of the light

rail system, creates a disincentive to develop at low densities and encourages landowners to delay development until the light rail system begins operations and encourages high-density development (Knaap *et al.*, 2001; Stanley, 2016; Kanasugi & Ushijima, 2017). Timely announcements of transportation plans can serve as a coherent means of coordinating government investments in transportation infrastructure with private investment in urban and peri-urban areas (Knaap *et al.*, 2001; Cho *et al.*, 2016).

2.4 Economic Explanation of Land Speculation

Land speculation involves the assessment of the degree of certainty and characteristics of the land market (Thontteh & Babarinde, 2018). However, in some cases the future is known with complete certainty hence planning for the future can involve accepting lower current income in the short term with anticipation of higher future prices (Evans, 2008). In planning a landowner or investor can accept lower current income in the short term as long as there is complete certainty that oncoming development will increase land value (Malpezzi & Wachter, 2005). Evans (2008) using Figure 2-2 gives the economic explanation of land speculation and why land is left in lower income uses for some time until it becomes optimal for it to be developed or redeveloped. It is assumed that the land is located in the peri-urban area and anticipating development or urbanization.

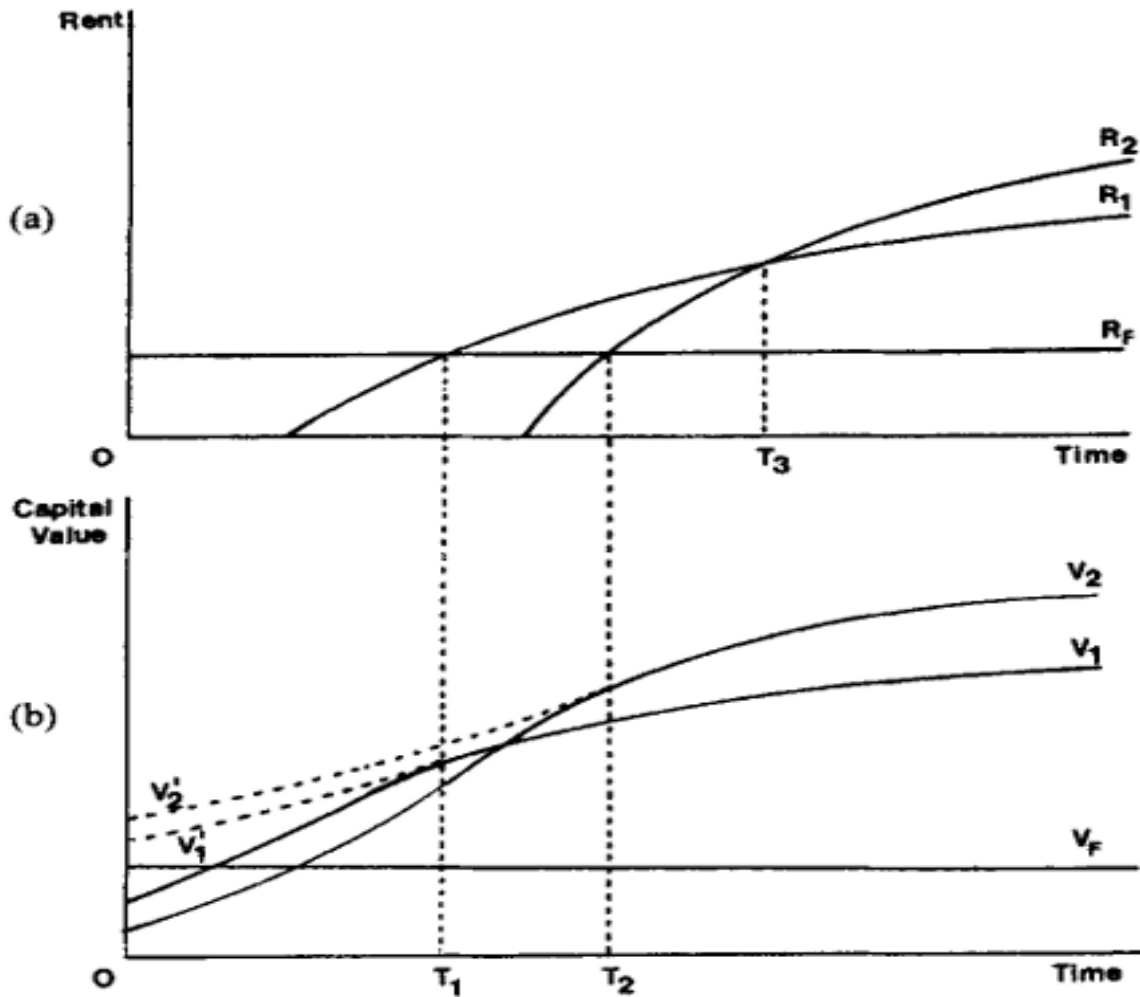


Figure 2-2. Rent from land with development of housing over time (Evans, 2008)

V_F shows land being farmed perpetually with a likelihood of uniform income from farming, but this is unlikely to happen because landowners will only allow land use that increases their income as indicated in Figure 2-2. The prices of agricultural land increase a little before infrastructure development happens and at T_1 farming ceases to allow development such as housing. Land speculators and investors step before T_1 to buy up agricultural land with anticipation to sell it at a higher price before or after development. Development begins to occur at T_1 when rent from urban use is equal to or greater to rent from farming. It is assumed that landowners will put land into profitable use at

V1 for the period before the anticipated development which increases income slightly more than if the land was left unused at V1. Housing development at T1 is more profitable than farming, however, a second urban use like commercial use becomes more profitable at T2, hence land held up until at T2 is more valuable. This explains why a speculator will hold land even after initial urban development has begun because it is anticipated a second urban use such as the development of a shopping mall in an area with residential development is more profitable. V2 shows an anticipated increase in value if the land is held or farmed up, as opposed to a second urban use such as retailing at V2, and kept until the date of development at T2. At T2 the income from commercial use is higher than agricultural and at T3 the income will exceed that for housing, thus creating a possibility of redeveloping the land for commercial use.

The above explanation suggests why land speculation is discredited. First, leaving land underused for a long time is viewed as a waste of resources though from an economic perspective the interest is the anticipated profit by land speculators (Ambrose, 2005; Archer, 1973; Clawson, 1962, 2013). Secondly, speculators are viewed as driving away farmers or original occupiers especially when there is anticipated development and income from farming is lower than land prices (Clawson, 1962, 2013; Lindeman, 1976). Thirdly, since the income from a land awaiting development may be very low relative to its capital value, the speculator may opt to leave it unused and underutilized (Clawson, 1962; Evans, 2008, 2017). When such land is bypassed by development, a non-speculative mind may wonder why it is not being developed when the surrounding land is already developed. Leaving the land vacant gives the speculator more advantage

since no tenant is required to vacate or demolition of existing development (Evans, 2008).

In explaining land speculation, there is a difference between the planned development and the market situation (Evans, 2008; 2017). In a planned development, the authority knows which land will be used for commercial use and other land uses (Schmid, 1970; Evans, 2008). However, in an unplanned situation and the existence of a free market the speculator or landowner on the path of development speculates on the pattern of future urban development (Evans, 2008). Different landowners and speculators make different assumptions about anticipated development and sometimes may make wrong assumptions leading to a waste of resources (Hovinen, 1977; Rakodi, 2003; Shih-Shen, 2013). There is a difference in public, non-market activity of planning and activities of landowners and developers. The urban authorities in planning for various land uses may make mistakes in over-providing or under-providing land (Schmid, 1970; Evans, 2008). Underproviding promotes intensive use and higher rents while overprovisioning lower rents and numerous vacant unrented spaces; hence land is not used for its current highest and best use (Bowman & Pagano, 2000; Cavailhes, 2003).

2.5 Land Speculation and Land Uses

Various economic models explain the relationship between human behaviour and land use change outcomes in different areas (Du *et al.*, 2016; Stanley, 2017; Thontteh & Babarinde, 2018 Abuya *et al.*, 2019; Zhang *et al.*, 2020). These models begin from the viewpoint that landowners make various decisions to maximize returns and utility derived from land (Du *et al.*, 2016; Mather, 1986). Spatial land use models cannot be

fully used to explain urban land morphology without an economic theoretical framework since they may be susceptible to certain conceptual and estimation shortfalls (Brown *et al.*, 1981; Cartier, 2001). Recent works in environmental economics have focused on developing economic models of individual landowner's decisions within a spatially explicit framework (Cartier, 2001; Colsaet *et al.*, 2018). Urban fringes in most developing countries face similar challenges (Clawson, 1962; Brown *et al.*, 1981; David, 1981). The predominant land use change from agricultural use to residential development is common across the world (Elena *et al.*, 1999). Peri-urban land is viewed as a multi-functional environment characterized by essential service functions, adaptation and conversion between uses, a low-density economic activity including retail, industry and an untidy development pattern (Clawson, 2013).

The dominant land use in most urban areas of the United States of America is characterized by low density, scattered and non-contiguous residential development (Dewar, 2007; Zhang *et al.*, 2017). This leapfrog development is a result of the withholding of land close to urban centres and the development of more remote land (Irwin & Bockstael, 2007; Zhang *et al.*, 2017). Land speculation has been viewed as a key driver influencing land use change on the urban fringe and is detrimental to the livability and sustainability of a city (Atack & Margo, 1998; Morandé *et al.*, 2010). It results in green unused spaces that are easily converted into dens of robbers, accentuates slum development due to increased rural-urban migration and shortage of houses and increased hoarding of developable land (Bowman & Pagano, 2000; Morandé *et al.*, 2010; Kittrell, 2012; Kim *et al.*, 2018). In cities where vacant land is not subjected to property tax, land speculation can reduce the tax base as a source of revenue (Razak *et*

al., 2018). The land market is characterized by its heterogeneity aspects, which vary from the pattern of land ownership, land physical qualities such as type of soil, location of land, zoning and building codes as well as social services available (Mills, 1981; Dowall, 1995; Gul *et al.*, 2018).

Land speculation actively influences the land market and infill development outcomes, by altering land prices, value assessment and market behaviour (Gemeda *et al.*, 2020; Malpezzi & Wachter, 2005). In studies carried out in Columbia Savanna and Humid Tropics of Costa Rica, land speculation was considered the principal cause of deforestation (Smith *et al.*, 1997; Roebeling & Hendrix, 2010). Cattle ranchers hold more pasture land for beef production and economic returns while at the same time securing land while waiting for land prices to rise (Roebeling & Hendrix, 2010). Inaccessibility of roads, poor land subdivisions, the dominance of residential land use, lack of proper setbacks and incompatible land uses are some of the problems associated with land speculation in Bajabure town, Nigeria (Ilesanmi, 2016). Change in land policy from communal holding to individual holding facilitated a market-oriented economy and prompts commercialized development in different parts of Kenya (Napier *et al.*, 2013). Subdivision and fragmentation of group ranches also trigger speculative land sales which resulted in the loss of pasture land, land degradation and mixed land uses (Kimani & Pickard, 1998). In absence of effective land policies and proper planning standards, land speculation results in chaotic development (Thontteh & Babarinde, 2018). Additionally, intense land speculation distorts land uses and construction patterns in major urban centres in Kenya (Musyoka, 2013). The Freehold tenure system maximizes individual rights of ownership against the public interest, resulting in

unmanageable situations and difficulty in coordination with other urban development policies (Olima & Obala, 1998; Syagga, 2006).

Land speculation is characterized by discontinuous development as opposed to the expected continuous development from the urban centre (Webster & Muller, 2009). However, it creates an inefficient allocation of land uses over a longer period (Malpezzi & Wachter, 2005). Infill development of initial vacant land is used for higher value; hence, the land is developed with more productive uses (Jiang *et al.*, 2007). The premise is that land prices increase with density development (Fujita, 1989; Chin, 2002). However, zoning restrictions and the time taken for infill development may contradict the presumption that speculated vacant land will be of higher value (Zhang *et al.*, 2017). Land may be speculated for other benefits where hobby farmers motivated by other factors such as status or amenity may resist pressure to sell their land (Brown *et al.*, 2007). As it is valued in multiple ways apart from location-specific qualities, farmers in peri-urban Indian cities hold land as habitation and a long-term source of security a value not reducible to exchange value (Levien, 2012). Peri-urban land is withheld even where non-farm economic opportunities are not promising or viable due to nuisance effects such as trespass, rubbish dumping, crop theft and damage (Mather, 1986; Kombe, 2005).

2.6 Peri-urban Land Speculation and Development Patterns

Studies carried out globally to explore the effects of land speculation have established leapfrog development as one of the major impacts in addition to disorganized land use and increased cost of services and transport (Brown, 1927; Clawson, 1962; Yearwood,

1968; Gayler, 1970; Archer, 1973; Lindeman, 1976; Dewar, 2007; Stanley, 2016). Developers may skip over land closer to urban centres, and obtain land further out leaving vacant tracts behind. This process is called leapfrogging which is a broader manifestation of urban sprawl (Heim, 2001; Clawson, 2013). Leapfrog development is described as a form of sprawl where subdivided land is separated from the periphery of an urbanized area by some amount of land, which is either completely vacant or unused for urban purposes (Hovinen, 1977; Heim, 2001; Clawson, 2013). Economic forces such as rising incomes, operation of home mortgage loan programs, transportation subsidies favouring automobiles and subsidization of infrastructure have promoted leapfrog development (Dewar, 2007; Philip, 2013). Scattered, nucleated and low-density development patterns characterize leapfrogging in peri-urban areas (Clawson, 2013; Hovinen, 1977). The primary contributing factor to leapfrog development is the availability of cheap land in outlying areas (Clawson, 1962; 2013). Developers and homebuyers who chose to develop land on the periphery of peri-urban land are not confronted with the full costs and benefits of their decisions which leads to inefficient use of urban fringe (Colsaet *et al.*, 2018). The greatest concern about leapfrogging is that it does not promote proper utilization of land, which is in limited supply and efficient use of available infrastructure (Frederic & Huang, 2004; Shiu-Shen, 2013; Sisson *et al.*, 2018). Integrating transport planning and land use planning has been a huge challenge in addressing peri-urban land speculation and consequent leapfrogging (Heim, 2001; Clawson, 2013). Development of new infrastructure in the peri-urban areas triggers land use changes hence the process of planning for these infrastructures

should be accompanied by land use planning to guide the land conversion process (Kanasugi & Ushijima, 2017).

The government's role in promoting leapfrog development is seen in the rezoning decision to allow residential, commercial, or industrial development on previously agricultural land and in the development of infrastructure in the outlying areas (Zhang *et al.*, 2017). Leapfrogging led to unstable property values in most American cities; which prompted positive land development policies to prevent discontinued scattered urban development (Heim, 2001; Stanley, 2016). In the General Plan for Phoenix (1985-2000) development was only restricted to existing zoned and vacant land before granting additional rezoning (Brown *et al.*, 1981; Heim, 2001; Stanley, 2016).

The emergence of leapfrog development results from forward-looking developers that anticipate future prices and are optimistic about higher value development over time (Jiang *et al.*, 2007). Developers reserve land located close to the urban centre for future higher-valued and higher-density development and pursue lower-valued and lower-density development in locations farther away (Zhang *et al.*, 2017). The inefficiency of discontinued development is depended on how much land is bypassed, how long land is withheld, how it is ultimately used and the nature of leapfrog development (Ewing, 1994; Zhang *et al.*, 2020). Heterogeneity of landowners in the urban fringe; rural farmers, exurban commuters, sophisticated land speculators, small investors and development firms determine the development pattern and urban growth (Brown *et al.*, 1981; Dewar, 2007). The morphology of cities in England has been affected by the pattern of land ownership with uneven patterns where owners with large estates are

unwilling to release land for development (David, 1981; Mather, 1986; Evans, 2017). The larger estates form gaps in the urban fabric; some are converted to urban parks due to building pressure (Clawson, 1962). Large estate owners may act as structural speculators by imposing restrictive stipulations on releasing land for development and thus constraining the type or form of development (Laloo, 2002; Logan & Molotch, 2007). Investors and developers predominate among the recent buyers of urban fringe land especially close to where major development projects are anticipated (Brown *et al.*, 1981). Intensification of development changes ownership of land characteristics and leads to change in the pattern of land use (Smith *et al.*, 1997; Clawson, 2013).

Peri-urban land use patterns in Kenya are complex and cannot be explained using the classical theories of concentric zones, sector theory, or multiple nuclei though some aspects may be visible (Ayonga, 2015). The pattern on the fringes of Nairobi City is partly a reflection of the pattern of land ownership and a product of separate decisions on land use (Olima, 1997; Musyoka, 2013; Napier *et al.*, 2013). Derelict agricultural land with tall grass and broken-down fences characterises speculated peri-urban land along the fringe of Nairobi (Thujo, 2013a). The agricultural land use is discontinued and landowners, land companies and developers speculate land until the optimal time for subdivision or development (Thujo, 2013a). In anticipation of urban development and an increase in land values, farmers may be reluctant to invest capital in maintaining an adequate level of fertility, drainage and fences on their farms (Brown *et al.*, 2007).

Analysis of land development patterns has been used as a spatial and temporal trace of urban and peri-urban land development (Kleeman *et al.*, 2017). Al-Dosary & Khan,

(2010) describes development pattern as the appearance and density of settlement in a given area. Analysis of land development patterns involves analysing the location of buildings and building density. Building density refers to the number of buildings per her which is measured within a radius of 564m which is equated to a 1km² area. Quadratic kernel function has made density calculation easier using GIS software such as ArcGIS (Kirk & Manson, 2012). The majority of recent studies of land development employ GIS techniques for measurement and comprehending land fragmentation, settlement configuration and generally urban growth (Al-Dosary & Khan, 2010). The use of GIS has become a valuable technology in supporting decision-making on urban planning. To capture patterns and spatial distribution in urbanization, GIS techniques utilise land use change analysis, reclassification of land use data, buffering and neighborhood characteristics to come up with development patterns (Al-Dosary & Khan, 2010).

2.7 Land Speculation and Land Prices

The land is a heterogeneous good, because of its different characteristics and uses triggered by different dynamic processes. The land is speculated on increased land value, unimproved value and anticipated increased value (Kittrell, 2012). Land prices are a function of dynamic social, economic, legal and environmental processes interacting over space and time (Glumac *et al.*, 2019). Localization plays a major role in the land market and it influences the price of land (Colsaet *et al.*, 2018). Local land information such as upcoming new infrastructure may trigger land values, impact on urbanization and closeness to the urban area may cause a significant increase in land prices (Jones *et al.*, 1994; Foldvary & Minola, 2017; Kanasugi & Ushijima, 2017). The

quality of land determines the land price (Donoghue *et al.*, 2015). Depending on the predominant land use, different characteristics of land are considered, for instance, drainage capacity and soil texture are important for agricultural production. In addition, the productivity value of land is also dependent on the type of crop. However, some of the land qualities that are suitable for agriculture are equally good for residential development; hence, the increased competition between the two land uses (Clawson, 1962).

Land speculation is accompanied by land hoarding and soaring land prices for vacant land (Du & Peiser, 2014; Thontteh & Babarinde, 2018). This is because land speculators capitalize on a windfall from land speculation. During rapid economic growth and urbanization, land speculation causes accelerating land prices which sometimes leaves land idle as development leaps to land with lower prices (Shiuh-Shen, 2013; Du & Peiser, 2014). High land prices due to a highly speculative land market have been associated with increased construction costs and thereby slowing economic growth (Du *et al.*, 2016). In the early 1970s countries like Japan, United States cities such as Seattle, England and Wales experienced economic depression due to fluctuation in land prices and bubble burst associated with the highly speculative land market (Archer, 1973; Ho & Kwong, 2002; Du & Peiser, 2014; Gul *et al.*, 2018). An increase in land prices is the most significant factor that prompts land hoarding by local governments in China as a source of revenue while in Africa it contributes to increases in the disparity between the poor and the rich in accessing land. Lack of holding cost and property tax especially for peri-urban land further aggravates the problem of land hoarding (Napier *et al.*, 2013).

Land value indices show changes in land prices of comparable quality over time (Filatova *et al.*, 2009). Land valuation is carried out over some time to determine the changes in land prices. However, the high speculative nature of transactions and few recorded transactions for analysis deter the process of valuation (Cho *et al.*, 2016). Land value indices are used to monitor national economic activities due to the strong correlation (Glumac *et al.*, 2019). Consequently, measurements of land price changes should be done accurately as it is critical in local policy development such as in the assessment of value capturing (Brzezicka, 2016). An accurate land value index allows policymakers to foresee how quality improvements and infrastructural development would influence the price of land and speculation phenomena (Carruthers & Ulfarsson, 2003; Brzezicka, 2016). The land price index can help urban planners understand the real estate development process because the land development process is an outcome of interrelated actors' decisions where land price is a crucial pay-off function (Du & Peiser, 2014; Glumac *et al.*, 2019).

Different valuation approaches should be used depending on the location of land, use and whether it is urban or rural (Donoghue *et al.*, 2015). For remote land, it is suitable to rely on the income potential than using data on land sales to estimate value (Archer, 1973; Du *et al.*, 2016). Lack of adequate data may inhibit the estimation of land value; hence, comparison and hedonic approaches are used as an alternative (Kittrell, 2012). Automated valuation models for the land property have been developed in the past decades however; few of them give land price indices (Glumac *et al.*, 2019). The differences in land price indices are related to the objectives for developing the indices (Knaap *et al.*, 2001). There is no one appropriate method for compiling quality indices

hence different methods have been developed and adopted; namely, appraisal-based methods, repeated sales method, median indices and hedonic methods (Krabben & Needham, 2008; Glumac *et al.*, 2019).

Appraisal-based approaches are widely criticized due to different types of biases while repeated sales methods are considered imprecise due to the inadequacy of collected observations over time (Donoghue *et al.*, 2015). Government land valuers in Kenya in determining stamp duty to be paid for land transfers (Ronge & Moyi, 2006) commonly use the repeated sales method. However, in this valuation method, the land price and value are not subject to underlying factors of physical characteristics, locational benefits and neighbourhood effects but a probable speculated value (Glumac *et al.*, 2019). The limitation of this method is that the land prices are based on deflated prices of transactions. Median indices are not able to capture the impact of quality change hence the hedonic methods have been viewed as more appropriate for land indices where there is available data on different variables such as population, wages, employment, land rent, and distance from the city and so on (Walters, 2012). Hedonic models have become popular tools for analysing the values of real estate and specific attributes (Cotteleer *et al.*, 2019). The model assumes that land prices contain information relative to the value that consumers associate with the characteristics of land (Donoghue *et al.*, 2015). Although the past literature has proven that parcel, characteristics and urban influences result to change in land prices in peri-urban areas (Kittrell, 2012). Ottensmann (2006) pointed out that buyers and sellers are key determinants of land prices due to their bargaining position as market participants and the level of their expectations about

market characteristics. The change in land prices is used to measure the productive value of the associated characteristics (Cotteleer *et al.*, 2019).

The use of hedonic models in estimating land value can be traced back to early 1922 (Glumac *et al.*, 2019). It has also been used to value non-market goods such as pollution, air quality and associated risks. Hedonic price models have been modified by different authors to suit various types of research ranging from analysing the change in prices due to transport infrastructure to changes in agricultural land prices (Donoghue *et al.*, 2015) and housing prices (Kanasugi & Ushijima, 2017). Different models have considered different variables in analysing the change in land value varying from farm characteristics, personal characteristics of buyers and sellers, urban influences and other variables accounting for the impact of alternative land uses (Brzezicka, 2016). The hedonic price function is used to link land prices with characteristics derived from observation of market behaviour (Yang *et al.*, 2017). Hedonic price theory assumes that there are many potential buyers and sellers of land. The land market operates under different market powers that affect transaction prices (Cotteleer *et al.*, 2019). The economic consequences of these market powers cause deviation of transaction prices from efficient competition outcomes (Razak *et al.*, 2018). Market powers emanate from different sources for example when there is land speculation and some commercial real estate agencies that had bought land earlier act as the single supplier of residential land for development (Krabben & Needham, 2008; Cotteleer *et al.*, 2019). Government agencies as key participants in the land market have market power that can cause a change in transaction prices for instance change in land policy to promote the preservation of nature and landscapes (Glumac *et al.*, 2019).

The land is viewed as a composite good that consists of a bundle of attributes from which consumers obtain utility (Cotteleer *et al.*, 2019). Land price can be decomposed by regression analysis for instance; the implicit prices of attributes, hence insight into consumer's preferences and their willingness to pay for land as a heterogeneous good (Glumac *et al.*, 2019). Hedonic methods have the advantage of allowing for adjustment of sample mix and quality where the land characteristics are adequately covered by data (Yang *et al.*, 2017). Secondly, indices based on hedonic methods are easy to stratify by locations and products. Thirdly, they are suitable to test spatial price effects.

The key determinant of land prices is location, most developed countries have a geo-referenced database that allows integration of Geographic Information System (GIS) based on environmental and agronomic characteristics, which allow the value of non-traded characteristics to be assessed (Donoghue *et al.*, 2015). Selecting the variables plays a major role in determining/estimating the value of land (Cotteleer *et al.*, 2019). The appreciation and depreciation of land prices within a given region is a function of dynamic social, economic, legal and environmental processes continuously interacting over time and across space (Glumac *et al.*, 2019). In the estimation of land value using hedonic models two classes of variables are dominant; location (accessibility and proximity) and the physical characteristics of the land that surrounds it (Evans, 2017). Accessibility and proximity of a given land are represented using variables such as distance from a major road, distance from the bus station or train station, or airport (Kittrell, 2012). In addition, travel time to the CBD using different available modes is used to estimate proximity.

2.8 Infrastructure Development and Land Speculation

The provision of new roads, schools, water supply, sewerage and other marked improvements add greatly to the development of peri-urban areas (Clawson, 1962; Cho *et al.*, 2016). Cities invest in roads and other forms of infrastructure with the intent of shaping urban development (Knaap *et al.*, 2001). However, speculation of accessible land parcels developed with infrastructure diverts urban growth into less developed marginal land (Zhang *et al.*, 2017). High-density, transportation-oriented development and rail transportation nodes (Knaap *et al.*, 2001) characterize new urbanism features. However, for this kind of development to work along major transportation infrastructure, a market condition that discourages low-density residential development must be created. Zoning, building codes, tax incentives and other forms of market interventions can be used to restrict development in given areas (Sheehan, 1982). Agricultural land in the peri-urban is highly speculated when development projects are publicly notified; those who access the information first buy the lands at a lower price with the expectation of reselling them at higher prices (Huang *et al.*, 2009; Cho *et al.*, 2016). The difference between appraised land value or normal prices and the elevated transaction prices becomes eminent as infrastructure in peri-urban develops (Sheehan, 1982; Cho *et al.*, 2016). The weakness in national and local governance allows private agents to leverage and exploit public information on development initiatives for speculative gain (Stanley, 2016). Land speculation is predicated upon gaining access to political and economic information and coordination across spatial and institutional scales (Stanley, 2017). Where development pressure intensifies, the majority of landowners anticipate selling or developing their property soon (Brown *et al.*, 2007).

However, engulfing vast land along with the installation of utility services and other infrastructure to improve residential development may be limited by speculation of residential land (Gul *et al.*, 2018).

Traffic congestion was a major problem in Bangkok in the early 1990s and the cause was attributed to the roadway system, which failed to provide distributor roads to handle traffic flow from small access streets (Evans, 2017). The consequent effect was that land available for housing and commercial activities could not be effectively used hence leading to reduced land development (Gul *et al.*, 2018). In large cities, transport infrastructures divide the urban areas into blocks, where the blocks can be distinguished by development density (Colsaet *et al.*, 2018). The pattern of the road network determines the accessibility of this block and the amount of urbanized land (Carruthers & Ulfarsson, 2003; Kittrell, 2012). In countries where the development of minor roads and access streets are left to private developers and builders, most of the urban land may tend to be landlocked hence increased leapfrog development, traffic congestion and land vacancy (Kim *et al.*, 2018).

The land tenure system in Kenya influences the provision of infrastructural facilities within urban boundaries (Syagga, 2006). Under freehold interest, the process of land acquisition and compensation retards the development of infrastructures (Abuya *et al.*, 2019). Poor governance and lack of bargaining power allow individuals in governments to manipulate the development of some infrastructures to influence property values in certain areas (Logan & Molotch, 2007). The residential developments in the urban fringe of Nairobi are characterised by a lack of infrastructural facilities and social

amenities attributed to poor planning, uncontrolled subdivisions and land development (Thuo, 2013a). Plans are used as instruments for local government to shape the expectations of participants in the land market, alter land values and thus affect the pattern of development (Sisson *et al.*, 2018).

2.9 Measurement of Land Speculation

Different parameters have been used in quantifying land speculation. The selection of the variables is dependent on the context of the study such as urban or peri-urban, planned or unplanned and other parameters related to land value assessment. The key phenomenon in land speculation is the windfall gained from selling or reselling a parcel of land at a higher price than the purchase price, hence the use of change in land prices in assessing land speculation (Du & Peiser, 2014; Du *et al.*, 2016). The biggest drawback in using land prices is the fact that a myriad of factors influences land prices (Donoghue *et al.*, 2015). Several studies have adopted the use of land prices to describe the extent of speculation alongside other aspects such as the announcement of development plans, and changes in policies that would trigger or cause land speculation. The following past studies were analysed to assess the variables applied;

Table 2-1. Various researches quantification of land speculation

Author	Year	Context	Parameters used
Gul <i>et al.</i> ,	2018	Urban/planned	Land prices
Clawson	1962	Peri-urban	Land prices
Stanley	2016	Urban	Land prices, number of transaction and land transfers
Gemeda et al	2019	Urban and Peri-urban	Land value
Swierenga	1977	Urban and Peri-urban	Land value
Juanfeng et al.	2020	Urban and Peri-urban	Income from transfers, Hoarded land (Ha), Change in land prices
Zhang et al.	2014	Urban and Peri-urban	Land subdivisions, distance from the road and land prices
Triantafyllopoulos	2017	Urban and Peri-urban	Land prices, number of transactions/land sales and transfers
Brezicka and Justyna	2016	Urban	Property prices, time
Thontteh and Babarinde	2018	Peri-urban	Hoarded land (Ha), Change in land prices

2.10 Strategies to Control Land Speculation

In earlier studies on assessing the evolution of land speculation (Ambrose, 2005; Irwin & Bockstael, 2007; Zhang *et al.*, 2017) fixing allowable development density, low-density zoning eliminates the incentive to withhold more accessible land and reduce leapfrog development. Gul *et al.* (2018) note that providing built houses in place of serviced plots was an effective tool for controlling residential land speculation in Lahore

City in India. The appreciation in plot prices was higher than the annual increase in rent for the built houses hence it was lucrative to speculate land even with a 10% holding fee (Gul *et al.*, 2018). However, the option of using built houses in place of serviced plots would only work in areas with planned land use and infrastructure is provided to attract demand for housing. Developing countries in Africa lack stringent policies and control on access and regulation of land use hence incentivising land speculation (Tarimo, 2014; Napier *et al.*, 2013). In the absence of land use controls, the land market operates to allocate land to users based on price (Evans, 1983; Dowall, 1995). Lack of common guiding principles in planning and coordination among different sectors such as agriculture, transport and urban development results in competing and uncoordinated land use practices (Ayonga, 2015; Oyugi & Owiti, 2007).

Zoning regulations in some countries complicate the land market due to segmentation resulting in different prices of land (Colsaet *et al.*, 2018). Zoning schemes restrict certain land uses in different areas, for example, residential development on agricultural land. Prices in the submarkets are depended on land uses; land prices for residential and industrial use are higher than for agricultural land (Cotteleer *et al.*, 2019). Change in zoning from agriculture to residential land use may lead to prices that are subject to speculation. Use of land and property tax and capturing land values have been used to mitigate land speculation, but there is no adequate empirical data to confirm their efficiency (Bird & Slack, 2005; Filatova *et al.*, 2009).

2.10.1 Land and Property Tax

Land value tax provides a large percentage of total recurrent revenue for local authorities and county governments (Foldvary & Minola, 2017). Economic theory provides a formidable case for land taxation to improve the economic efficiency of fiscal systems, especially in developing countries (Ho & Kwong, 2002; Gemedá *et al.*, 2020). Most developing countries in Africa tend to have a low tax to Gross Domestic Product ratio despite social and development objectives that would require increased investment. Land taxes have a minimal distorting effect on the economy and hence can be implemented as a central policy to increase domestic resource mobilization (Byamugisha, 2013). However, excessive land administration costs have been viewed as the major factor hindering the implementation of land taxation in developing countries (Hall *et al.*, 2015). Land administration reforms in some developing countries such as Rwanda, Ethiopia and South Africa have developed systems to lower costs and increase valuation accuracy through computer-assisted mass appraisal (Gemedá *et al.*, 2020). Land taxes vary from one country to another depending on the tax base, appraisal systems, taxation policy and to whom they may apply (Walters, 2012). In Chile to stimulate inner city development an extra tax of 100% is charged on idle and vacant land (Morandé *et al.*, 2010). Two-rate and single-rate property taxes have been used by different countries in the assessment of land value (Foldvary & Minola, 2017). Two-rate property tax required land and its improvement assessed separately and a higher tax is levied on land than on structures developed on that piece of land. In single-rate property tax, only land is assessed and a tax is levied based on the land value. These different approaches are used to increase the tax base, while other countries focus on

property tax to avoid land value appraisal processes (Bird & Slack, 2005; Brzezicka, 2016). Lowering the tax rate on buildings encourages land improvement and leads to efficient use of land (Walters, 2012). The shift towards differential taxation according to land value, size and land uses has been adopted by countries such as South Africa, penalizing unimproved urban land to curb land speculation (Bird & Slack, 2005; Foldvary & Minola, 2017).

In Kenya, the Rating Act Cap 267 of 2012 (RoK, 2012d) gives a guideline on different types of land and property to be taxed (Konyimbih, 2000). The Act allows the local authorities to tax either land or land and its improvement (Ayonga, 2015). However, county governments only tax land without including the improvements or structures constructed on this land. Notably, only public and freehold land within municipal boundaries is taxed by the county governments while agricultural land of fewer than 12 acres and private land are excluded (Konyimbih, 2000; Walters, 2012). Freehold land outside the municipal boundaries is not taxed since it is considered agricultural land which is taxed through agricultural cess and also because it does not receive local government services. Consequently, much of the peri-urban land in Kenya is not included in the tax base; this creates an incentive for speculating this land (Walters, 2012). The government is required by the Rating Act of 2012 to pay an annual rate "contribution in lieu of rates" to the local authority as a property rate for properties owned by the government (Ronge & Moyi, 2006). However, most county governments do not pay the annual rate hence contributing to a distorted tax system (Walters, 2012). Properties and public areas used for prescribed public purposes such as worship areas, cemeteries, museums, libraries, parks, and charitable homes are excluded from

valuation and rating. Most of the municipalities and towns in Kenya have relied on area ratings while counties combine area and valuation ratings (Abdu *et al.*, 2016). Area rating has majorly been used in small towns and rural areas to assess agricultural and commercial public land.

The Rating Act of 2012 provides three types of rates; area rate based on the size and use of land, unimproved site value rate based upon the capital value of bare land and improvement rate based on land improvements. The Act provides flexibility in the use of different options including a flat rate or a graduated rate upon an area of land, land use or any other method of rating the authority may resolve to use. The Valuation for Rating Cap 266 requires that county governments prepare and update the valuation roll to ensure the rates used for land and property taxation are not outdated hence improving the tax base and revenue collected (Olima & Obala, 1998; Konyimbih, 2000; Ouna, 2017). A valuation roll is prepared on yearly basis, but due to changes that may occur and influence property value within the year, a supplementary valuation roll is prepared to capture the changes (Ronge & Moyi, 2006). The basis for valuation for rating purposes according to the Valuation for Rating of 2012 is the market sales value. The market value is the amount the property would have been sold, on the date of valuation in an open market by a bonafide seller to a willing buyer. However underassessment in the valuation roll poses a great problem since the values entered in the fiscal cadastre are way below the market sale value (McCluskey & Franzsen, 2016; Ronge & Moyi, 2006).

Property tax has been employed as an instrument to balance the expected returns and holding costs of properties in urban areas of developed countries (Du & Peiser, 2014). Lack of and malfunctioning property tax has been associated with increased land speculation (Du *et al.*, 2016). Property taxes are formulated to yield different effects from taxing land ownership, increased land value, urban land versus unimproved land, and building and improvement on land such as utilities versus sale prices (Kim *et al.*, 2018; Zhang *et al.*, 2020). Notably, due to elasticity in the supply of land, several studies have indicated that it is not feasible to use property tax to curb land speculation unless the taxes are fixed so highly (Malpezzi & Wachter, 2005; Newman *et al.*, 2016; Kim *et al.*, 2018; Zhang *et al.*, 2020).

2.10.2 Capturing Rising Land Values

Value capture has been used in parts of the United States, Canada and Latin America, where local authorities participate in rising land values (Krabben & Needham, 2008; McCluskey & Franzsen, 2016). Value capturing involves the use of a group of instruments to capture directly or indirectly, an increase in the value of land and property resulting from public investment to finance the activities responsible for the value increase (Krabben & Needham, 2008). Property owners negotiate a cash payment to the municipality which is paid in kind through a transfer of part of the land or participate in the formation of an urban development partnership (Levien, 2012). Value capture is seen as an effective way to link planning and land use regulation and serves to control land use, finance urban infrastructure and generate additional local revenue (Walters, 2012). Development of infrastructure and urbanization increases the land value and through value capture, local government can benefit apart from the private sectors

(Kalkuhl *et al.*, 2018). The increase in land and property value that result near public works can be regarded as positive externalities (Krabben & Needham, 2008). However, the value of this externality is unpriced and unexploited hence the benefits that could be accrued from trading in them have not been realized (Kittrell, 2012). Positive externalities can be viewed as a resource though un-priced they have a value that individuals use in different ways to capture (Ho & Kwong, 2002). This gives rise to cost competition and property speculation. The value captured from public infrastructure development can be used to improve the welfare of users by accelerating the development process (Evans, 2017; Walters, 2012). Where public infrastructure development causes negative externalities such as congestion and avoidance, institutions that arise to address these issues will impose their costs hence the need for value capture to cater to emerging externalities (Elena *et al.*, 1999; Kalkuhl *et al.*, 2018).

The aim of the government in developing roads and other public infrastructure is to make more land accessible physically and available for development (Abdu *et al.*, 2016). However, the existence of land speculation deters land accessibility as speculators hold land anticipating benefiting from changes in land values (Archer, 1973; Clawson, 2013). In Kenya, land speculators gain from infrastructure development without paying capital gain tax (Bassett, 2018). Capital gain tax refers to the profit realized on the sale of an asset that was purchased at a lower price and appreciated without the owner's participation in creating added value (Krabben & Needham, 2008; Kittrell, 2012; Yang, 2018). Most governments in developing countries lack mechanisms for taxing land value gain resulting from investments in infrastructure, land registration and titling (Walters, 2012). The amount gained from taxes could be used to

finance infrastructure development and land regulation. Land value benefits associated with government action are considerable and could form a basis for property taxes that could be used to recover public investments (Krabben & Needham, 2008; Walters, 2012). Various fiscal tools such as development fees, special economic zones, and subdivision charges have been used to generate finances for urban development, however without accurate information about land values, the cost of providing infrastructure and its impact on land values, these fiscal tools cannot be used effectively (McCluskey & Franzsen, 2016).

2.10.3 Agricultural Land Preservation Policies

Agricultural land preservation policies have been used in countries like China and Japan where land is kept out of the land market for purposes of farming (Shiuh-Shen, 2013; Du & Peiser, 2014). These policies ensure that arable land suitable for agriculture is not taken up for other land uses before a given period (Du *et al.*, 2016). It is the local governments that decide when the land is ready for urban use and residential use. Although agricultural policies have been used in curbing land speculation, they have been identified as a factor that leads to the rise in land prices. The development of policies in the United States to preserve agriculture has been prompted by inefficient land use patterns associated with urban growth (Gul *et al.*, 2018; Du *et al.*, 2016). The visibility of farmland conversion for urban use has motivated policymakers, farmers and environmentalists. Justification of farmland preservation revolves around the undesirable effects of urban sprawl such as environmental degradation, disruption of the agricultural economy and interference with rural communities (Clawson, 2013; Thompson & Prokopy, 2009). The policies used in preventing the conversion of

farmland into urban use vary from one country to another and sometimes in different regions within a country. Examples of policies adopted by some states in the United States include the purchase and transfer of development rights in Maryland, giving an income tax credit to farmers to offset property tax and farm incentives to farmers in exchange for a 10-year agreement to prevent the land from being converted (Thompson & Prokopy, 2009). Due to variations in the implementation of the policies, the impact on land use planning is very varied.

2.11 Land Governance and Speculation in Kenya

The history of land speculation in Kenya could be traced back to the first post-colonial government land administration, where state power influenced the distribution and redistribution of land previously owned by the colonialist (Boone, 2012). During the colonial period, much of the fertile land in the Central and Rift Valley regions were allocated to the European settlers and this was the so-called White Highlands (Kanyinga, 2009). The land was used for huge ranches, commercial estates and large plantations where Africans residing as squatters in African reserves provided labour (Kanyinga, 2009; Syagga, 2006). Agrarian radicalism by colonial farmers aimed at reducing the number of African farmers led to rising of the Mau Mau Movement which was fighting to gain control of land taken by white settlers. Through the nationalist movement struggle, Kenya gained independence in 1963 and 20% of land owned by European settlers was bought from the white settlers and allocated to Kenyans to carry on farming to support the country's economy (Boone, 2012). In the early 1970s more land was acquired from European farms and transferred to individuals and land companies through government-financed transactions (Syagga, 2006). The Kenyatta

government redistributed more land to the majority of the Kikuyus living in the African reserves to avoid political uproar. There were three modes used by the Kenyatta government to distribute state-acquired land to smallholder farmers; settlements schemes, land buying companies and forest reserves (Boone, 2012; Syagga, 2006). Kenyatta government encouraged the formation of land-buying companies between 1960 and 1970s that were headed by the regimes notable and politicians. The companies purchased or leased land in the former White Highlands from the government, and then the land would be subdivided among the individual shareholders. It is argued that post-independence distribution of land through settlement schemes and land buying companies was ethnicised and became a source of political conflicts (Boone, 2012; Kanyinga, 2009; Syagga, 2006). There were subsequent land reforms that the colonial and post-colonial governments attempted to address the issue of land rights. However, access and control of land rights remain a privilege for the wealthy and the political class (Boone, 2011; Kanyinga, 2009).

The political economy behind land distribution in Kenya is behind the bureaucratic private property-based economy and largely influences land development and distribution of infrastructure, amenities and utilities (Branch & Cheeseman, 2016). The structure of government in Kenya is marked by retention of clientelism, centralization of power and bureaucracy in a public institution, which can be traced to colonial rule and continues to shape economic growth and politics in the country (Boone, 2011). Large-scale acquisition of land increases competition for land and results in land disputes in many developing countries (Byamugisha, 2013). This is attributed to rising food prices and the need to cultivate the land, uncontrolled rural-urban migration

leading to high densities and increasing demand for shelter and other forms of accommodation (Thontteh & Babarinde, 2018; Barrows & Roth, 2017; Tarimo, 2014). Registration of land titles in Kenya introduced through the Swynnerton plan has been the centerpiece of land reform policy in Kenya (Miceli *et al.*, 2005). It was started to increase the security of land ownership and promote land development (Boone, 2012; Thuo, 2013b). However, land distributive politics coupled with a bureaucratic system of land administration have not allowed Kenyans to benefit adequately from land registration and other land reforms (Byamugisha, 2013; Syagga, 2006; Thuo, 2013b).

Kenya has many land laws (RoK, 2012d, 2012c, 2012b, 2017, 2019a, 2019b, 2019c, 2019d) and institutions on land administration and development, some with overlapping roles and inadequate enforcement leading to ever-increasing problems in urban and peri-urban areas (Bassett, 2018). Kenya has not had a clearly defined land policy since independence until 2016 (Branch & Cheeseman, 2016), this has resulted in a haphazard approach to handling various land use practices and policy responses. The uncoordinated legal and policy framework has made land use management very chaotic with major effects evident on the urban landscape (Abuya *et al.*, 2019). Subdivision guidelines espoused in Physical Planning Handbook (Physical Planning Department, 2007) give provision for minimum plot sizes for different residential densities and other land uses, but weak land use planning and enforcement gives room for unregulated subdivisions. Approval of land subdivision is based on existing physical, land use, building, or zoning plan (RoK 2019c; 1996), but the lack of these plans leaves land speculators with room to subdivide land into uneconomical units that later result in congestion and disorganized land uses (Thuo, 2013). Land use planning is a tool used

to guide and control land development, but it is being used as an avenue for revenue collection (Byamugisha, 2013). The government has not enforced land laws and policies that regulate excessive land acquisition and subdivision to curb speculative practices (Bassett, 2018) despite the existence of the National Land Policy (RoK, 2009), Land Act (RoK, 2019b; 2012), National Land Commission Act (RoK, 2012) and the Constitution (RoK, 2010). Additionally, there are no penalties for the large acquisition of land for speculative purposes (Boone, 2012). The Land Acquisition Act (RoK, 2019b; 2012) provides for land acquisition for public use by the concerned authority through a gazette notice. However, the process of land acquisition has often been manipulated by the political class as an avenue to benefit from the compensation of illegally acquired land (Syagga, 2006; Boone, 2012). According to the Ndungu Commission Report (2003), corruption in the land planning and registration offices has been viewed as the greatest hindrance to land access and development. Land speculators take advantage of corruption that creates interstices in the enforcement of land laws and policies (Kariko, 2009).

Kenya has not made strides in promoting productive and sustainable use of land and many policy issues need to be addressed (Bassett, 2018). Barrows & Roth (2017) argue that the problem of land reforms in most African countries is the centrality of land allocation to the maintenance of power in the country. The use of land as a political token has aggravated land distribution and access to land among marginalized groups (Boone, 2012). Colonial and post-colonial political regimes used their directional power to distribute land and granted land access strategically to bolster political support (Bassett, 2018; Boone, 2012). The opportunistic manipulation of politicians in local

issues related to distribution, allocation and compensation of land has to a large extent resulted in long-standing land-related ethnical violence (Harbeson, 1971; Kanyinga, 2009; Boone, 2011). The earmark of corruption and political patronage in Kenya can be demonstrated through the illegal allocation of land by post-colonial political regimes as established in the Ndung'u Report (Manji, 2012). Beneficiaries of illegal or irregular allocation in Kenya are majorly politicians, renowned businessmen, senior civil servants and ministers in various political regimes (Branch & Cheeseman, 2016).

2.12 Theoretical Framework

Land speculation has been explained in light of many theories from the urban regime theory which explains the machination of governance surrounding development (Stanley, 2016) policy to a political economy which describes how the politics of a place influences policymakers and developers over infrastructural development, subsequently institutionalizing land speculation (Stanley, 2017; Triantafyllopoulos, 2017). Other theories used in describing land speculation include urban economics, bid rent and axial theories.

2.12.1 Political Economy Theory

Political economy is an interdisciplinary branch of social sciences that explains the interrelationship between individuals, governments and public policy (Caporaso & Levine, 2005; Stanley, 2013). Karl Marx first proposed the political economic theory as a class-based analysis of the economy in the mid-nineteenth century (Baiman *et al.*, 2000). The theory sought to advise the statesman on how best to manage the economic affairs of the state to ensure the wants of citizens are met (Caporaso & Levine, 2005). It

brought an endless debate on the responsibility of the statesman concerning the economy. It is the responsibility of the state to determine which wants to be satisfied and mobilize resources to ensure satisfaction or wants will best be satisfied if resource mobilization is left to individuals acting as private agents with private interests (Baiman *et al.*, 2000; Stanley, 2013). Political economy theories such as Marxian, Neoclassical and Keynesian theories revolve around explaining how political intervention into the economy enhances or impedes satisfaction of wants (Bear, 2020). The Marxian theory of class and conflict is used to explain the movement of wages and profits and primitive accumulation in capitalistic economies (Caporaso & Levine, 2005). It explains how private interests become relevant in setting public goals. Rakodi (2003) explains how land and housing supply in Zimbabwe is because of the political transition from post-independence socialism to economic liberalism. Lalloo (2002) highlights three themes on how the political economy of a place influences infrastructure and resource distribution. First, is the formation of the corporate elite and their behaviour and power to direct infrastructure development to suit their interests. Second is how the corporate elite exploits the exchange value of resources such as land and how residents protect the use value of a resource. Third, is the intersection of exchange value and use value and the collaboration of beneficiaries of each (Lalloo, 2002).

The availability of land as a key resource for development is determined by physical factors (geological and topographical), economic (demand and supply), administrative (legal, institutional and land policy formulation and implementation) and political factors (Rakodi, 2003). However, it is the political economy of a country that disentangles these influences on land availability. Political compromise ensures that

interested parties get equal opportunities for speculative investments, which spur structural land speculation (Sheehan, 1982; Lalloo, 2002). There is a close relationship between land take and the political economy of a place, which is shaped by institutions and public policies that are linked to infrastructure development (Krabben and Needham, 2008). Notably, political coalitions headed by leading land grabbers and media moguls can direct the pro-growth agenda of a country to favour major developers and employers (Thontteh & Babarinde, 2018). Infrastructure development in urban and peri-urban areas is a result of public policies and programmes controlled by national and state-level governance systems (Clawson, 2013). Public policy planning entails systematic actions by the government to respond to public problems (Jones and Ward, 2003) like infrastructure development to shape urban and peri-urban development patterns (Clawson, 2013; Knaap *et al.*, 2001). It is through long and short-term plans that local governments shape expectations of participants in land markets, values and patterns of land use in urban and peri-urban areas (Knaap *et al.*, 2001). The policy planning process from policy conception, feasibility studies, preliminary design, environment and social impact assessment and detailed design is perceived to fuel speculative development where planning documents and plans act as a signal to developers and speculators on where to buy land before public notification of planned projects (Sisson *et al.*, 2018; Foldvary, 1998). The announcement of new land development policies influences the value of land and the pattern of land use (Cho *et al.*, 2016). The first public notification is done after the design stage; thereafter land acquisition process is carried out, and the development plan is prepared and disposed of for the development of a detailed plan (Schmid, 1970). The development agency can

affect land use and freeze development in a given area where development is planned (Clawson, 1962; 2013). Speculators' illegal land banking, aggressive land assembly tactics and proposals that obstruct re-zoning (Sisson et al., 2018) circumvent the process of public policy planning.

2.12.2 Urban Regime Theory

Urban regime theory builds upon the locational theory by Von Thunen (1826) which emphasizes the effect of the urban market on agricultural land use and land value but also the effect of transportation costs and differential factors such as land fertility. The theory utilizes the foundation for building an understanding of speculative processes (Mossberger & Stoker, 2001). Speculative strategies appear successful when taking advantage of the weaknesses in coordination and bargaining power of local growth coalitions; weaknesses derived from scalar mismatches between land use governance and municipal entrepreneurship (Stanley, 2017). Urban regime theory has been developed from political sociology to probe and codify the different types of governance regimes that emerge when pervasive pro-growth sentiments guide the contingencies of local land development politics (Stanley, 2016). It justifies the existence of structural land speculation where politicians and those in government can leverage on change in land value due to proposed public investments. Growth machine formation tends to be enhanced when state structure enables fiscally independent municipalities and incentivizes inter-municipal competition for economic development (Logan & Molotch, 2007). Land speculation is often predicated upon leveraging land value gains triggered by public investment and government initiatives (Laloo, 2002).

Urban regime theory has been used in the field of urban politics and policy to explain the public and private sector relationship, especially how various interests are incorporated in governing coalitions (Mossberger & Stoker, 2001; Mickey, 1997). It has been used to explain different arrangements adopted by policymakers in cities to respond to changes in governance and local actors. The theory views power as fragmented and regimes as a collaborative arrangement through which local governments and the private sector assemble the capacity to govern (Davies, 2002; Mossberger & Stoker, 2001). The urban regime, therefore, is the formal and informal arrangements that promote cooperation across institutional boundaries, nations and international organizations (Mickey, 1997; Klopp, 2000; Rakodi, 2003). Different governance regimes have pervasive pro-growth outlooks that govern and guide local, and development politics (Stanley, 2016). Power is fragmented because of the division of labour between the market and state. National and local governments and business communities possess the resources needed for legitimacy and policy-making authority in a country (Mossberger & Stoker, 2001). The governments generate capital and create jobs, tax revenue and financing for businesses (Davies, 2002). The urban regime concept combines elements of political economy, pluralism and institutionalism, thus making it complex and uncertainty may arise in an attempt to generalize from prototype cases that explain the urban regime theory (Mickey, 1997).

The urban regime has been criticized for focusing on political reasons for development strategies in urban areas without evaluating the economic outcomes of urban development policy (Mickey, 1997; Mossberger and Stoker, 2001). Nevertheless, it justifies the existence of structural land speculation where politicians and those in

government can leverage on change in land values resulting from proposed public investments (Stanley, 2016). The political regimes in post-colonial Kenya have used public land as an attractive patronage asset due to its minimal public scrutiny compared to other sources such as international aid (Klopp, 2000; Southall, 2005; Boone, 2011). For fear of losing the privilege to access public resources, once there is a change of regime, administration officials accumulate public land and sell it to unsuspecting buyers. Political liberalization has given state actors room to use historical injustices around the land to access power and to determine where infrastructures such as new roads are developed (Klopp, 2000; Southall, 2005; Boone, 2011). Land ownership patterns coupled with state policies, and legal and regulatory frameworks may limit the accessibility of the most suitable land for urban development from the land market (Triantafyllopoulos, 2017). The fact that wealthier land actors can outbid others and defend their rights in the formal legal system dictates the path of future development in a given area (Napier *et al.*, 2013).

2.12.3 Axial Theory

The axial theory explains the expansion of urban areas through land uses aligning along major arterial transportation routes (Knaap *et al.*, 2001). It describes how existing and planned transport facilities shape and control the expansion of the urban area in terms of speed and pattern of development (Mather, 1986). The development of transport infrastructure in peri-urban areas increases access to the urban core by reducing commuting time, leading to the emergence of transition zones that can emerge as the pinnacle of urban fringe development that land speculators target (Brown *et al.*, 1981; Lindeman, 1976). Hotspots for land speculation are largely along transport corridors or

areas where major government programmes are planned (Foldvary, 1998; Lalloo, 2002). This makes (Greater) Eastern Bypass a choice for the case study.

2.12.4 Bid Rent Theory

Bid rent theory explains the growth of lower-valued and lower-density development in urban fringes and the withholding of land close to urban centres for future higher-valued developments (Zhang *et al.*, 2017). It explains how access to the land market affects land rents and land use patterns (Miranda *et al.*, 2019). Developers and land agents act as primary land speculators by buying agricultural land in areas likely to develop before public policy notification; they speculate land or subdivide it and retail it to other users and land speculators (Cho *et al.*, 2016). Media creates a transformative effect between land brokers and land investors by portraying land as a scarce resource thereby creating boom psychology (Jimu, 2012). When land in the peri-urban is speculated and held out of the land market, urban growth spreads to marginal land where land values are lower although the land may not be ready for urban purposes (Clawson, 1962; Ottensmann, 1977). Urban economic theory explains leapfrog development as the result of optimal inter-temporal decision-making by developers who choose the timing, type and location of the development. The economic theory argues that land speculation is a unique economic phenomenon driven by a wait-and-see game, where shrewd dealers make a huge fortune without contributing to the wealth of the nation (Lee, 1990). Therefore, land speculation hurts the active agents of creating wealth process; the worker and their accumulated savings. Land speculation is a two-dimensional activity; spatial because it entails acquisition and a piece of lands such as on urban fringes and temporal because

purchases made today have calculated value they will generate in the future, hence the agent must be willing to hold the land until prices are attractive (Lee, 1990; Bear, 2020).

2.13 Research Gap

Prior studies carried out in Kenya focused majorly on factors influencing the growth of real estate, changes in land values, and the resulting economic effect (Mundia & Aniya, 2006; Loyford & Moronge, 2014; Ayonga, 2015). A recent study on the influence of highway development on land values and livelihoods revealed significant changes in land values, land uses and the livelihood of people living along the highway (Gateri, 2017). Other studies on the effects of land ownership structure on urban land in Kenya have been carried out (Olima & Obala, 1998; Syagga, 2006; Musyoka, 2013; Thuo, 2013a). Thuo (2013) and Nyagu (2016) explored the dynamics of land development in Nairobi's urban-rural fringes and indicated that urbanization is contingent upon many factors of which population pressure through natural growth and immigration is primary. Ayonga (2015) focused on how differentiated land transaction costs triggered land speculation in Nairobi Metropolitan. This study focuses on peri-urban land speculation, the influence of public policy planning on land speculation and its implication on land development and prices; an area that previous studies have not covered. The study also focuses on the development pattern that emerges after land speculation and the resultant impact of peri-urban land development.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the area of study, research procedures in sampling, data collection and analysis.

3.2 Area of Study

3.2.1 Location of Study Area

The study area is located in Kiambu County and stretches across two sub-counties namely Juja and Ruiru. It lies between latitudes $0^{\circ}752$ and $1^{\circ}202$ South and longitudes $36^{\circ}542$ and $37^{\circ}100$ East (Figure 3.1) (County Government of Kiambu, 2018). The study was undertaken along part of Eastern and Greater Eastern Bypass in Kiambu County, which is the Northern of Nairobi Metropolitan peri-urban area (Figure 3-1). The Eastern Bypass stretches 39km connecting Mombasa road and Thika Highway while the Greater Eastern Bypass is a 77km proposed road connecting Mombasa road, Eastern Bypass and Thika-Garissa road. The study area is defined by the Thika highway on the west, a 7km stretch of Eastern Bypass, a 13km Link Road connecting Eastern and Greater Eastern Bypass and a 15km stretch of Greater Eastern Bypass (Figure 3.1). The land abutting Eastern Bypass and the Link Road on the south was part of the proposed Northland City while on the North is the largely subdivided land belonging to individuals. The 15km stretch of Greater Eastern Bypass cuts through Juja Farm Trading Centre, which is a former colonial farm but currently owned by individuals and land enterprises. The area of interest is land abutting 7km of Eastern Bypass and Link road that was formerly owned by Githunguri Constituency Ranch and the land abutting part

of Greater Eastern Bypass that was formerly Juja Farm Limited. The study area was selected because it is located in a part of Nairobi Metropolitan peri-urban area that is experiencing growth in population and infrastructure development leading to increased speculative land subdivision, resulting in the rapid change of land uses from agriculture to residential and commercial albeit with minimal planning (Abuya *et al.*, 2019). Secondly, the area has one complete major infrastructure, the Eastern Bypass and a planned Greater Eastern Bypass that awaits development hence providing a scenario for analyzing the effect of public policy planning on peri-urban land speculation. It is also a major transportation route that investors and industrialists prefer to locate because of its proximity to the largest airport in Kenya (Nyongesa, 2018).

The study area is located in a semi-arid low midland zone which lies between 1000 and 1500m above sea level and is characterized by low fertility plateau soils while some parts have well-drained volcanic soils, sandy and clay soils that support livestock farming and drought-resistant crops such as sisal, soya beans and maize (County Government of Kiambu, 2018). The area receives an average rainfall of 1100mm per year and a mean temperature range of 15⁰ to 20⁰C (County Government of Kiambu, 2018) suggesting the climate of the study area is hot and wet. Ecologically the study area occupies two catchments, Kamiti-Ruiru served by Kamiti and Ruiru Rivers and Aberdare plateau, which is formed by Ndarugu and Thiririka rivers. On the east the study, area borders the Athi River a permanent river where all rivers in the four catchments drain hence characterised by irrigation farming on the riparian reserves.

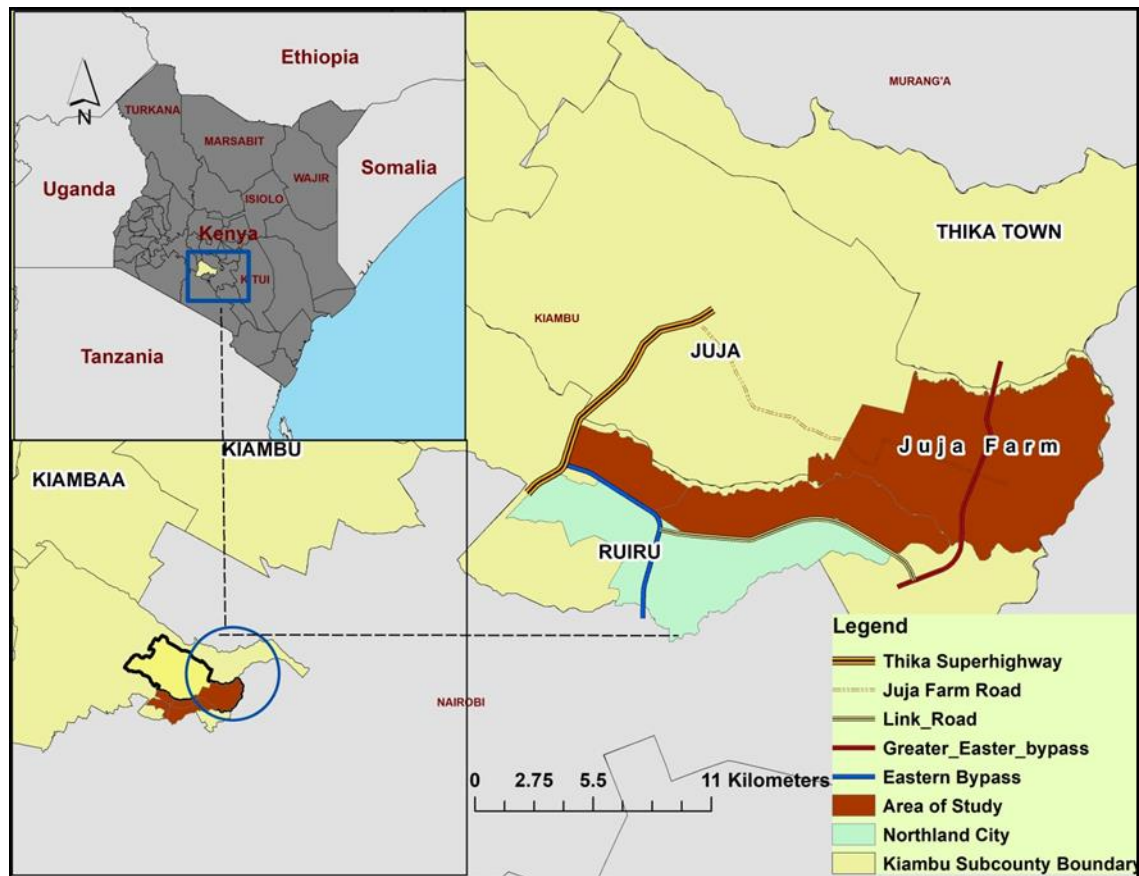


Figure 3-1. Location of (Greater) Eastern Bypass Area

3.2.2 Historical Background of (Greater) Eastern Bypass Area

The land in the study area was originally used for large-scale farming during the colonial days from 1902 when the land was taken from the native Africans and given to the White settlers (Syagga, 2006). Before the colonial period in 1895, the land along (Greater) Eastern Bypass belonged to natives, from the Kikuyu and Kamba tribes who used the land for grazing and shift cultivation where the soils were fertile and closer to rivers, while part of the land was forested and formed an extension of Oldonyo Sapuk forest reserve (Aldrick, 2012). During the colonial period between 1902-1963 the land in the study area was occupied by three farms; Juja Farm Estate owned by Lord Macmillan, East African Sisal owned by Mitchell Cotts and Sukari Ranch owned by

Socfinaf Company Limited was used for sugar production and dairy farming. On the other farms, sisal was the main crop, which was being farmed, in addition to beef ranching, maize and orange farming, which was concentrated close to rivers. Juja Farm became famous for hosting historical prominent personalities such as Ewart Grogan, Theodore Roosevelt, Winston Churchill and Evelyn Baring before and during the Second World War (Aldrick, 2012). The land became alienated from Africans in 1900 after the Crown Lands Ordinance of 1902 which replaced the East African Order of 1897 that had granted white settlers a certificate to own land under a renewable tenure of 21years (Okoth-Ogendo, 1991). The British colonial government constructed the railway line connecting Mombasa port and Kisumu terminus, between 1896 and 1902, as key infrastructure to spur economic growth in the East African Protectorate (Harbeson, 1971). Feeder lines were constructed to connect agriculturally productive areas -the white highlands- where large-scale farming of coffee, sisal, sugar, tea and ranching was taking place. The white settlers who were mainly British syndicates, Europeans and South Africans were facilitated with loans by commercial banks to buy suitable land for large-scale farming (Okoth-Ogendo, 1991). Land close to the railway line was highly sought due to the reduced transportation cost of farm produce, hence the establishment of the Crown Land Ordinance of 1902 was to control how the land was distributed and land speculation along the railway line corridors (Ross, 1927). As part of controlling land distribution and speculation, the Ordinance gave the Commissioner in the British colonial government power to allocate land ranging between 600-1000acres to one settler (Okoth-Ogendo, 1991). Crown Land Ordinance aimed at increasing agricultural productivity by maximizing the use of available land and

controlling land speculation (Syagga, 2006). The railway line was located east of the (Greater) Eastern Bypass corridor where it separated coffee farms, which were located on the west and sisal and ranching farms on the east. The railway line passed through Ruiru and Thika towns, which were industrial towns where part of the farm produce was being processed. There were other extensive sisal plantations linked to the railway line for ease of transportation of produce to the factories and the Mombasa port for export (Ross, 1927). Sisal farming was a significant part of the economy from 1907 to the mid-1940s it was one of the leading exports. This motivated establishment of a sisal research centre in 1937 located in Thika and the enactment of the Sisal Industry Act of 1946 to form the Kenya Sisal Board (Ochieng' & Maxon, 1992).

The land in the study area was repatriated to the Kenyan government after independence in 1963 and later was distributed to Africans to continue farming which was the main economic activity in the country (Ochieng' & Maxon, 1992). Kenyatta government, which came into power after independence, was in charge of redistributing land repatriated from Europeans (Bassett, 2018). The government encouraged Africans to form cooperatives and land companies, which were given loans through Settlement Fund Trustee to buy the large farms from the departing white settlers (Boone, 2011). The Settlement Fund Trustee was established by the colonial government in 1962 as part of the transition to assist Africans to reclaim their land. Cooperatives and land companies were formed such as Juja Farm Limited in 1968 and Githunguri Constituency Ranching Company in 1969, where membership was through buying shares. Most of the members of the two land companies were former workers on colonial farms. However, regime notables and politicians who were favoured by land distribution policy

headed most of the land companies and cooperatives. A former Member of Parliament in Githunguri Constituency headed Githunguri Constituency Ranching Company, which was allocated land previously under East African Sisal, while Juja Farm Limited was under the late Honorable Ngegi also a former Member of Parliament.

3.3 Research Design

The study used a case study research design (Kumar, 2011; Jonker & Bartjan, 2018). The case study design is based on the assumption that the case being studied is atypical and can give insights into events and situations prevalent in a group from which the case is selected (Jonker & Bartjan, 2018). The (Greater) Eastern Bypass was selected as a case in the peri-urban of Nairobi and as a basis for holistic and in-depth exploration of aspects of peri-urban land speculation to land development. The research design is characterized by flexible and open-ended techniques of data collection and analysis (Jonker & Bartjan, 2018). The design uses purposive and information-oriented techniques to obtain quantitative and qualitative data for analysing land speculation and land development. The advantages of case study research design are flexibility in data collection and the ability to explore deeper issues and causes of a phenomenon (Kothari, 2004). However, the findings of a case study cannot be generalized due to the specific setting of a case (Jonker & Bartjan, 2018). Primary data was collected through a combination of instruments including interviews, questionnaires and observation checklists. Cadastral maps, aerial photography and satellite images, document review and subdivision data are the secondary data sources. Descriptive analysis is used to describe trends in land subdivisions, transfers, prices and enterprises, which characterize

the extent of land speculation while inferential statistics are used to show correlation and significance between variables.

3.4 Sample and Sampling Procedures

3.4.1 Target Population

The target population for land subdivision, transfer, prices and development was land parcels along (Greater) Eastern Bypass, while three roads-Greater Eastern Bypass, Eastern Bypass and the Link Road-were the target for public policy planning. The land parcels along (Greater) Eastern Bypass qualified as the target population because the timing and number of land transfers, subdivisions and land enterprises are key indicators of land speculation (Stanley, 2016; Zhang *et al.*, 2017). Three roads along (Greater) Eastern Bypass were the public policies for which their planning from conceptualization to feasibility studies, preliminary and detailed design, public notification and construction phase were analysed along the indicators of land speculation. Land parcels along (Greater) Eastern Bypass were used as target population to analyse land development through analysis of land use/cover change, leapfrog measure and patterns of development.

3.4.2 Sampling Procedures

The study used purposive sampling to identify key informants from various institutions involved in land management and infrastructure planning authorities. Major institutions identified were the Kenya Urban Roads Authority (KURA), the County Government of Kiambu and the National Land Commission (NLC). Key informants that were interviewed include Kiambu County Chief Planner and two planners from Juja and

Ruiru sub-county planning office, land registrar (Thika Land Registry), Managing Director (KURA), Chief Surveyor (KURA) and 10 directors of land enterprises that had the highest quantity of subdivided land along (Greater) Eastern Bypass based on subdivision data. To ensure the validity of data collected from land enterprises, the population of enterprises involved in the land business along (Greater) Eastern Bypass was obtained from land subdivision data. The first step was to obtain land subdivision data for the period between 2005 and 2018. The number of land enterprises and quantity of land subdivided by each enterprise were extracted from land subdivision data. Purposive sampling was applied to pick 10% of the total number of land enterprises and further pick enterprises with the highest subdivision to be representative sample size to give insight on land subdivision, transfer process and information on public policy development. In sampling land enterprises, it was assumed that enterprises with the highest number of subdivisions had been in operation for a long and thus would have more reliable information on the planning of (Greater) Eastern Bypass and how it influenced their land business. 35 land enterprises that comprised 15 land companies, 3 self-help groups, 4 welfare associations, 8 cooperative societies and 5 land agents were sampled. The inclusion of different categories of land enterprises was to ensure proper coverage of active land markets. The location of the selected land enterprises was obtained from site offices and telephone contacts on signage in the study area.

Land subdivision data was obtained from registers stored and retrieved in terms of block names and numbers. All parcels that had been subdivided between 2005 and 2018 were recorded (Table 3-1) and this formed the sample for subdivision data. Cadastral data on land subdivision is usually organized in blocks each with a unique name and a number

for identity and inside the blocks are sheets organized numerically. Only blocks that had been subdivided were sampled for the study (Figure 3-2). The land abutting Eastern Bypass and Link Road on the south was not used as part of the sample since it was not subdivided. Land along Eastern Bypass comprises 3 blocks (Ruiru East Block 1-sheet 1, 3 & 4, Ruiru East Block 7 and Ruiru Kiu Block 2 sheet 1 & 5) with a total of 2400 parcels, Link Road had 2 blocks (Ruiru Kiu Block 2 sheet 2, 3 & 4 and Ruiru East Block 4 sheet 1 to 6) with a total of 3003 parcels while Greater Eastern Bypass had 1 block (Ruiru-Juja East Block 2 sheet 1 to 16) with 4220 parcels. Registered Index Maps (RIMs) which showed the spatial location of parcels were obtained from the Survey of Kenya based on the subdivision data that was obtained from the registry. The parcels used for the study were based on initial subdivision done in the early 1980s and the majority had a standard parcel size of 0.5Ha and 0.125Ha along Eastern Bypass and Link Road and 1.3Ha and 0.125Ha along Greater Eastern Bypass.

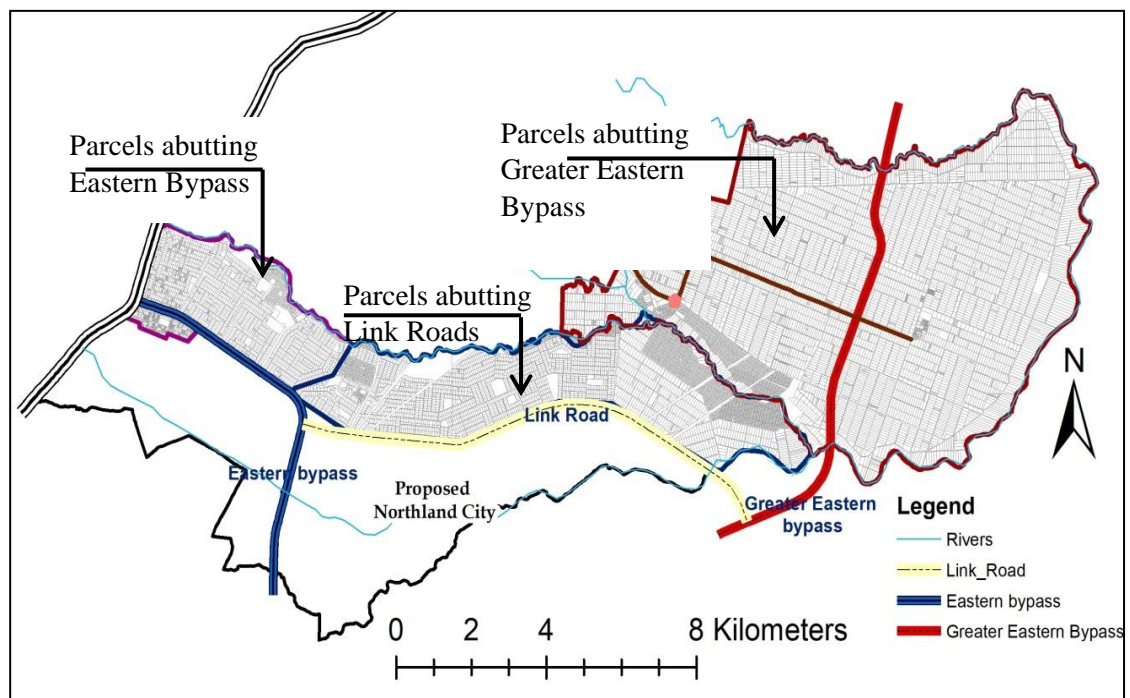


Figure 3-2. Sampled subdivided parcels along (Greater) Eastern Bypass

Land transfer data was obtained from Green Cards filed chronologically based on block name, year and parcel number. They contained information on land ownership, the number of transfers, parcel size and number. The number of transfers was obtained by counting the number of Green Cards with at least one transfer for the period between 2005 and 2018 and used to assess the trend in land transfers. To assess details on the number of transfers per parcel, a sample was obtained from the total number per year. Systematic random sampling was used to pick a Green Card and record the number of transfers in every parcel. 30% of the subdivided plots in a given year were desired hence the green cards were picked systematically where every third card was sampled.

Convenience sampling was used to obtain land prices from transaction documents retrieved from the land valuation office in Thika Land Registry. Data on land transactions were not chronologically stored hence it was not possible to retrieve all transaction documents for (Greater) Eastern Bypass. Transaction documents were obtained by perusing through the files until a parcel located along (Greater) Eastern Bypass, identified using block name was picked and data on land price, size, parcel number and year was recorded. Due to the complexity of accessing land transaction data, a sample size of between 30 and 45 transactions per year was used at intervals of two years from 2008 to 2018. The data was used to study trends in land prices.

3.4.3 Sample Size

The sample of land parcels used for the study consisted of all the subdivided parcels within the study period from 2005-2018 as per the obtained subdivision data. The

original number of parcels was obtained from cadastral data, which was linked to subdivision data using the parcel identification number.

Table 3-1. Characteristics of land subdivision along (Greater) Eastern Bypass

	Subdivisions	Complete Subdivision Data	Sampled Subdivision	N=Sampled parcels
Eastern Bypass	2400	715	29.8%	715
Link Road	3003	764	25.4%	764
Greater Eastern Bypass	4220	1058	25.1%	1058

The total number of land enterprises along (Greater) Eastern Bypass between 2005 and 2018 was 310, which was a finite population. A sample size of 35 was obtained based on the argument that 10% of the population is a suitable maximum sample size and according to Central Limit Theorem, a sample size equal to or greater than 30 is sufficient to predict parameters in a population (Kothari, 2004). The sample size for the land transaction was between 30 and 50 based on the availability of data, Table 3.2 indicates the samples obtained.

Table 3-2: Sample size for land transactions along (Greater) Eastern Bypass

Year	Eastern Bypass <i>n</i> =sampled land transactions	Link Road <i>n</i> =sampled land transactions	Greater Eastern Bypass <i>n</i> =sampled land transactions
2008	34	36	30
2010	36	38	35
2012	40	40	38
2014	35	45	40
2016	35	40	32
2018	50	45	50

To calculate the sample size for land transfers equation 3-1 (Nassiuma, 2001) was used

$$n_0 = \frac{z^2 * p(1-p)}{e^2} \dots \dots \dots \text{Equation 3-1}$$

$$1 + \left(\frac{z^2 * p(1-p)}{e^2 N} \right)$$

Where: n_0 =sample size

N = number of transfers per year along (Greater) Eastern Bypass.

z =the standard normal deviation at required confidence level (z statistic is 1.96)

p =prevalence or the proportion in the target population estimated to be 50% proportion of the target population assumed to have characteristics of interest

e =level of statistical significance (study used 0.05 as significance level)

Table 3-3. Sample sizes for land transfer data in (Greater) Eastern Bypass

Year	Eastern Bypass		Link Road		Greater Eastern Bypass	
	N=Number of transfers	n=Sampled Parcels	N=Number of transfers	n=Sampled Parcels	N=Number of transfers	n=Sampled Parcels
2005	38	35	14	14	—	
2006	50	45	37	34	—	
2007	78	65	44	40	48	43
2008	92	75	50	45	48	43
2009	126	96	65	56	35	32
2010	105	83	184	125	100	80
2011	116	90	368	188	256	155
2012	128	97	192	129	229	144
2013	52	46	370	189	420	204
2014	49	44	364	188	450	214
2015	53	47	348	183	310	171
2016	37	34	364	188	346	182
2017	48	43	256	154	406	198
2018	72	61	406	198	370	189

3.5 Data Collection

3.5.1 Nature and Sources of Data

Quantitative and qualitative data was collected from secondary and primary sources.

Data collected for objective one comprised land subdivision, transfers and number of enterprises, which was obtained from the land registry in form of several entries recorded per year. Reports and gazette notices were used to trace details on the timing of public policy planning which entailed data on when conceptualization, feasibility studies, preliminary and detailed design, environmental impact assessment, public

notifications, land acquisition and compensation and construction of (Greater) Eastern Bypass was done. Changes in the number of land subdivisions, transfers and enterprises along the planning process of (Greater) Eastern Bypass between 2005 and 2018 were used as indicators of land speculation. Earlier studies by Stanley (2016) used analysis of land transfers and transactions as indicators of land speculation while Zhang et al (2017) used subdivisions platted per year to explain peri-urban land speculation and leapfrog development.

Data on land use/cover, development patterns and leapfrog measure was collected using a combination of satellite images and cadastral shape files while data on land prices was sourced from land enterprises and transaction documents sourced from Thika Land Registry. Data collected from enterprises contained the price of land at a given distance from (Greater) Eastern Bypass about the size of land. Data on the distribution of amenities and utilities was sourced from utility agencies such as Kenya Power and Lighting Company (KPLC) in form of shape files, Global Positioning System (GPS) coordinates and Keyhole Mark-up Language (KML) files.

3.5.2 Primary Data Collection Techniques

Data collection methods for primary data include interview schedules with key informants, questionnaires administered to land enterprises and an observation checklist that was used to note amenities and utilities available in the study area and transect walks were used to supplement secondary data on land development. A questionnaire (Appendix 1) was used to collect data on parameters such as the number of land enterprises subdivided along (Greater) Eastern Bypass, length of time the enterprises

had operated in the land business, sources of income for the land business, change in land prices and information on the development of (Greater) Eastern Bypass. The questionnaire had both closed and open-ended questions to obtain both qualitative and quantitative data. To ensure validity and reliability the questionnaire was pretested on 5 land enterprises in Ruiru Town which were identified as having many land buying company offices. The questionnaires were administered face to face by an enumerator who had been trained. Administration of the questionnaires was done in the land enterprise site office and main office for those that did not have one within the study area. 90% of the land enterprises' offices were located in Ruiru Town, which was favourable due to its proximity to the (Greater) Eastern Bypass. The questionnaire was administered to five categories of land enterprises; land companies, land agents, self-help groups, welfare associations and cooperative societies, to ensure proper coverage of the active land market in the study area. The categories were obtained from land subdivision data under details on land ownership.

Interview schedules (Appendix 2,3 and 4) were applied in collecting data from key informants identified concerning data needed for the study such as information on conceptualization and planning of (Greater) Eastern Bypass, land subdivision and acquisition process. The key informants comprised of former Managing Director and Chief Surveyor at KURA, Director of NLC and Chief Planner in Kiambu County Physical Planning Department. The interview was administered to the former Managing Director at KURA as opposed to Acting Director because the former had held the position for about twelve years from 2007 when the authority was formed and was privy to the information on planning and development of (Greater) Eastern Bypass. Chief

Surveyor was interviewed to give information on how feasibility studies along (Greater) Eastern Bypass and initial road design activities before public notification. The Director of NLC was interviewed to give information on land acquisition, valuation and compensation process during the development of public infrastructures while Chief Planner gave information on the land subdivision in Kiambu County.

A Focus group discussion guide was used to collect information on the nature of peri-urban land speculation in Kenya. The focus group discussion was undertaken at Thika Land Registry and it comprised eight members; the Land Registrar, Land Valuer, District Surveyor, two members of a self-help group, two land company owners and a planner in charge of development control who participated based on willingness. The focus group discussion took 20-30 minutes where the participants gave insight and their perspectives on land speculation in Kenya. The researcher asked open questions to guide the discussion and recorded the responses, which were used to supplement qualitative data from interviews.

3.5.3 Secondary Data Collection Techniques

Secondary data was collected from documents such as project reports, government publications, land subdivision registers, Green Cards and land transaction documents. Secondary data was collected by retrieving documents and recording entries such as subdivisions done in a given period. Data on land subdivisions, transfers and transactions were sourced from Thika Land Registry in different offices after gaining authorization from the Land Registrar in charge of the registry. Due to the sensitivity of land data, the researcher was only allowed to record entries in a notebook, a process that

was cumbersome and time-consuming. Government publications such as gazette notices were sourced from Government Printer in Nairobi and were used to obtain information on public notifications related to the development of (Greater) Eastern Bypass, land acquisition and other notices to (Greater) Eastern Bypass development. Project reports and detailed road design on (Greater) Eastern Bypass were obtained from KURA and used to supplement available data on the planning process of the bypasses. Satellite images closely corresponding with time intervals were sourced from Regional Centre for Mapping and Resource Development (RCMRD) in Nairobi and open sources such as the National Aeronautics and Space Administration (NASA) and Sentinel Satellite Data (SSD) for land use/cover and development patterns analysis. Digitized subdivision plans and shape files for the sewer line, piped water, boreholes and electricity distribution obtained from utility agencies such as Ruiru and Juja Water and Sanitation Company (RUJWASCO), Water Regulation Authority (WRA) and Kenya Power and Lighting Company (KPLC) were used in the analysis of the distribution of amenities and utilities in the study area. Data on population estimates to assess the adequacy of amenities and utilities was sourced from Kenya National Bureau and Statistics (KNBS) 2019 census reports (KNBS, 2020) was used along with provisions given in the Physical Planning Handbook of 2007 and Urban Areas and Cities Act ((Physical Planning Department, 2007; RoK, 2011, 2012, 2019).

3.6 Data Analysis

3.6.1 Use of Geographic Information Systems

To process and carry out analysis of various variables such as land use/cover, land subdivision and development pattern, Arcmap 10.5 was used as GIS application to

retrieve, manage and analyse spatial data. Subdivision data collected from registers in Thika Land Registry was linked to shape files that had been generated by digitizing scanned cadastral maps using Arcmap 10.5. Parcel number was used as the unique identifier to add attributes to the shape files. Hard copies of cadastral maps covering the study area were obtained from Survey of Kenya and scanned. To allow geo-referencing and digitizing of the maps the coordinate system of the cadastral maps was converted from Cassini to Universal Transverse Mercator (UTM) projection where Arc_1960_UTM_Zone 37s was used. The scanned images of the maps were imported into Arcmap 10.5 environment, geo-referenced and digitized by tracing the line work and the polygons while labelling using parcel number as the identifier. Subdivision data, which contained parcel number, original size of land, landowner, subdivided sizes and approval status, was added to the shape files and used to create attribute tables. Statistical analysis using Arcmap 10.5 was used to compute maximum, average and minimum subdivision sizes and presented in tables. Amount of land subdivided by different categories of land enterprises was analysed using Arcmap 10.5 and presented in figures (bar charts). Distances of subdivided parcels in relation to (Greater) Eastern Bypass was calculated using Near Tool in Arcmap 10.5 and results were presented using line graphs and box plots.

Land use/cover change was used as indicator of land development. Using maps the distribution of land uses were presented and areas covered by various uses derived. Change in land use was analysed to assess the rate of land conversion from agriculture to urban use. Areas for land converted from agriculture to residential and urban use were calculated and change was analysed. Multi-spectral Landsat images for the period

between 2000 and 2020 were used to study change in land use/cover along (Greater) Eastern Bypass. The study period was pegged at 2000 to assess land use/cover before planning of (Greater) Eastern Bypass public policy. The analysis was done in intervals of five years where land classification maps were created using Arc Map 10.5 to trace the trend in land use. Five remotely sensed Landsat images for a period of 20 years were used in the study (Table 3-4). Classification of land uses was done in four categories of farmland, built up areas, grassland and riparian reserve using Level 1 Landsat Images, Landsat-5 Thematic Mapper (TM), Landsat-7 Enhance Thematic Mapper plus (ETM+) and Landsat-8 Operational Land Imager (OLI) and Thematic Infrared Sensor (TIRS). Google earth imageries and topographical maps were used to supplement data. Landsat imageries were processed and analysed using ArcGIS 10.5 software. The interpretation is a combination of supervised classification and visual modification.

Table 3-4: Remotely sensed data and their characteristics

Year	Sensor	Spatial Resolution	Bands
2000	Landsat 4-5 Thematic Mapper (TM)	30 meters	7
2005	Landsat 4-5 Thematic Mapper (TM)	30 meters	7
2010	Landsat 4-5 Thematic Mapper (TM)	30 meters	7
2015	Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS)	30 meters	7
2020	Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS)	30 meters	11

Once Landsat images had been acquired, a layered selection of clear images with less cloud cover, band combination and enhancement of image was done. Training classes for different categories of land covers were done, supervised classification was used and multispectral data derived from image pixels were utilized to generate a classification algorithm that was used on the entire image for classification. Landsat image corresponding to a given year was imported into the Arcmap10.5 environment and classified using the image classification tool. Thereafter, training areas were created by drawing polygons in areas of known land uses across the entire image and used to create four classes. The polygons for one class such as farmland were merged to form one class and the same steps were followed to create the other three classes. A maximum likelihood classification tool was used to classify the image and using a shape file of the study area the classified map was clipped. After clipping the areas covered, various land use was calculated and data were represented in a line graph to show a trend in land use/cover change. The land use/cover maps were used to analyse the prevalence of one land use/cover in the planning and development of (Greater) Eastern Bypass.

Land development pattern was analysed from 2000 to 2020 at intervals of five years. The study period was selected to cover majorly the period before, during and after the planning and development of part (Greater) Eastern Bypass. Data on development patterns were collected by overlaying closely corresponding medium resolution satellite images with subdivision shape files and developed parcels were identified and recorded using parcel numbers as the identifier. The medium-resolution images were used to single out developed parcels that were highlighted. The overlaying of the maps was done using Arcmap 10.5 and overlaying tool was used. The analysis was done by

describing the pattern emerging from highlighting the developed plots. Maps were used to present and describe the observed pattern of development within the study period. Maps generated from overlaying high-resolution images with shape files and marking all developed parcels in intervals of five years from 2000 to 2020 were used to analyse development patterns. Development patterns were described as linear, clustered, radial, or scattered. The number of settlements occupying a parcel of 0.5Ha or 1.3Ha described development density.

Leapfrog development was measured to ascertain the rate of development and leapfrogging along (Greater) Eastern Bypass. To identify the set of leapfrogged parcels, buffers of 250m, 500m, 1000, and 1500m were created along five major roads along (Greater) Eastern Bypass. In addition to the three roads making up (Greater) Eastern Bypass, two roads were added; Thika Highway, which was intersecting the Eastern Bypass and Juja Farm Road which is the main access road into the land along, proposed Greater Eastern Bypass. The shape files were overlaid with medium-resolution satellite images at intervals of four years with the base year being 2008, to provide a temporal snapshot of land development before implementation of the three major public policies. The overlaying of the satellite images for different years was used to identify vacant parcels. The process of overlaying was done using ArcMap 10.5, buffers were created using the buffer tool, using location tool and intersecting features within the layer all parcels within the buffer were selected, and the area for each parcel was calculated. All parcels that were undeveloped and were neither preserved nor protected land were identified as leapfrogged parcels. The area of leapfrogged parcels and that of developable land was calculated in a given buffer and periods and were feed into

equation 3-2 where leapfrog measures were derived. Leapfrog development was measured using equation 3-2 adopted from Empirical Investigation of Leapfrog Development by Zhang *et al* (2017).

$$LFjts = 1 - \frac{\text{Developed land in Time s in buffer j platted in year t}}{\text{Developable land in Time s in buffer j platted in year t}} \dots \dots \dots \text{Equation 3-2}$$

Leapfrog measure varies continuously between zero and one with a higher value indicating a greater degree of leapfrog development associated with the specific subdivision and distance to a major road (Zhang *et al.*, 2017). After computing leapfrog measure using equation 3-2, data was presented in line graphs and used to depict the trend over the study period. Descriptive analysis of the trend in relation to planning and development of (Greater) Eastern Bypass and change in leapfrog measure is discussed in relation to observed development pattern.

Data on available public amenities and utilities obtained from utility agencies such as sewer line and distribution of piped water from Ruiru and Juja Water and Sanitation Company (RUJWASCO), data on boreholes from Water Regulation Authority (WRA) and electricity distribution from Kenya Power and Lighting Company (KPLC) was linked to subdivision shape files by importing KML files and converting them into shape files using Arcmap 10.5. Distribution of amenities and utilities is presented in maps while the quantities were presented in tables that were used to analyse adequacy of amenities and utilities in relation to provisions given in Physical Planning Handbook of 2007 (Physical Planning Department, 2007) and Urban Areas and Cities Act (RoK, 2011, 2012, 2019).

3.6.2 Analysis of Adequacy of Amenities and Utilities

Adequacy of amenities and utilities was assessed by identifying available utilities and amenities on the 500m buffer of Eastern Bypass and measured against the population and provisions and standards in Physical Planning Handbook, 2007 (Physical Planning Department, 2007) and Urban Areas and Cities Act (RoK, 2011, 2012, 2019). In the Physical Planning Handbook, 2007 and Urban Areas and Cities Act population size is used to categorize an area as either a town centre (indefinite), local centre (3500-5000), intermediate centre (15,000-50,000) and major centre (100,000-150,000). To obtain population estimates the number of developed plots in 500m buffer were counted and multiplied by average number of dwelling units per hectare and sub-county average household size from Kenya National Bureau of Statistics 2019 census (KNBS, 2020). The 500m buffer is used because Kiambu County Planning Department issued an order in 2015, for restricting commercial high density development within 500m from the road and low density development on the area beyond. Provision of public amenities and utilities along 500m buffer of Eastern Bypass was measured against provisions given in Physical Planning Handbook (Physical Planning Department, 2007) and Urban Areas and Cities Act (RoK, 2011, 2012, 2019) and level of adequacy is marked as high if provisions are fully available, medium if provision is moderate and poor if no provision.

3.6.3 Analysis of Land Prices

The study employed schedules to obtain data on land prices from land enterprises in relation to change in distance from (Greater) Eastern Bypass. To ease data collection on land prices, a map with land parcels indicated at different distances from the major roads

and X2 distance in km to Eastern bypass). c is the constant; d is the dummy variable for developed areas while $h1$ and $h2$ are the distance gradients. Distances from two major roads were used in the regression analysis, where Eastern Bypass was used along Thika Highway, Link Road along Eastern Bypass and Greater Eastern Bypass along Juja Farm Road and these two distances were represented by X1 and X2 in the equation. The constants are converted from natural logarithm basis to Kenyan shillings indicating the prices of the plots regardless of their distances from the considered roads. Estimates of plot prices by the status of infrastructure (Thika Highway, Eastern Bypass, Link Road, Greater Eastern Bypass and Juja Farm Road) and distance in km to the infrastructure, during the years 2008, 2014 and 2018 are calculated using equation 3-3.

Data on land prices was also used to calculate windfall from speculative land sales. Average land purchase price (LPP) per plot (0.035ha), land subdivision charges (LSC) and land sale price (LSP) within 500m buffer from the three roads were obtained and equation 3-4 was used to calculate the speculative gain (SG). Land subdivision charges which comprised surveying charges, land transfer, land board, amendment of survey plan and beaconing charges were obtained from Survey Act Cap 299 (RoK, 2010), Land Act (RoK, 2012) and Land Control Act (RoK, 2012) of Kenyan laws. Land in (Greater) Eastern Bypass was originally subdivided into parcels of 0.5 Ha and 1.3 Ha mainly for small-scale farming, however, with the onset of infrastructure development, land enterprises bought off the land for speculation. The 0.5 Ha and 1.3Ha were subdivided into average plot sizes of 0.035Ha for urban and residential use. The fact that agricultural land in rural and peri-urban areas in Kenya is not taxed has incentivized

land speculation as most the land enterprises leverage on the speculative gain from the sale of subdivided plots.

$$SG=LSP-(LPP+LSC)\dots\dots\dots\text{Equation 3-4}$$

3.6.4 Analysis of Influence of Public Policy Planning on Land Speculation

Data on land subdivisions, transfers and enterprises was recorded in an excel spreadsheet and line graphs was generated to depict the trend against the public policy data on the timing for different activities such as conceptualization, feasibility studies, preliminary and detailed design and public notification. The amount of land subdivided by different categories of land enterprises was also analysed using Arcmap 10.5 and presented in bar charts. The number of land transfers per parcel was analysed and presented using tables. Data collected from questionnaires with land enterprises were analysed using Statistical Package for Social Sciences (SPSS) and data for various variables were presented in the line, bar and pie charts. Further inferential analysis was done to test the correlation between several variables such as the period a land enterprise existed and the quantity of land subdivided by an enterprise along (Greater) Eastern Bypass.

3.6.5 Inferential Statistics

Inferential statistics entails techniques used to generalize characteristics of interest for a population based on a data sample (Kumar, 2011). SSPS was used to carry out statistical analysis such as Pearson correlation, T-test and linear regression. Pearson correlation is used to test the strength of two sets of data for two variables (Kothari,

2004; Kumar, 2011). It is used to measure the degree of relationship between two variables such as the amount of land subdivided by land enterprise and the period a land enterprise existed and the correlation between the number of subdivided parcels and leapfrog measure in the study area. The coefficient assumes that there is a linear relationship between variables and that there is a causal relationship between the two. The Pearson correlation coefficient value lies between between 0-0.5 denotes a weak positive correlation and 0.5-1 a strong positive correlation while -1 to -0.5 indicates a weak negative correlation while -0.5 to-1 a strong negative correlation between variables. A coefficient value of 1 means a perfect positive correlation and a value of 0 means that the null hypothesis is accepted. Pearson correlation coefficient (r) is computed as per equations 3-5.

$$r = \frac{\sum X_i Y_i - n \cdot \bar{X} \cdot \bar{Y}}{\sqrt{\sum X_i^2 - n\bar{X}^2} \sqrt{\sum Y_i^2 - n\bar{Y}^2}} \dots\dots\dots\text{Equation 3-5}$$

Where

X_i = *i*th value of X variable

\bar{X} = mean of X

Y_i = *i*th value of Y variable

\bar{Y} = Mean of Y

n = number of pairs of observations of X and Y

\bar{x} = Standard deviation of X

\bar{y} = Standard deviation of Y

The t-test is used when two conditions are fulfilled to establish the significant contribution of the predictor variable to the dependent variable (Kothari, 2004; Kumar, 2011). It is used in the study to measure the significance of changes in land prices concerning changes in distance from the road. It is also used to determine the significance between the amount of land subdivided by land enterprise and the time an enterprise knew about planning and development of (Greater) Eastern Bypass. P value of less than 0.05 implies that the predictor variable is significant in contributing to the dependent variable. Equation 3-6 is used for the t-test is

$$t = \frac{(\bar{X} - \mu)}{\sigma_{\bar{x}}} \dots\dots\dots \text{Equation 3-6}$$

Where

\bar{X} = Mean of the sample

μ = Mean of the universe/population

$\sigma_{\bar{x}}$ = Standard error of mean worked out as under

Level of significance at 0.05 was used to test two null hypotheses in the study;

H₀ There is significant influence of public policy planning on land speculation along (Greater) Eastern Bypass

H₀ There is no significant change in land prices along (Greater) Eastern Bypass due to its development

Significance is tested based on the p-value, where a small p-value less than 0.05 signifies that the result is significant and therefore a conclusion can be drawn from the result,

whereas a p-value greater than 0.05 denotes that the result is insignificant and that no conclusion can be drawn. Regression analysis is a statistical method used in determining the relationship between two or more variables (Kothari, 2004; Kumar, 2011). Simple regression is used in the study to determine the statistical relationship between public policy planning and peri-urban land speculation where y is the total quantity of land subdivided in a given year by an enterprise and x is the length of time a land enterprise knew about the development of Eastern Bypass, Link Road and Greater Eastern Bypass (Equation 3-7). The timing of the Eastern Bypass was pegged in 2007 when feasibility studies and road design were done while Greater Eastern Bypass and the Link road were pegged in 2011 when the roads were conceptualized and preliminary designs were done. The year when a land enterprise learned about the development of the bypasses is used to determine if it was before or slightly after public notification of the public policy while the quantity of land subdivided is used to connote the extent of land speculation. Linear regression is also used in estimating the relationship between change in land prices and distance from major roads and whether the road was developed or not. In simple regression, two variables are used where one variable is independent and it is the cause of the behaviour of the other which is the dependent variable. The relation between X and Y is given by;

$$Y = a + bX \dots\dots\dots \text{Equation 3-7}$$

Where

Y =the outcome variable

a=the intercept (constant)

b=slope

X=explanatory variable

3.6.6 Factor Analysis of the Construct

Factor analysis is done to identify the statistical significance of factors and determine the necessary variables to be used in a study. It is carried out to remove redundancy and duplication of variables that are related. Factor analysis was done using the reduction dimension tool in SPSS where a factor loading of less than 0.3 suggests that the relationship between variables is weak. Principle component analysis was used to derive the factor analysis for variables such as land subdivision, enterprises and land development, which were analysed to determine statistical significance. Appendix 6 provides results for the significance of key variables.

3.7 Ethical Requirement

A research permit was obtained from National Council for Science and Technology (NACOSTI) and authorization to carry out research in institutions and government offices namely Kenya Urban Road Authority, Thika Land Registry and Kiambu County Government Planning Department was sought to meet the ethical requirement. In addition, clearance with Criminal Investigation Department (CID) in Thika town was sought as a pre-requisite for accessing data from Thika Land Registry. Respondents participated in the study voluntarily and were assured of confidentiality. The research permits and authorization documents are attached in Appendix 9 and 10

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the research findings and discussion of the findings based on analysed data that focuses on peri-urban land speculation and its implication on land development in (Greater) Eastern Bypass. The chapter sections are based on the research objectives of the study. The objectives are:

- a. To investigate the linkage between public policy on infrastructure planning and land speculation in (Greater) Eastern Bypass from 2005 to 2018.
- b. To examine the impact of land speculation on development patterns in (Greater) Eastern Bypass from 2000-2020.
- c. To determine the dynamics of land prices in (Greater) Eastern Bypass from 2005 to 2018.
- d. To assess the influence of public programmes on land development patterns in (Greater) Eastern Bypass.

4.2 Influence of Infrastructure Public Policy Planning on Land Speculation in (Greater) Eastern Bypass

4.2.1 Infrastructure Public Policy Planning in the (Greater) Eastern Bypass

The Eastern Bypass was planned between 1970 and 1973 as part of the Nairobi Metropolitan Growth Strategy, which was to guide infrastructure development, social welfare services, facility development and supply of urban land in Nairobi (Nairobi City Council, 1973). The bypass is part of the Nairobi bypasses, which were planned to decongest Nairobi City by channeling traffic away from the city centre. The

construction of the Eastern Bypass began on 22nd August 2009; 35 years after the road was planned. As explained by the former Director of KURA, there were earlier plans to construct the road in 2003 where part of the road corridor was cleared. However, a lack of funds hindered the construction process until April 2007 when an Engineering Procurement Contract (EPC) was awarded to a Chinese company to redesign and construct the road. The awarded contract was single-sourced and did not follow procurement procedures and regulations in Kenya. The Chinese government-funded 85% of the total construction cost through a concessional loan while the Kenya government funded 15%.



Figure 4 -1. Greater) Eastern Bypass as part of bypasses in Nairobi Metropolitan
The project report shows that the feasibility studies, preliminary and detailed engineering drawings for Eastern Bypass were carried out between August 2007 and

May 2008 as part of the contract (KURA, 2008). In May 2008, the government began demolition of structures built along the reserved road corridor to pave way for bypass construction, following a notice that had been given by the Ministry of Roads (RoK, 2003). The road construction was expected to take three years from 2007 when the contract was signed. Delays in construction of the bypass were occasioned by post-election violence, lengthy process of land acquisition and compensation and changes in the road design that were influenced by government officials, Kenya Airport Authority (KAA), military and police barracks and politically connected notables who wanted to benefit from compensations and the road realignment in relation to the location of their properties. The first engineering drawings for the bypass were prepared in 2008 but were later revised in 2010 due to changes occasioned by land acquisition and compensation that altered the road alignment. The construction process of the Eastern Bypass began without environmental approval from the National Environmental and Management Authority (NEMA) which is a key requirement for all major construction projects in Kenya as espoused in the Environmental Management and Coordinating Act of 1999 (RoK, 2012a;1999). The Environmental Impact Assessment was conducted unprocedural after road construction had begun and the public was not invited to participate nor was the document gazetted (Ngirachu, 2009) as per regulations in the Environmental Management and Coordinating Act of 1999 (RoK, 2012a; 1999). The construction of the Eastern bypass took place during a period of political transition in Kenya. The construction contract was awarded three months before the 2007 elections to a Chinese company, which was required to fast track the design and construction process. However, the post-election violence interfered with the construction process

and in 2008 a coalition government was formed to quell the political wrangles. The Ministry of Roads was given to the opposition side and the transition brought inconsistencies in the construction process, mainly compulsory land acquisition and compensation where private interests led to further changes in road alignment design.

The process of land acquisition for reservation of bypass corridors began in early 1973 under the repealed Land Acquisition Act (RoK, 1968) when they were first planned. However, the acquisition and compensation of land along the Eastern Bypass corridor was partially done with expectation that the landowners would surrender land during adjudication in accordance to Land Planning Act (RoK, 1968), which did not happen. This occasioned second land acquisition and compensation of 20Ha belonging to a renowned on 17th September 2008 (RoK, 2008) on Eastern Bypass corridor. There were consecutive acquisitions along Eastern Bypass; 3.2Ha in 2010 (RoK, 2010), 2.1Ha in 2011 (RoK, 2011) and 3.72Ha in 2013 (RoK, 2013). These acquisitions resulted from changes and revisions of road alignment design. The process of land valuation was highly manipulated resulting into high land values that increased compensation cost. Approximately Ksh. 4.7 billion, which is about 30% of road construction cost, was used on land compensation along Eastern Bypass corridor. Land valuation was carried out in 2008 with an acre of land along the road corridor valued between 150 and 200 million¹, which is three times the value of land in 2013 (RoK, 2013), making the land compensation unnecessarily costly. This implies that the valuation process was manipulated coupled with failure by government to cap land. value. Beneficiaries of the

¹ One USD = Ksh107.62, one EUR= Ksh 128.85 & one GBP=Ksh 152.67 as per 5th May 2021

monetary compensation were majorly individuals while government institutions such as Embakasi Military barracks and Utawala Regular and General Service Unit Police barracks benefitted from increased accessibility and reconstruction of structures that were demolished along the road corridor.

The proposed 77km Greater Eastern Bypass and Link Road were planned in 2008 to link Mombasa and Thika-Garissa highways (Figure 4-1) in order to reduce traffic transiting through Nairobi City. The 13.2 Km Link Road that passes through land owned by a renowned politician was planned to connect the Greater Eastern Bypass and Eastern Bypass and partly to increased accessibility of the proposed Northland City. Feasibility study, preliminary design, detailed engineering design and environmental impact assessment of Greater Eastern Bypass was carried out between 2011 and 2012 after the contract was tendered and awarded in May 2011 (KURA, 2012). Detailed engineering design and environmental impact assessment was completed in October 2012 and submitted to client (KURA) for verification and invitation of public to give input in May 2013. The official public notification was made through a gazette notice (RoK, 2013) to invite members of the public to participate in reviewing road design drawings and environmental impact assessment report. Over 10years since planning of the bypass, the government is yet to start the process of land acquisition and compensation or placing a caveat to prevent further activities on land marked for the bypass corridor.

4.2.2 Land Subdivision in (Greater) Eastern Bypass

There is increased number of subdivisions between 2005 and 2010 along the Eastern Bypass with the highest subdivisions of 3744 plots recorded in 2011, the year before

road construction was completed (Figure 4-2). There is minimal land subdivision between 2003 and 2005, which is during the design phase. The subdivisions carried out between 2005 and 2008 are mostly by those who had acquired land during the design phase. However, individuals and companies with information on bypass development acquired land parcels along the Eastern Bypass corridor before normal land speculators. The award of Eastern Bypass construction contract in 2008 led to a spike in subdivisions rising by 280% from 2008 to 2014. The completion of Eastern Bypass in 2012 increased the subdivisions until 2014; thereafter a 25% decline in subdivisions was noted between 2015 and 2018.

There is an increase in subdivisions along the proposed Greater Eastern Bypass and the Link Road between 2010 and 2014, the period when the roads were being designed as well as when the first public notification was done. The highest number of subdivisions along the Link Road is 3214 plots in 2011, which is when the road was still under design and 4619 plots in 2014 along Greater Eastern Bypass, which is a year after public notification was done. Although the peak was recorded in 2014 along the Greater Eastern Bypass, which is a year after the public notification, there is significant increase between 2010 and 2013 due to road surveys and design activities that happened on the ground. It is during the preliminary road designs, which entail land surveying that some land agents got to know about upcoming new roads and probable locations. The land agents established the location of beacons and used them to speculate subdivided land in relation to the estimated location of the upcoming road and as a marketing strategy to lure buyers.

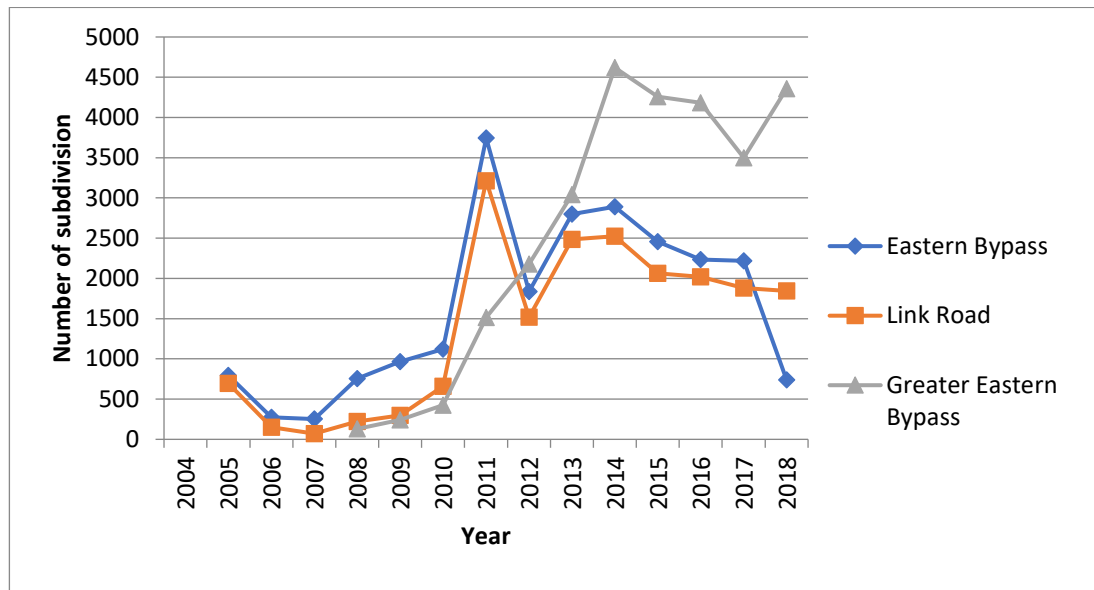


Figure 4 -2. Land subdivision trend in (Greater) Eastern Bypass

Looming development of the Greater Eastern Bypass and the Link Road triggered speculative land subdivisions, with part of the subdivided parcels intersecting the Greater Eastern Bypass corridor (Figure 4-3). As more subdivision and development of parcels along the corridor continue to happen, there is a likelihood that the process of land acquisition and compensation may become more lengthy and expensive since the number of landowners and cost of land is increasing.

The large farms inherited from colonial production system that covered approximately 12,000Ha were subdivided between 1983 and 1987 into smaller parcels of 0.5Ha and 0.125Ha along Eastern Bypass and Link Road and 1.3Ha and 0.125Ha along the Greater Eastern Bypass. The subdivisions that happened between 2005 and 2018 are of urban nature and majorly residential and a few commercial. Along the Eastern Bypass 715 parcels were subdivided between 2008 and 2018. About 90% of which were subdivided into 8 to 16 plots with an average of 8, while along the Link road, 80% of 764 parcels

were subdivided into 10 to 20 plots with an average of 10; whereas along the Greater Eastern Bypass 60% of 1058 parcels were subdivided into 26 to 34 plots with an average of 26. Most of the subdivisions were done for residential use and to attract the ever-increasing demand for homeowners as opposed to inheritance and other purposes.

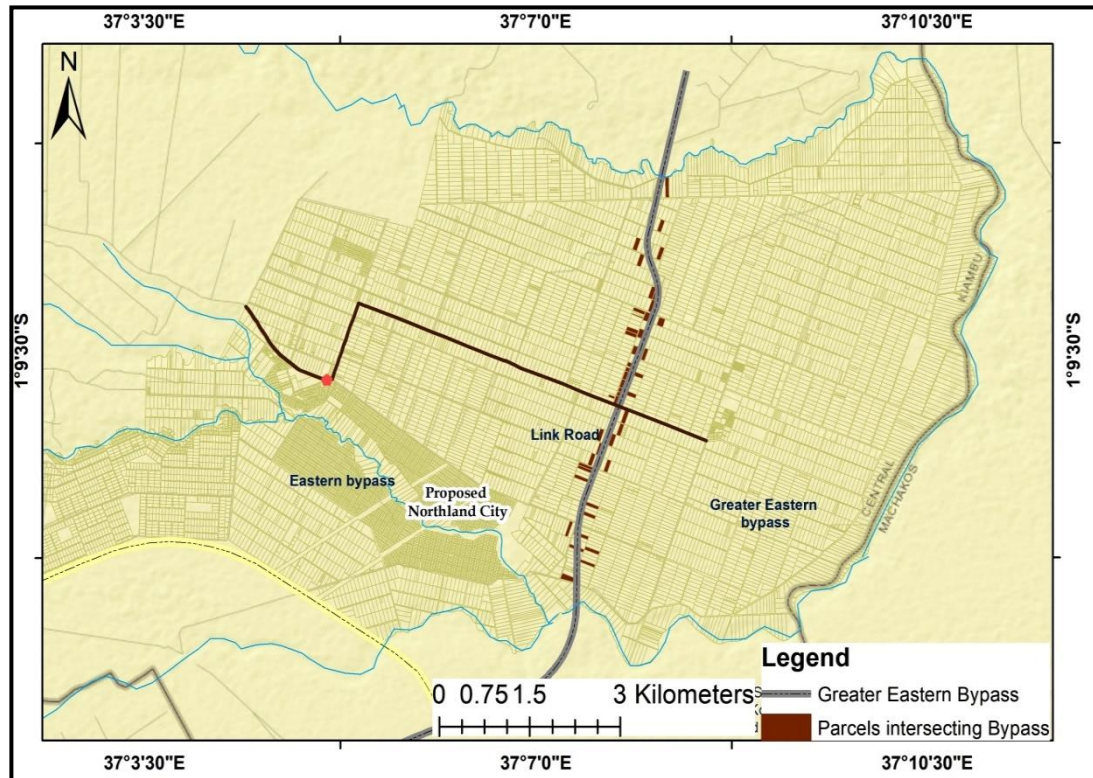


Figure 4-3. Land subdivision intersecting the proposed Greater Eastern Bypass

Kiambu County Subdivision Standards and Guidelines (County Government of Kiambu 2015) and Physical Planning Handbook (Physical Planning Department, 2007) stipulates land subdivision sizes in relation to use and available basic infrastructure and amenities. For normal housing development in un-serviced area, such as the land along (Greater) Eastern Bypass, the plot size should be at least 0.045Ha, while 0.033Ha is recommended for low cost housing in serviced areas. Therefore, for the guidelines to be

met a standard parcel of 0.5Ha should be subdivided into 10 plots leaving at least 0.05Ha for access roads while a standard parcel of 1.3Ha should be subdivided into 26 plots leaving 0.13Ha for access roads. After sampling 0.5Ha and 1.3Ha standard parcels (Table 4-1). From land subdivision data in Table 4.1 about 36% of subdivided land along Eastern Bypass, 66% along the Link Road and 40% along the Greater Eastern Bypass area did not meet subdivision guideline and standards.

Table 4-1. Characteristics of land subdivision in (Greater) Eastern Bypass

	Size of plots per specified hectares		
	>10/0.5Ha	≤10>5/0.5Ha	≤ 5/0.5Ha
Eastern bypass (N=580)			
Number of parcels	207	299	74
Min Size of plots (Ha)	0.031	0.047	0.112
Ave Size of plots (Ha)	0.039	0.054	0.151
Max Size of plots (Ha)	0.042	0.075	0.227
Link Road (N=614)			
Number of parcels	404	202	8
Min Size of plots (Ha)	0.031	0.049	0.143
Ave Size of plots (Ha)	0.039	0.052	0.159
Max Size of plots (Ha)	0.041	0.067	0.167
Greater Eastern Bypass (N=642)			
Number of parcels	258	267	117
Min Size of plots (ha)	0.0213	0.04685	0.0990
Ave Size of plots (ha)	0.0363	0.05252	0.2169
Max Size of plots (ha)	0.0440	0.07536	0.6933

Note N=Sampled subdivided parcels

The following observations revealed that land subdivision in the study area was un-procedural and did not follow subdivision process espoused in the Kiambu County Subdivision Standards and Guidelines (County Government of Kiambu, 2015) and Physical Planning Handbook (Physical Planning Department, 2007) namely:

- 47% of the subdivided plot in the study area did not meet the required minimum size of at least 0.045Ha for normal housing in un-serviced area
- There were no subdivision schemes for the period between 2005 and 2015, indicating that physical planners were not involved during subdivision process. This was confirmed by a memo dated 27th August 2014 (Appendix 7) in which Land Control Boards in Kiambu County were instructed not to approve any land for subdivision without approved scheme or plan from the county (County Government of Kiambu 2014).
- Land subdivision should be guided by a land use or zoning plan of a given area (RoK, 1996, 2019). It was observed that there was no land use or zoning plan prepared by the County or National Government to guide land subdivision, hence leaving the decision to land agents and landowners. Although the land in the study area was considered agriculture hence subject to Land Control Board regulation (RoK, 2012), there was no intervention from the boards.
- Most of the land was subdivided into residential and commercial plots (Table 4.1) hence converting the land from agricultural to urban use. There was no evidence of change of user since it was not a requirement for land enterprises and agents subdividing land. On the contrary, the owners and buyers of the

subdivided plots are required to pay 2% of the land value before land development as cost for change of use. Change of use is therefore only used as a mechanism for generating revenue to the county as opposed to controlling development.

- Land Control Boards are institutions established under the Land Control Act (RoK, 2012) and mandated to protect agricultural land in peri-urban and rural areas. However, they approved 95% of irregular subdivisions with the remaining 5% being rejected due to double allocation. Double allocation is attributed to corruption in the land registration where land documents are duplicated and land is sold to unsuspecting buyers. Due to corruption in boards, land subdivision applications were approved hence increasing conversion of peri-urban land without prior land use planning. The dissolution of land boards in Kenya in April 2016 due to giving of consent and approval for non-credible transaction left land sector at county and national level in a mess and with many irrevocable transactions (RoK, 2016).

4.2.3 Land Transfer in (Greater) Eastern Bypass

About 85-90% of all land transfers are on the 0.5Ha land parcels along the Eastern Bypass and Link Road and 1.3Ha land parcels along the Greater Eastern Bypass. This suggests that most of original land owners did not subdivide their land, but sold it out in the original size. From 2005, three years before construction of Eastern Bypass, the number of transfers increased steadily by 200% until 2008 and the numbers began to decline, probably because construction of the road had begun and there was no more speculation. Along the Link Road and Greater Eastern Bypass most of the transfers

happened between 2010 and 2015 with highest number being recorded in 2011 and 2012 (Figure 4-4). The transfers spiked by 46% between 2010 and 2011 on the land along the Greater Eastern Bypass, which is the period between which the bypass was being planned and thus suggesting that some land buyers were acting on information about the upcoming road to buy cheap land before the road development.

The number of transfers (2-3) per parcel is high along the Greater Eastern Bypass suggesting that most parcels were acquired from original land owners before public notification and were later transferred to speculators who subdivided for sale (Table 4-2). Along the Eastern Bypass and Link Road, the 1-2 transfers are high suggesting that majority who bought land from landowners subdivided it for sale (Table 4-2). The number of transfers increased exponentially along the Greater Eastern Bypass and Link Road (Figure 4-8) between 2009 and 2010 due to bypass survey and design activities. Notably, 85% of 1-transfer along the Eastern Bypass is between individuals, while 15% are from individuals to land companies while about 45% and 55% of 2-transfers along the Link Road and Greater Eastern Bypass are from individuals to land companies respectively. The high number of land transfers to individuals and land companies' points to their role in land speculation. Along the Eastern Bypass, land transfers may have begun earlier in 2003, but as plans to construct the bypass were conceptualized, the number kept growing until 2008 when construction process started. The area has the lowest number of transfers compared to the land along the Link Road and Greater Eastern Bypass, suggesting that most of the land was held and subdivided by original owners or structural speculators who were well informed of the upcoming road. Data

on land transfers points at high land speculation along the Link Road and Greater Eastern Bypass area, which is attributed to the public planning of the roads.

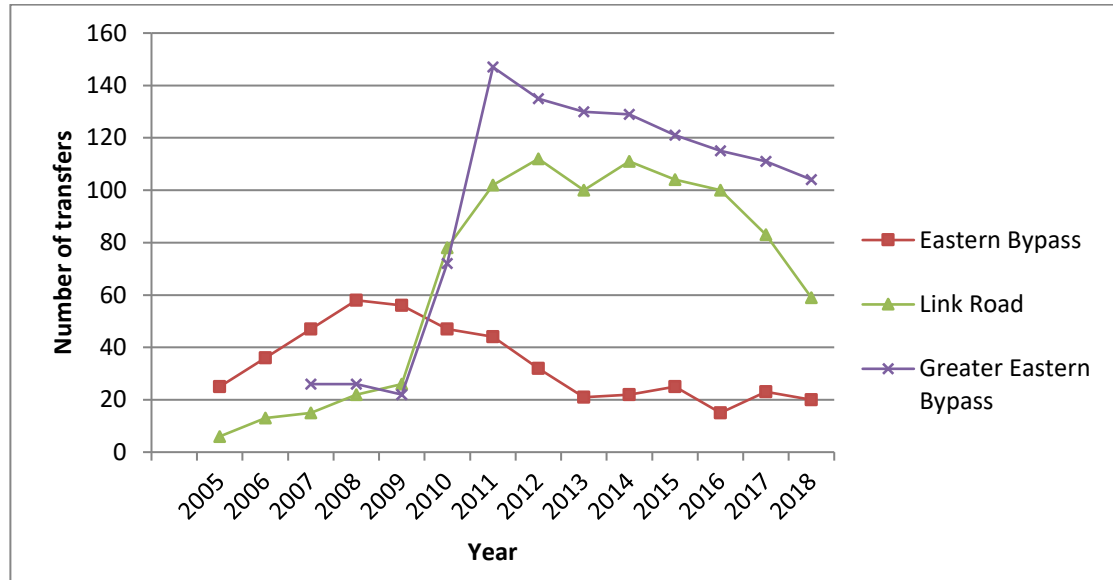


Figure 4-4. Trend of land transfers in (Greater) Eastern Bypass

Table 4-2. Characteristics of land transfers in (Greater) Eastern Bypass

Year	N	Number of Land Transfers										
		Eastern Bypass			N	Link Road			N	Greater Eastern Bypass		
		1	2	3		1	2	3		1	2	3
2005	35	25	5	3	14	6	1	2	—	—	—	—
2006	45	36	2	1	34	13	13	5	—	—	—	—
2007	65	47	4	2	40	15	4	4	43	26	7	2
2008	75	58	9	0	45	22	17	6	43	26	7	2
2009	96	56	24	4	56	26	10	5	32	22	5	0
2010	83	47	8	7	125	78	27	12	80	72	19	5
2011	90	44	19	5	188	102	48	6	155	147	32	8
2012	97	32	12	1	129	112	20	3	144	135	46	4
2013	46	21	6	0	189	100	21	3	204	130	49	1
2014	44	22	3	1	188	111	23	0	214	129	70	4
2015	47	25	2	0	183	104	18	3	171	121	32	2
2016	34	15	0	0	188	100	8	1	182	115	18	0
2017	43	23	5	0	154	83	14	1	198	111	10	1
2018	61	20	4	0	198	59	7	0	189	104	6	0

Note N = Sampled Parcels

4.2.4 Land Buying Enterprises in (Greater) Eastern Bypass

The land market in the (Greater) Eastern Bypass area was dominated by few individuals before 2008, but between 2008 and 2018 it is comprised of land companies, self-help groups, welfare associations and cooperatives; with some subdividing land in the entire area from Eastern Bypass through Link Road to the Greater Eastern Bypass (Figure 4-5). The distribution of land enterprises is different across the study area; land along the Eastern Bypass has the lowest number of enterprises at 54, the land along the Link Road has 105 while land along Greater Eastern Bypass has the highest number of enterprises at 290. The data on the number of land enterprises in an area infers that the higher the number of enterprises the higher speculative activities and fewer structural speculators. Most land enterprises focussed on areas where land was available, cheaper and easier to acquire and speculate hence the preference for marginal, undeveloped peri-urban land where there is looming development. Even with a high presence of land enterprises, individuals subdivided 55% of land in the study area. There were at least 15 individuals who were singled out and identified by name having subdivided at least 20 parcels of land each, distributed across the study area. Among the identified individuals there is one who had subdivided 22 parcels between 2013 and 2015 on land along the Eastern Bypass was the then chairperson of Githunguri Constituency Ranching Company. Two other officials of the company had subdivided at least 10-15 parcels suggesting that some officials used their position to access and acquire land at low cost from members of the company who feared protracted disputes and wrangles related to land distribution and ownership and thus forcing disposing them to the officials. The subdivisions by these individuals are residential, indicating they were in the land sale business. Most of

the land agents and individuals operated land companies but used their names to carry out land transactions such as subdivision and transfers, which suggests that their business names and companies are for marketing purposes.

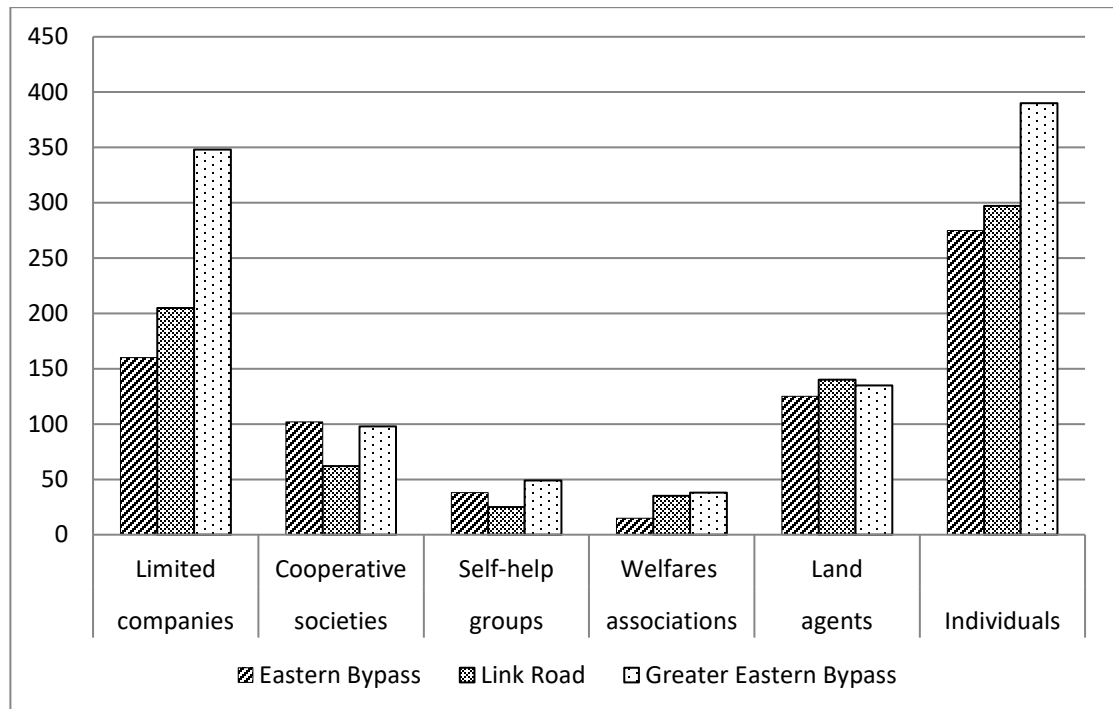


Figure 4 -5. Land parcel ownership structure in (Greater) Eastern Bypass

Land enterprises that have existed for a period of over 10 years have subdivided on average 15.5Ha of land. About 45% of the land enterprises in the study area have existed for a period of 6-10 years, 36% for about 11-15 years while 20% for a period of 1-5 years (Figure 4-6); hence most of the land companies were formed between 2008 and 2018. The 8 land companies that invested earlier have the highest number of subdivisions suggesting that at the onset of structural land speculation when the planning of an infrastructure is taking place, there is less competition to hoard land

among the enterprises, but as planning and development of new infrastructure progresses the competition for acquiring land increases.

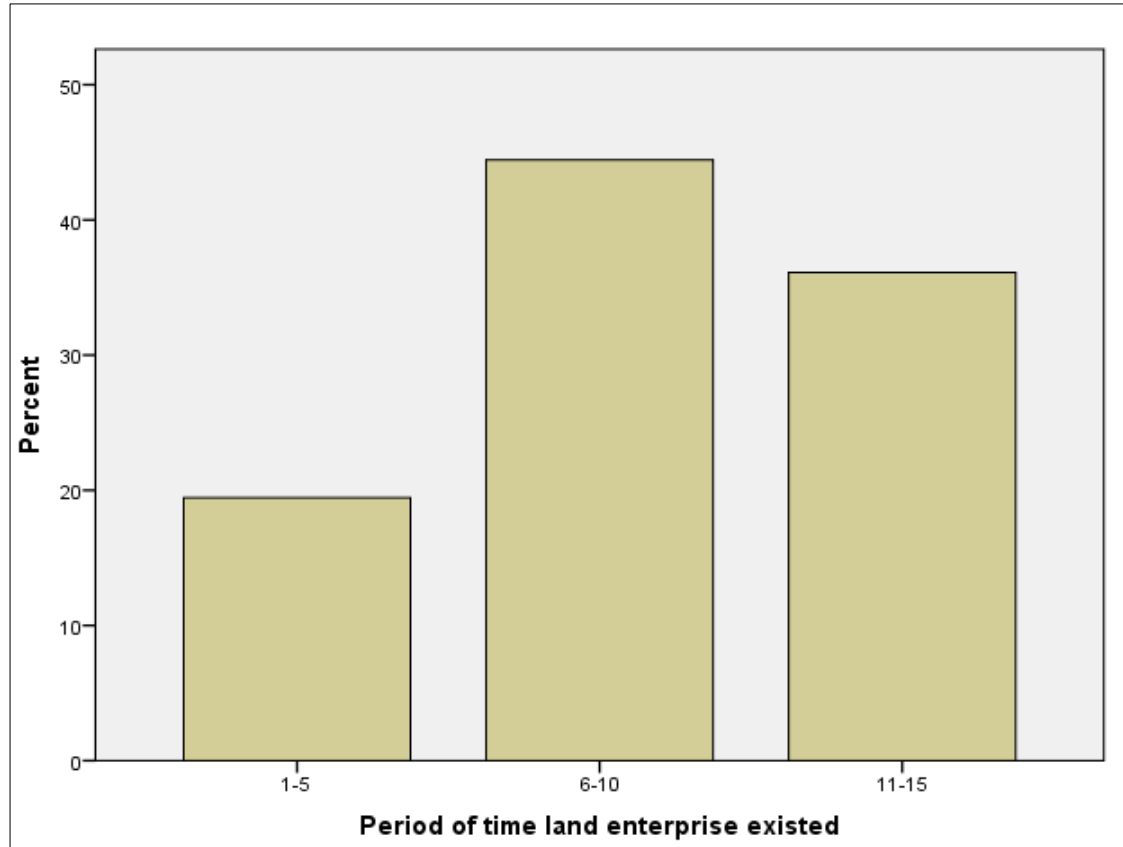


Figure 4-6. Period of time land enterprise had existed

There is a positive correlation between the number of years a land enterprise has been in existence and the total size of land subdivided in the per-urban area (Figure 4-7). The distribution of the plotted points indicates a positively increasing trend. This implies that there is a positive correlation between the time a land enterprise has existed versus total quantity of land sold in Greater Eastern Bypass. The symmetric matrix with Pearson correlations in Table 4-3 and Figure 4-7 shows that the Pearson correlation coefficient is 0.731 for Greater Eastern Bypass, 0.575 for the Link Road and 0.660 for

Eastern Bypass. This demonstrates that period of time a land enterprise has existed has a strong positive correlation with total quantity of land sold in Greater Eastern Bypass, Link Road and Eastern Bypass.

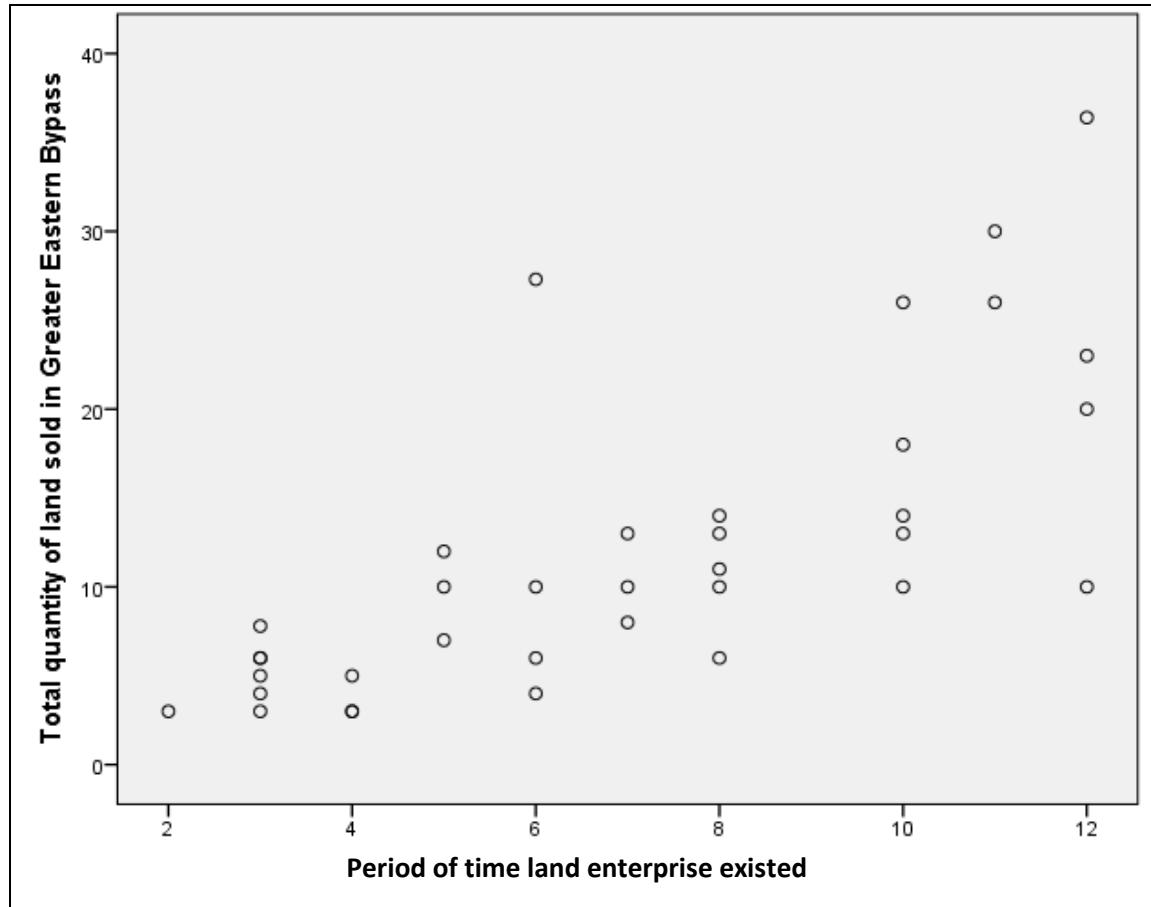


Figure 4-7. Correlation between quantity of land subdivided and existence of land enterprise in Greater Eastern Bypass

Table 4-3. Correlational analysis between quantity of land subdivided and period land enterprise existed in (Greater) Eastern Bypass

		Period of time enterprise has existed	Total quantity of land subdivided in Greater Eastern Bypass	Total quantity of land subdivided along Link Road	Total quantity of land subdivided along Eastern Bypass
Period of time enterprise has existed	Pearson Correlation	1	.731**	.575**	.660**
	Sig. (2-tailed)		.000	.000	.000
	N	36	36	36	36
Total quantity of land subdivided in Greater Eastern Bypass	Pearson Correlation	.731**	1	.687**	.687**
	Sig. (2-tailed)	.000		.000	.000
	N	36	36	36	36
Total quantity of land subdivided along Link Road	Pearson Correlation	.575**	.687**	1	.793**
	Sig. (2-tailed)	.000	.000		.000
	N	36	36	36	36
Total quantity of land subdivided along Eastern Bypass	Pearson Correlation	.660**	.687**	.793**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	36	36	36	36

** . Correlation is significant at the 0.01 level (2-tailed).

The number of land enterprises rose exponentially from 2008 to 2015 as land activities continued to increase (Figure 4-8). Land companies, individuals and land agents are the major actors in the land market on land abutting the five roads (Figure 4-5). Analysis of land subdivision data revealed that land enterprises are involved in irregular subdivision of land parcels (Table 4-1). This implies that land enterprises are likely to contravene subdivision guidelines in order to make more profit in their business, hence the need for proper enforcement of land laws. Most land buying enterprises acquire cheap land in

areas likely to attract development due to infrastructure development and hold it until they gain maximally from change in land values. About 70% of land buying enterprises subdivided land after 1 to 2 years after buying and sold part the of plots as they study the change in land prices; whereas 30% kept for 2 to 5 years before subdivision depending on location and value of land. Parcels abutting roads are kept longer before subdivision to allow for appreciation in prices for better returns. Two directors indicated that parcels away from road are subdivided and sold cheaply with limited profit margins to keep the enterprises in business. About 90% of land buying companies view land business as profitable since it appreciates rapidly compared to other commodities, with 85% indicating the major risk being buying land with fake registration documents or family land thronged with disputes.

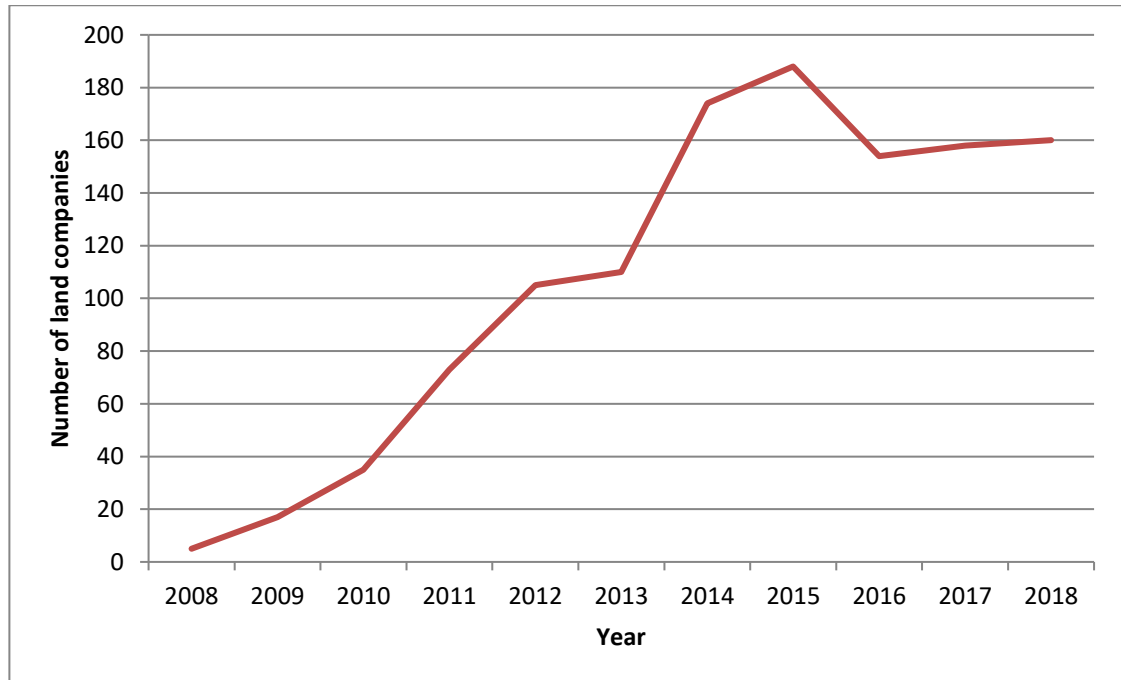


Figure 4-8. Trend of land enterprises in (Greater) Eastern Bypass

Three land companies confirmed to have accessed road design showing the road alignment, which assisted them to buy and hoard land closer to the bypass. 90% of subdivisions by land enterprises are residential since the main target is individuals who want to own homes. Some directors had registers containing names and details of land owned by members of Githunguri Constituency Ranching Company as a safeguard against being conned during sourcing and buying of land. Land bought from original owner was cheap since the owners did not know the value of land had increased due to the proposed bypass developments. The directors of three land buying companies with high number of subdivided parcels are relatives who started land selling business as early as 2006. They later registered each a land company between 2008 and 2009; their collaboration assisted them in buying and hoarding land before other land enterprises got into the market. These three land companies are among structural land speculators who were able to access prior information on planned public infrastructure and acted swiftly to acquire cheap land in strategic locations. Figure 4-2, Figure 4-4 and Figure 4-5 depicts structural land speculators as individuals and companies directly involved in planning of public infrastructure, connected political class, and government officials. Structural speculators are able to manipulate their way in accessing land along the transport corridors during planning and design phase ahead of public notification, which gives them a head start. These speculators aim at benefitting from land compensation, accessibility, increased value of their property and acquisition of large parcels of land along corridors of proposed development. While most of the land enterprises are normal land speculators that rely on official public notification of proposed plans to identify hotspots for land speculation, structural land speculators act on credible information

from planning authorities and institutions in charge of planning public infrastructure or land registration. It is during feasibility studies and site survey that ordinary landowners and agents become aware of upcoming road development. Land agents traced out beacons laid during survey work and use them as a bait to lure land buyers to buy land close to the upcoming development. In addition, some land agents act as brokers and are used by large land companies to source for credible agricultural land from farmers.

Land enterprises are aggressive in sourcing information on location and timing of the planned infrastructure development to help in acquiring land close to the project. Once they access preliminary plans, they create their advertisements to show location of the plots they are selling and proximity to the upcoming development. To make their adverts more attractive, some use Google maps to emphasize the location of their plots in relation to the planned infrastructure. Some of the land agents are original landowners who keep land while waiting to sell at higher price while some sell a portion retaining the rest for farming. Unlike land companies, agents and individuals, most cooperatives, self-help groups and welfare associations acquire suitable cheap land in an area likely to develop then later subdivide it among members. However, some cooperatives are owned by individuals as opposed to institutions and operate more like land companies where the individual acquire massive land, subdivide and sell to the public. One such example is Gakuyo Real Estate that was operating as a cooperative before closure and land subdivision data reveals that most of its land had been acquired under the director's name. Cooperatives, self-help groups and welfare associations constitute members of institution working together such as Thika Teacher's Housing Cooperative or people from different occupations unified by purpose. Women groups make up most of self-

help groups. Excess land acquired by cooperatives, self-help groups and welfare associations is sold out to non-members at a higher price while members buy at slightly lower price. These three have attracted many women since they offer an opportunity for them to own land, which they would not access through inheritance due to cultural limitations.

The challenge facing land enterprises are court impediments resulting from land disputes, corruption in land administration characterised by unauthentic land titles, and difficulty in tracing original landowners. Production of illegal land titles has contributed to increased land disputes and court cases. Though a title deed is a legal document showing ownership of land, sometimes the process of acquiring it may be unauthentic resulting to multiple ownership of the same parcel of land due to lack of credible land management information system.

Responses from land enterprises revealed that 55% raised capital to buy land through bank and cooperative loans (Figure 4-9), with many indicating that land documents such as title deeds for already paid land are used as collateral for more loans. The Director of Ngurish Limited, one of the land companies with the highest subdivisions explained that access to quick loans is critical in land business since one needs to act swiftly to secure land available for sale in a given area. He further explained that it is necessary to cultivate a business relationship with the bank or financial facility so that they can avail money even on a short notice. This is because as the number of land enterprises increase the competition to secure land for subdivision and sale also increase, hence the need to ensure a reliable source of capital. About 28% of land enterprises rely on personal

savings to run their land business while 17% finance their land business through group savings (Figure 4-9). About 90% of the land enterprises that relied on personal savings are land companies that were established before 2008, indicating that their businesses are thriving and entering the land market early optimizes land businesses. Cooperative societies, welfare associations and self-help groups constitute the land enterprises that rely on group savings to raise capital for buying land and running the land businesses. Capital raised through group savings is dependent on the size of membership and the amount contributed by each member. The monthly contribution for different groups ranged between Ksh. 1,000 and 5,000, while the membership ranged between 15 and 250 individuals. Uhuru Welfare Association based in Juja town had the highest membership at 270, with 75% being motorcycle and taxis operators, which is an indication, that membership of most welfares and self-help groups constitutes persons in the same economic engagements. The welfare association was among the land enterprises with the highest number of subdivided land in the (Greater) Eastern Bypass. All parcels of land subdivided by the welfare are located along the Greater Eastern Bypass, suggesting the group may have been formed after realizing an opportunity to speculate on land.

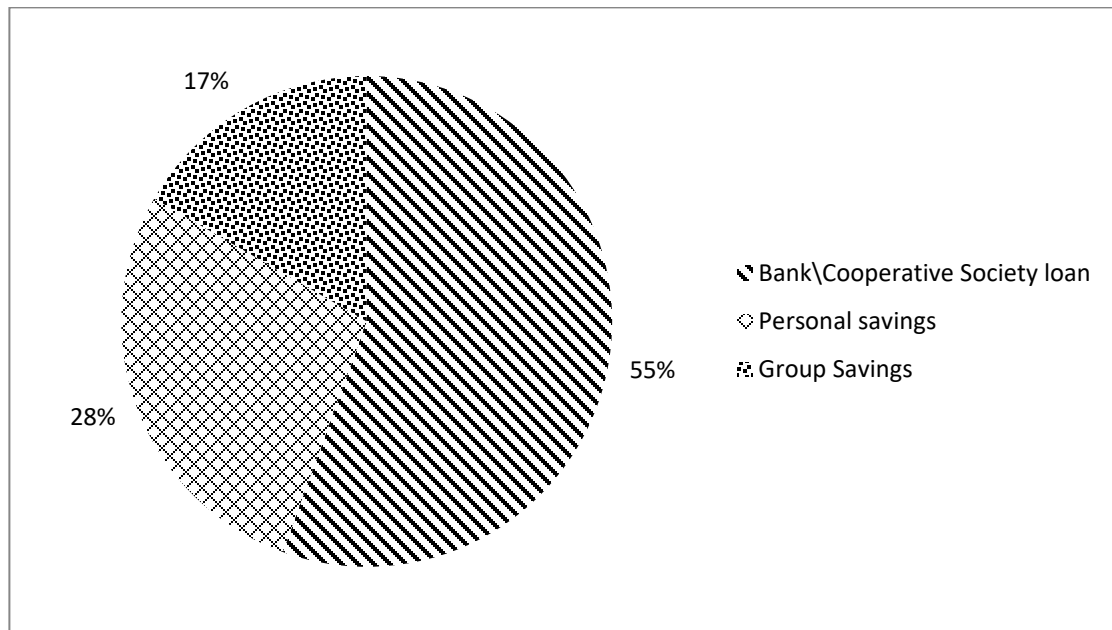


Figure 4-9. Sources of capital for land enterprises to finance land business

Analysis of data to ascertain motivation of land enterprises in land business indicates that 60% is motivated by the high profit margin since it is possible to sell land at 2 to 3 times the buying price. 25% felt land business is easy to operate with significantly reduced risks compared to other businesses. The low risk is associated with the fact that land can be held for long with high appreciation of land price unlike other commodities that may expire or incur cost for storage and transportation. 15% felt that land business is easier to run in Kenya compared to other businesses since there is no structural regulation and it is possible to run a “*briefcase*” land business where one buys, subdivides and sells land under their name. 10% of the respondents indicated that land business is good since it is possible to start in most of the peri-urban areas of major towns in Kenya where land value is still low. However, competition among the land enterprises is the greatest deterrence for new and upcoming land businesses.

From the interviews responses it emerged that land business is considered easier to start as the only cost incurred by land agents is capital to buy land, with subdivision fee that ranges between Ksh 200-400 per plot and 4% of land price as stamp duty is accrued during land transfer. In most cases, the land buyer as separate payment pays the 4% stamp duty from the land amount. The director of Ngurish Limited explained that he previously operated land business without a registered company for years. However, as the business grew, a land company became necessary for marketing of plots as well as access loans from banks and cooperative societies. As noted during the interviews most of the land enterprises after subdividing land they would sell the plots and issue share certificates (Plate 4-1) and after all plots are sold then the seller will start the process of transferring ownership to the buyers. The share certificate or certificate of ownership is not a legally binding document, and thus at times has been used by some land enterprises to con land buyers.

Certificate No. 1889..... Block CATHOLIC⁸ Size 50x100

CORNERSTONE ONE ENTERPRISES LTD
P.O. BOX 7529-00200 NAIROBI

Certificate of Ownership

This is to Certify that
Mr./Mrs./Miss

Name HANNAH WANJIRU KINUTHIA ID No. 24170487
0723057166

is the registered owner of Plot No. 3..... Block 2639.....
located at RUIRU EAST/ISUA EAST BLOCK 2/2639 in the
New Thika District

Issued on this Day 22nd..... Month DECEMBER Year 2015.

Issued under the common seal of **CORNERSTONE ONE ENTERPRISES LTD.**

For the Directors
Chairman's Sign.....
or
Secretary's Sign.....
Date of Issue 22/12/2015.....

**NOTE: This Certificate has been issued without any erasure or alteration
No transfer of the above plot can be registered UNLESS accompanied by the original of this Certificate**

Plate 4-1. Sample share certificate/certificate of ownership

4.2.5 Does Infrastructure Public Policy Planning Influence Peri-Urban Land Speculation in (Greater) Eastern Bypass?

The period of time land enterprises knew about the planning of (Greater) Eastern Bypass is regressed against the total quantity of land subdivided by an enterprise where a significant relationship is observed (Table 4-5). As presented in the Table 4-4 the coefficient of determination (R square) is 0.205 along Eastern Bypass, 0.314 along Greater Eastern Bypass and 0.303 along the Link Road while R is 0.452, 0.560 and 0.550 respectively. The R Square value indicates that 20.5%, 31.4% and 30.3% of the variation on the quantity of land subdivided along Eastern Bypass, Greater Eastern Bypass and Link Road respectively is influenced by the period an enterprise first learnt about development of the bypasses.

Table 4-4. Model summary of regression between period of time a land enterprise knew about the bypasses and quantity of land subdivided in (Greater) Eastern Bypass area

Eastern Bypass	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.452 ^a	0.205	0.181	3.515

a. Predictors: (Constant), Period of time land enterprise learnt about development of Eastern Bypass

b. Dependent Variable: Total quantity of land subdivided along Eastern Bypass

Greater Eastern Bypass	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.560 ^a	0.314	0.294	7.179

a. Predictors: (Constant), Period of time a land enterprise learnt about development of Greater Eastern Bypass

b. Dependent Variable: Total quantity of land subdivided in Greater Eastern Bypass

Link Road	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.550 ^a	0.303	0.282	3.6558

a. Predictors: (Constant), Period of time a land enterprise learnt about development of Link Road

b. Dependent Variable: Total quantity of land subdivided in along Link Road

Beta coefficients of the time a land enterprise learnt about development of the bypasses versus total quantity of land subdivided along Eastern Bypass, Greater Eastern Bypass and Link Road shows a regression coefficient of 1.343, 3.038 and 1.507 respectively (Table 4-5). This indicates that a single unit change in the time a land enterprise learnt about development of the bypasses causes total quantity of land subdivided along Eastern Bypass, Greater Eastern Bypass and Link Road to increase by 1.343, 3.038 and 1.507 units respectively. The significance level for this dependent variable is Eastern bypass 0.006, Link Road 0.000 and Greater Eastern Bypass 0.001. This is less than 0.05,

which implies that time a land enterprise learnt about development of the bypasses is statistically significant in explaining the variations in total quantity of land subdivided in along (Greater) Eastern Bypass.

Table 4-5. Regression coefficients of period of time a land enterprise knew about the bypasses and quantity of land subdivided along (Greater) Eastern Bypass

Eastern Bypass	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-4.449	3.656		-1.217	.232
Period of time an enterprise knew about development of Eastern Bypass	1.343	.454	.452	2.957	.006
a. Dependent Variable: Total quantity of land subdivided along Eastern Bypass					
Greater Eastern Bypass	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-1.713	3.685		-.465	.645
Period of time an enterprise knew about development of Greater Eastern Bypass	3.038	.770	.560	3.946	.000
a. Dependent Variable: Total quantity of land subdivided along Greater Eastern Bypass					
Link Road	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.122	1.877		.065	.949
Period of time an enterprise knew about development of Link Road	1.507	.392	.550	3.844	.001
a. Dependent Variable: Total quantity of land subdivided along Link Road					

Therefore, there is significant relationship between public policy planning and peri-urban land speculation, hence the null hypothesis is rejected.

4.3 Land Development Pattern in (Greater) Eastern Bypass Peri-Urban Area

4.3.1 Land Use/Cover Change in (Greater) Eastern Bypass Area

Land use cover for the year 2000 constitutes of grassland with the largest coverage of 8201Ha, followed by farmland at 6102Ha, then riparian reserve and rivers at 1208Ha and the smallest is the built up area with 408Ha (Figure 4-10). There is active small-scale sisal farming on the land along the proposed Greater Eastern Bypass, which may have accounted for the percentage of land under farming. Grassland accounts for the highest coverage possibly because absentee owners who are residing elsewhere owned part of the land. In addition, after the collapse of large scale, farming the land was abandoned and the natural vegetation grew hence increasing percentage of area under grassland.

Land use classes for 2005 are grassland occupying the largest area of 9003Ha; farmland at 5697Ha, built up area at 848Ha and riparian reserve and rivers at 573Ha (Figure 4-10). Area under grassland increased by 9% from 2000 to 2005, possibly because of a decline in farming attributed to the fact that the study area is located in semi-arid area and most of the farming relies on the rains. The poor performance of market for sisal products may have contributed to reduction in farming. The built up area increased by 51% with much of the concentration on the land along the Eastern Bypass, possibly because subdivision on this land began in 2003 when the government began the initial plans to construct the bypass and notice for demolition to clear the corridor had been given.

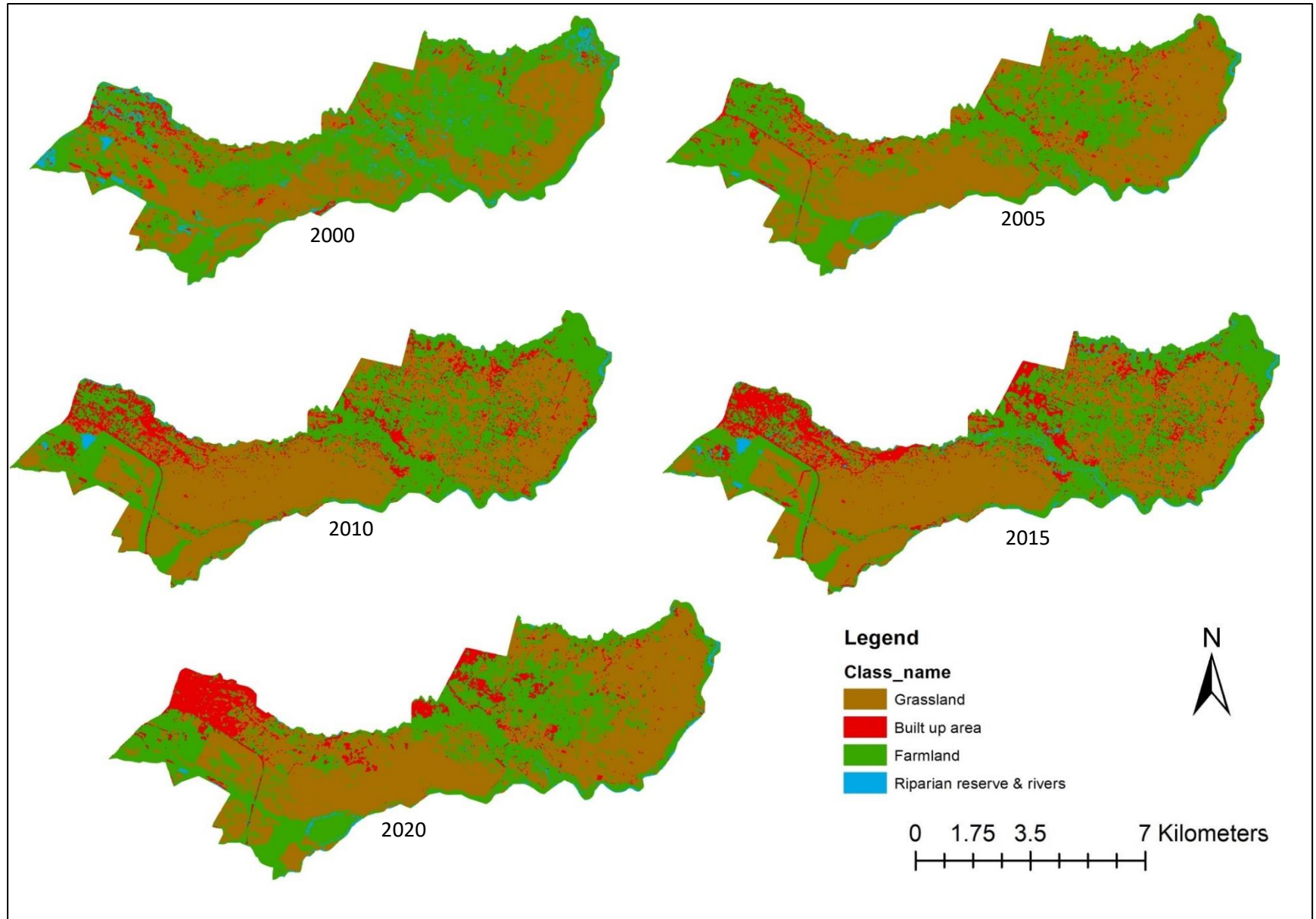


Figure 4-10. Land Use/Cover change for 2000-2020

Land use classes for 2010 are grassland occupying the largest area of 9276Ha; farmland at 5240Ha, built up area at 1132Ha and riparian reserve and rivers at 474Ha (Figure 4-10). Grassland increased slightly by 0.02% while farmland decreased by 9% from 2005. The built up area increased by 25% with the highest concentration along the Eastern Bypass, which is 60%. In addition, the construction work for upgrading Thika Highway from dual carriage to a highway had just been concluded, thereby increasing connectivity and reducing on travel time.

Land use classes for 2015 are grassland occupying the largest area of 9037Ha; farmland at 4796Ha, built up area at 1794Ha and riparian reserve and rivers at 494Ha (Figure 4-10). Grassland and farmland decreased by 3% and 9% respectively, while built up area grew by 37%. Notably, there is no significant increase of built up area on land along the proposed Link Road and Greater Eastern Bypass where approximately 70% is grassland, 25% farmland, 5% built up area and 5% riparian reserve and rivers. On the contrary, 45% of the land had been subdivided into plots for residential and urban use.

Land use classes for 2020 are grassland occupying largest area of 8,791Ha; farmland at 4,666Ha, built up area 2,103Ha and riparian reserve and rivers 542Ha (Figure 4-10). In 2020 the built up area increased by 15%, with most of the development is concentrated along the Eastern Bypass. About 75% of the land along the Link Road and Greater Eastern Bypass remained bare, possibly because most of the subdivided land was waiting to be sold or those sold to be developed. Most of the farming is concentrated along the rivers on the periphery. Though farming declined by 3% from 2015 to 2020, there are commercial farms that have been developed along rivers closer to the proposed

Greater Eastern Bypass possibly taking advantage of the improving transport connectivity to allow transportation of produce.

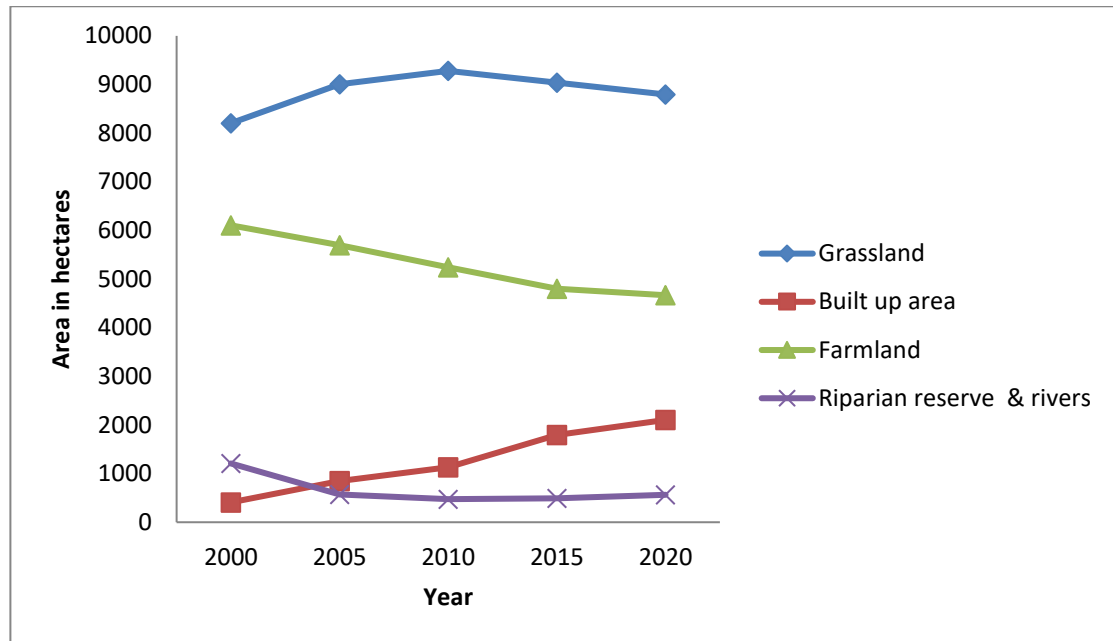


Figure 4-11. Land use/cover trends between 2000 and 2020

From the summary in Figure 4-11, only the built up area has experienced positive change within the study period, which is attributed to urbanization that has been spurred by infrastructure development. Farmland declined within the same period and can be attributed to land subdivision where at least 45% of parcels originally used for small-scale farming have been subdivided into smaller plots for urban use, which are not economical for agriculture. In addition, the subdivided land was sold out to buyers whose interest is either to speculate on the land and sell it when land value increases or to hold the land until it is suitable for development. Grassland area increased between 2000 and 2010, possibly because of farmers abandoning farming while the decline between 2010 and 2020 is because of increasing built up area. There is an inverse

relationship between the area under grassland and the built up area since as grassland decreases the built up area increases which suggests that grassland is a transitional use when land is converted from farming to urban use.

4.3.2 Land Development Patterns in (Greater) Eastern Bypass Area

The large farms that covered 12,000Ha were subdivided between 1983 and 1987 into smaller portions of 0.5Ha and 0.125Ha along Eastern Bypass and Link Road and 1.3Ha and 0.125Ha along Greater Eastern Bypass to members who owned the cooperatives and land companies' shares (Figure 4-12). The 0.125Ha parcels were meant for residential use and are majorly concentrated along rivers while the 0.5Ha and 1.3Ha were for agricultural use. The subdivided parcels were allocated to individuals depending on how many shares one had at the company or cooperative where one share was equal to 0.5Ha and 0.125Ha along the Eastern Bypass and Link Road while 1.3Ha and 0.125Ha along the Greater Eastern Bypass. In addition to the subdivisions for agricultural and residential use, there was land set apart for public use during the 1983-1987 land adjudication. These parcels for public use occupying at least 314Ha were not evenly distributed compared to a number of subdivisions around the parcels. Land along the Eastern Bypass had 126Ha against 1287Ha, Link Road had at least 141Ha against 2676Ha while the land along Greater Eastern Bypass had 47Ha against 8190Ha (Figure 4-12). In the reserved parcels, some amenities were developed such as schools to cater to initial settlers who were mainly former workers. However, about 20% of the reserved land has been utilized while most of the remaining 80% has been encroached on. The initial subdivisions paved the way for land development and small-scale farming, however, only a small population settled on the subdivided land.

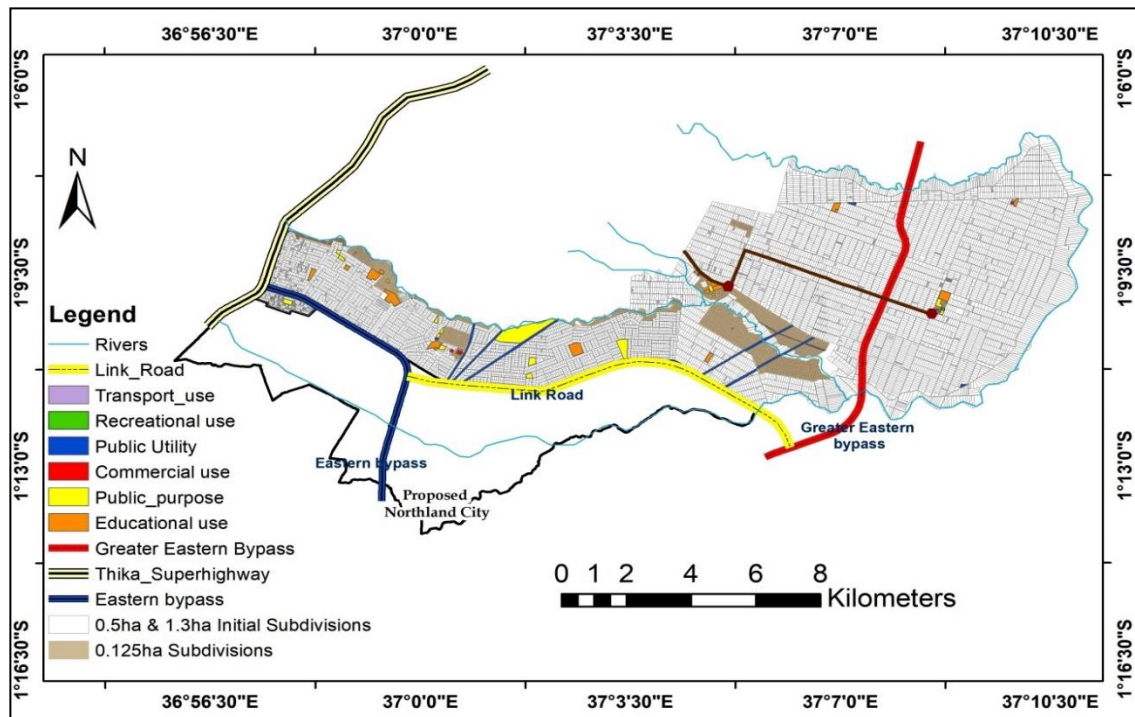


Figure 4-12. Distribution of reserved land in (Greater) Eastern Bypass

The land cover/use map for 2000 (Figure 4-10) shows that 2.6% of land had been developed. Further fragmentation of land in the study area continued from 2005, where the 1.3Ha and 0.5Ha parcels were subdivided into units of 0.03Ha to 0.042Ha for residential and other urban use (Table 4-1). About 35% of land in the study area had been subdivided by 2018, which paved way for more development and increased density. By 2020 (Figure. 4-10) the built-up area had increased from 2.6% in 2000 to 14% in 2020, suggesting that land subdivision paved way for development and contributes to different development patterns in peri-urban areas. As more land is subdivided and the smaller units taken by different landowners, there is a likelihood of development patterns shifting from leapfrogged and low-density development to compact high and low-density development.

Land development in 2000 is characterized by dispersed development with only about 3% of the land developed. Most of the development is concentrated closer to Thika Highway and the density per 0.5Ha parcel decreases as distance increases into the interior. Figure 4-13 shows that part of the land along the Eastern Bypass and the Link Road has leapfrogged development while cluster and ribbon development is observed along Greater Eastern Bypass. Ribbon development is mainly observed along the Ndarugu River and at the junction between Nairobi and Ruiru Rivers. Two public schools, a secondary and primary school, were among the initial developments along the Eastern Bypass developed in the early 1990s while Juja Farm Trading Centre along the Greater Eastern Bypass formed a cluster of development. More clusters are observed some distance from the town, majorly on 0.125Ha parcels that are closer and along the Thiririka River.

Most of the development in 2005 is concentrated on the land adjoining Thika Highway with scattered development on the interior (Figure 4-12) along the Eastern Bypass which had not been developed. The density of developed parcels decreases as the distance from Thika Highway increases. At 1km buffer from Thika Highway, the density per parcel is about four buildings on a 0.5Ha parcel, while at 3-4km buffer the density per parcel decreases with most parcels being vacant. Land abutting Link Road, Greater Eastern Bypass and Juja Farm Road is characterized by scattered development with 90% being undeveloped. Ribbon development is observed along Ndarugu, Ruiru, Juja and Nairobi River, where water from the rivers supports farming and household activities.

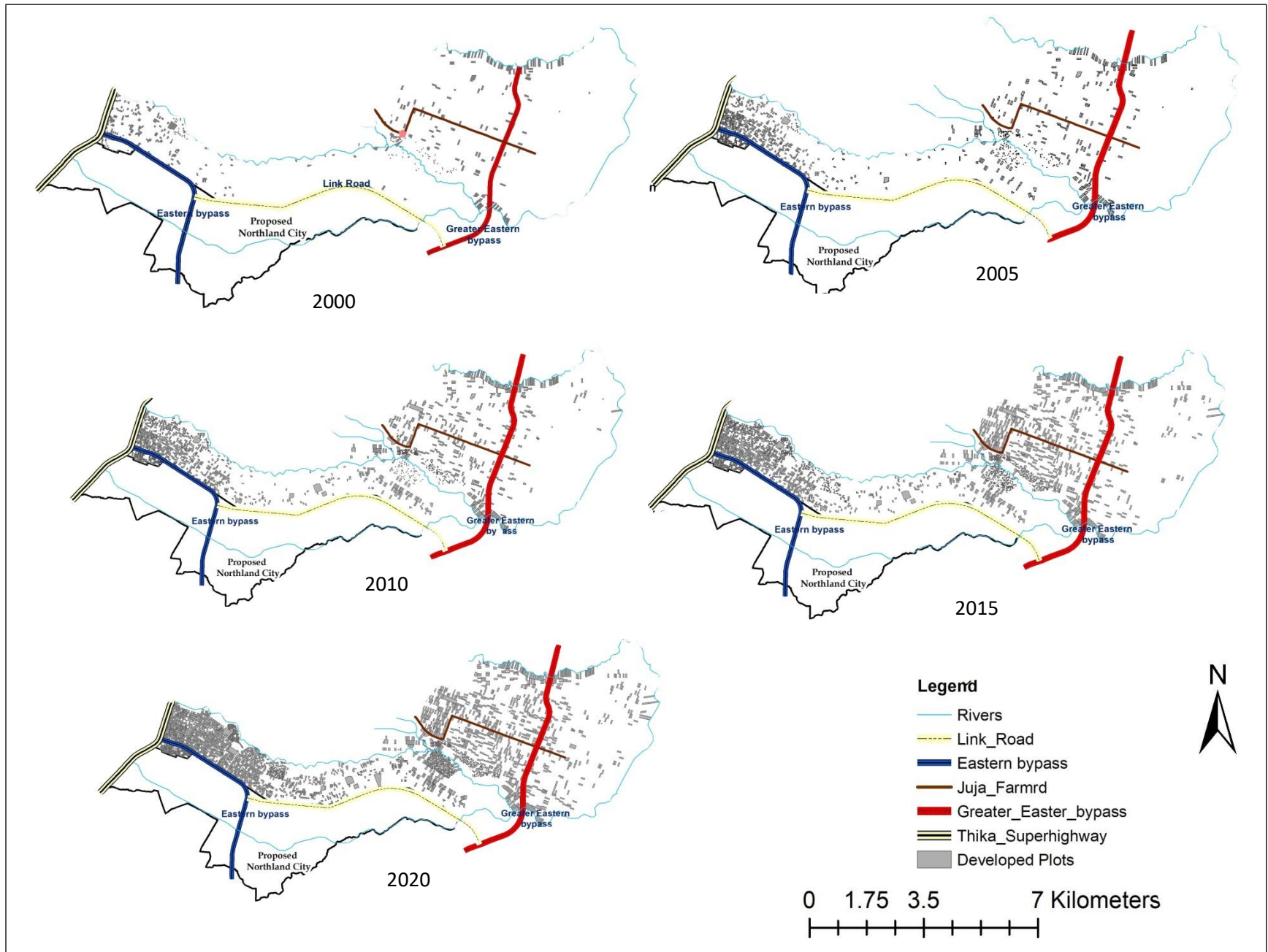


Figure 4-13. Land development pattern in (Greater) Eastern Bypass 2000-2020

There are clusters of development along Eastern Bypass concentrated around a borehole that was sunk in 1998 by a Gatong'ora Water Community Development and serves as a source of domestic water. Though development along Greater Eastern Bypass and Juja Farm Road is largely scattered, clusters are observed within 1km radius of Juja Farm Trading Centre, which is a colonial centre, thus a growth nucleus in the area.

The construction of Eastern Bypass in 2010 triggered linear development, which is characterized by meat barbecue “*Nyama Choma*” eateries and hardware shops (Figure 4-13). The proliferating eateries are because of Kenyan culture of eating meat while drinking beer. The hardware shops are because of increased construction and land development within the catchment. Development on 250m buffer of Eastern Bypass are majorly mixed, comprising of apartments, shopping malls, shops and vacant parcels that are under farming, but as one moves into 500m and 1000m the character changes to mixed density residential units (Figure 4-13). The residential units are built on different sizes of plots and vary from townhouses, detached, apartments and single units. High-density continuous development is observed at the road junction of Eastern Bypass and Thika Highway. Other road junctions such as between Eastern Bypass and Link Road lacks growth since the Link Road had not been developed. Development along the Link Road is scattered with few settlements near two schools, which were developed in 2009 and 2011 respectively. There is low-density linear development along Juja Farm Road and radial development around Juja Farm Trading Centre. The church, school and monastery developed around the Juja Farm Trading Centre contributed to the radial development. There is notable leapfrogging on the land along the Link Road where development leaped from Eastern Bypass to the land along Juja Farm Road

By 2015, 80% of plots on 250m buffer on one side of Eastern bypass have been developed, where the character has changed from the shops and “*Nyama Choma*” eateries to high-rise office blocks, warehouses with lower floors being taken up by chain stores such as Naivas and Quick Mart (Figure 4-13). Beyond the 250m buffer several gated communities developed along the Eastern Bypass that mostly comprise of 10-20 maisonette in one compound. These gated community development contributes to compact, but low-density development as opposed to linear high-density development on 250m buffer of Eastern Bypass. Clusters of development are observed along the Greater Eastern Bypass and Juja Farm Road comprising mainly families and small groups such as welfares and workmates who are among initial settlers of subdivided land.

Between 2015 and 2020, the density of development increases to 85% along the Eastern Bypass and Thika Highway and it is more continuous with few undeveloped parcels (Figure 4-13) while along the Link Road and part of Greater Eastern Bypass are largely leapfrogged. Development is concentrated on the western side of Greater Eastern Bypass, along Juja Farm Road and around Juja Farm Trading Centre. On land abutting Greater Eastern Bypass and Link Road, development is largely low-density with a parcel of 1.3Ha having one settlement unit. Some landowners settled on a portion of their land and subdivided the rest for sale. Notably, the number of planned developments increased along Eastern Bypass characterized by residential units of 2 to 3 prototypes with utilities such as piped water, surveillance cameras, community waste treatment plant, street lighting and additional amenities such as children play area, swimming pool, recreational parks, club house, kindergartens depending on the size of the

development. Planned development units contribute to continuous, compact low-density development pattern along Eastern Bypass, where most are concentrated. Low-density linear development is observed along the Greater Eastern Bypass, which is yet to be developed and Juja Farm Road, which is earmarked for upgrading to asphalt.

4.3.3 Measure of Subdivision Distances along (Greater) Eastern Bypass Area

Figure 4-14 shows that the number of subdivided parcels increased with distance from Eastern Bypass with most of the subdivisions happening between 0.5Km and 2Km from the bypass. Similar observation is made along the Link Road where the highest number of 49 parcels is subdivided between 0.5Km and 2Km from the road. Along the Greater Eastern Bypass, the highest number of subdivisions happened between 1Km and 5Km from the bypass. Juja Farm Trading Centre that is located 4km west of Greater Eastern Bypass may have influenced more subdivisions on the western side, although the highest number of 36 parcels is observed in 2014 east of Greater Eastern Bypass (Figure 4-14).

The average distance of most of parcels subdivided along the Eastern Bypass ranges between 500m and 1000m with the farthest being 2Km from the bypass (Figure 4-15). Notably, parcels within 2Km buffer from Eastern Bypass are mainly 0.5Ha in size and those beyond 2Km up to the edge of the river are 0.125ha. The 0.125Ha parcels are too small to subdivide and thus most land enterprises concentrated on the 0.5Ha parcels abutting the bypass. Three epochs can be discerned from the Figure 4-15 between 2005 and 2007 which is before public notification of development of Eastern Bypass where the average distance for subdivision is between 300m and 1700m and the distance range

changes to 200m to 1300m during public notification 2008 to 2013. Thereafter the distance range increases to 500m to 2000m. This observation suggests that more land is subdivided closer to the road before and during public notification and after public notification subdivisions are extended to the land beyond.

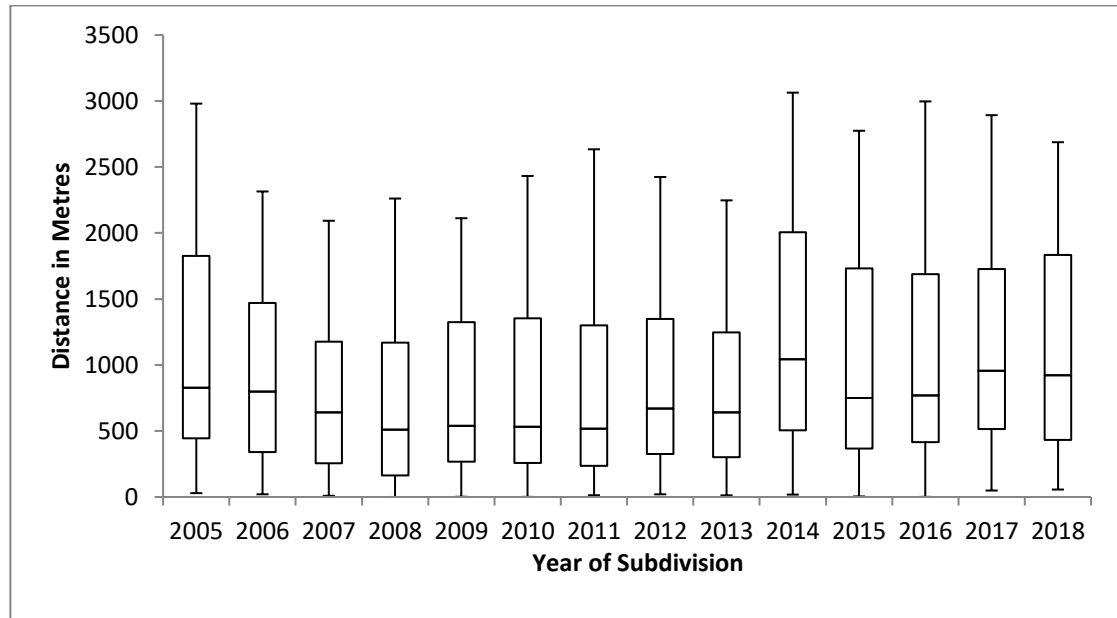


Figure 4-14. Average distance from subdivided plots to the Eastern Bypass

The average distance of subdivided plots along the Link Road ranges between 600m and 1000m with the farthest being 1800m from the Link Road (Figure 4-16). Similar to the land along the Eastern Bypass, the 0.5Ha parcels are located with 2.2Km buffer from the Link Road while the land beyond up to the edge of the river comprise of 0.125Ha which are not profitable for subdivision. The average distance between 2008 and 2012 which is the period before public notification, is 500m to 1200m and this increases to 1000-1800m in 2014, a year after public notification. This suggests that after public notification land enterprises could not leverage the subdivision on the upcoming infrastructure since the information is in public domain.

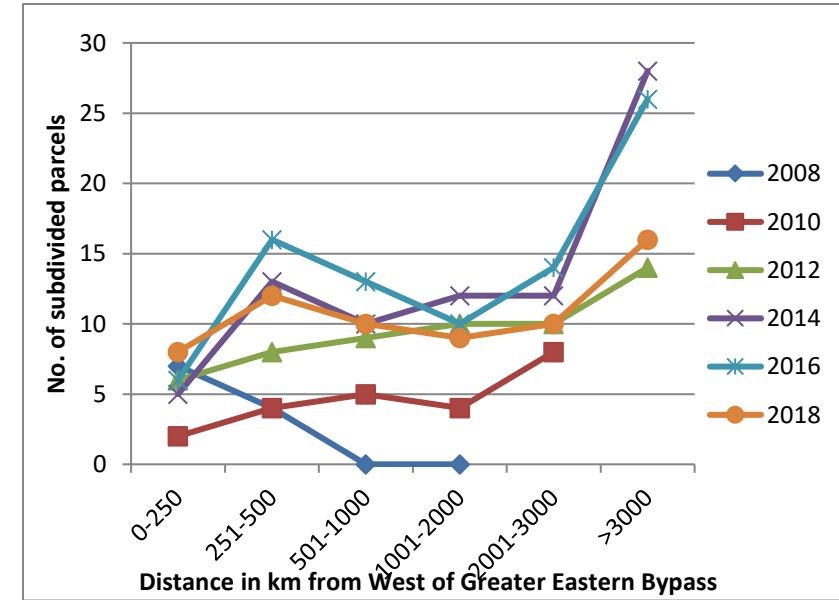
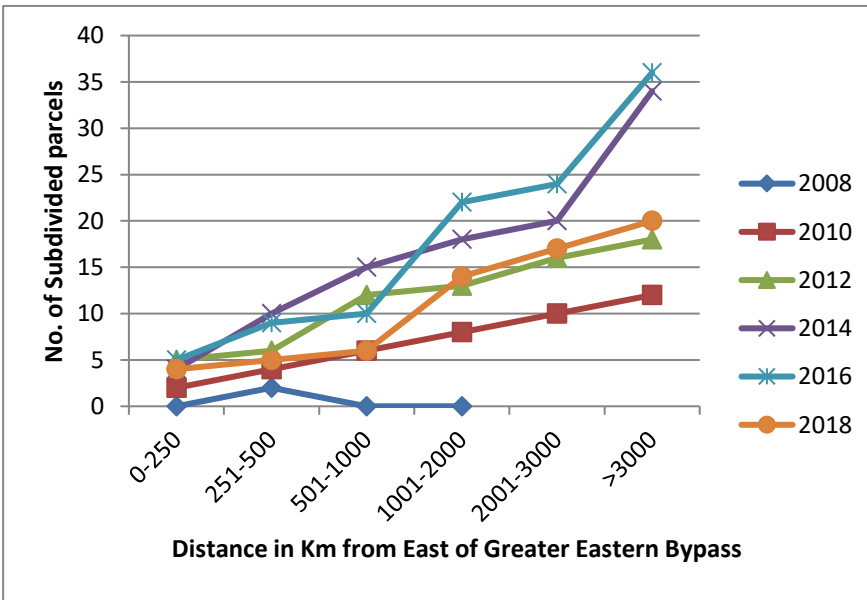
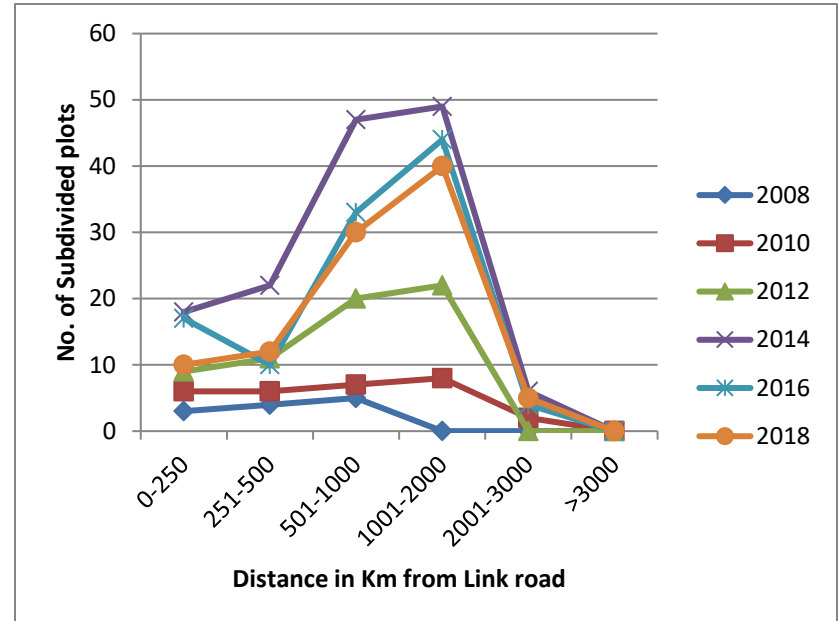
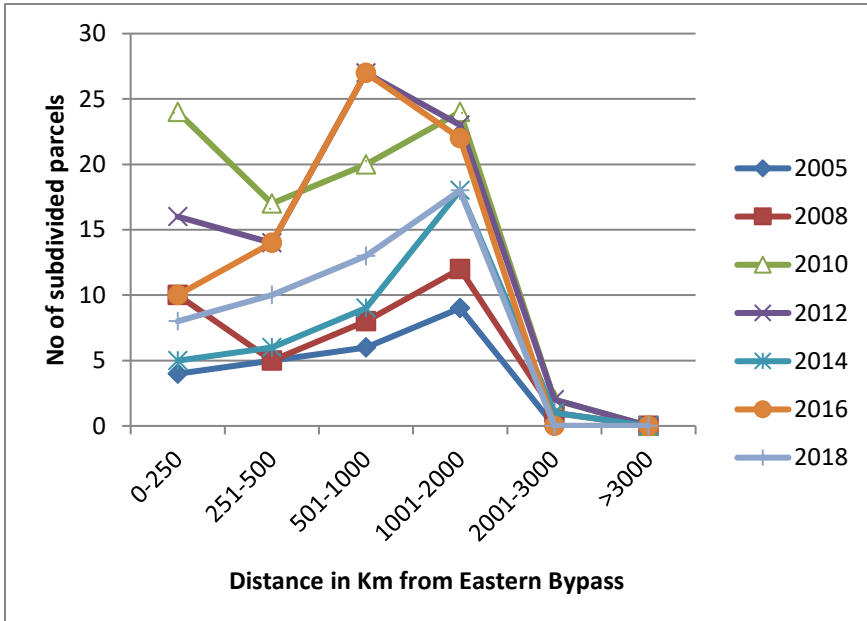


Figure 4-15. Number of subdivided parcels against change in distance along (Greater) Eastern Bypass

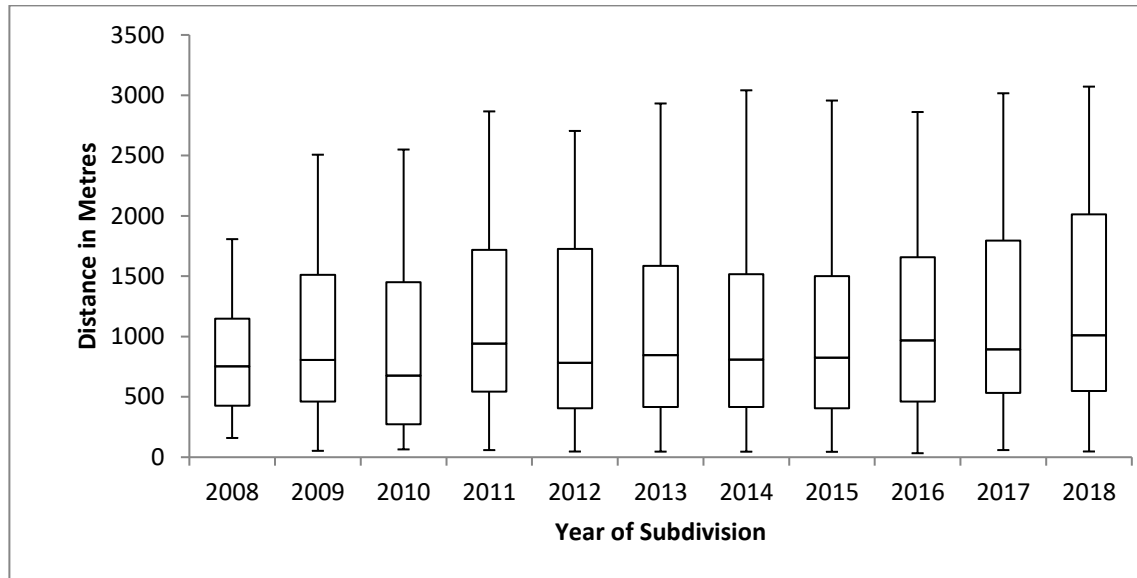


Figure 4-16. Average distance from subdivided plots to the Link Road

The average distance to subdivided plots along the Greater Eastern Bypass ranges from 1.5km to 2.5km with the farthest being 5km away (Figure 4-17). The Greater Eastern Bypass cut through expansive Juja Farm, which is almost at the centre; hence there are huge tracks of land on the East and West. Juja Farm Trading Centre is a colonial centre located 5km from the proposed route of the bypass. The land along the Greater Eastern Bypass has the highest number of subdivision, first because its location is more marginal than land along the Link Road and Eastern Bypass, which is closer to other developed infrastructure and better transport connectivity. Consequently, many land enterprises are able to obtain cheaper land to subdivide and speculate on. The subdivision along Greater Eastern Bypass are slightly more on the eastern side of the bypass suggesting that the location of bypass is a key driver of land subdivisions.

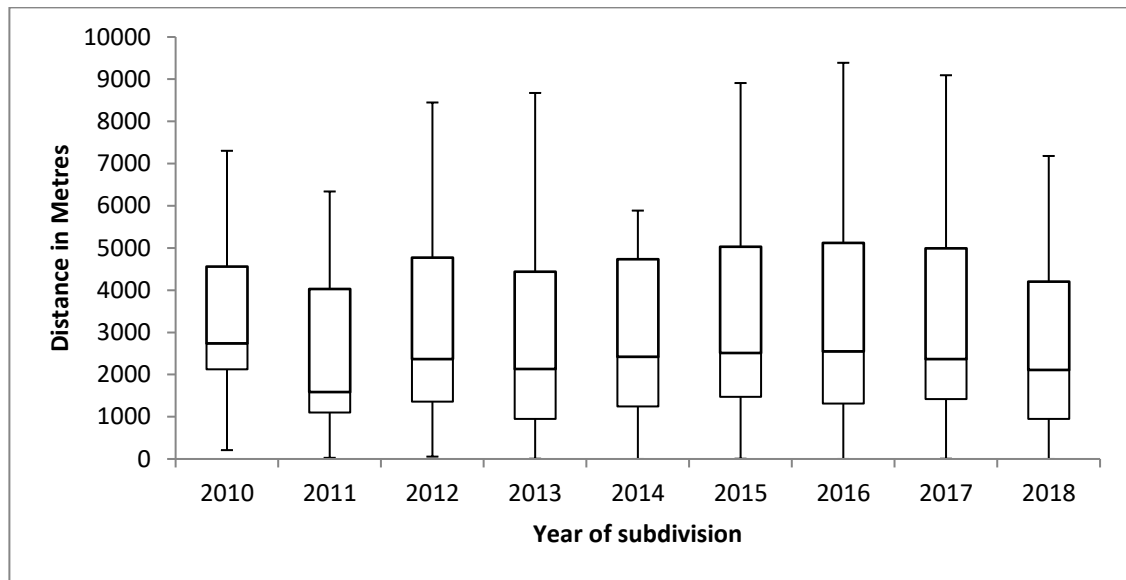


Figure 4-17. Average distance from subdivided plots to the proposed Greater Eastern Bypass

4.3.4 Leapfrog Development in (Greater) Eastern Bypass Area

Thika Highway has the lowest leapfrog index ranging from 0.6 in 2008 to 0.25 in 2020 on 500m buffer (Figure 4-18). Along the Eastern bypass, leapfrogging declined significantly after construction of the road between 2008 and 2012, with leapfrog measure of 0.4 in 2020 on 1000m buffer and drops to 0.25 in 250m buffer. Out of 2088 parcels analysed in 250m buffer of Eastern Bypass, approximately 60% of developable land have not been developed in 2008, 55% in 2012, 43% in 2016 and 25% in 2020 (Figure 4-18). Developments on the 250m buffer are majorly mixed, comprising of apartments, shopping malls and shops, but as one moves into the 500m and 1000m buffers, the character of land use changes to mixed density residential units. Steady growth is observed along the Eastern Bypass between 2012 and 2016 with a 20% decline in leapfrog measure compared to the Link Road, which experienced moderate growth with less than 10% change (Figure 4-17). The highest regression of leapfrog is observed

on 250m buffer along Thika Highway between 2016 and 2020 that changed by 25%. The growth seen on the 250m buffer along Thika Highway and Eastern Bypass between 2012 and 2020 can be attributed to infill commercial development triggered by the upgrading of the roads and other upcoming private developments such as Northland City. Along Juja Farm Road, leapfrog measure changed from 0.6 to 0.4 on 250m between 2008 and 2013, the period when there were political campaigns that stimulated supply of some infrastructure such as electricity and upgrading of access roads.

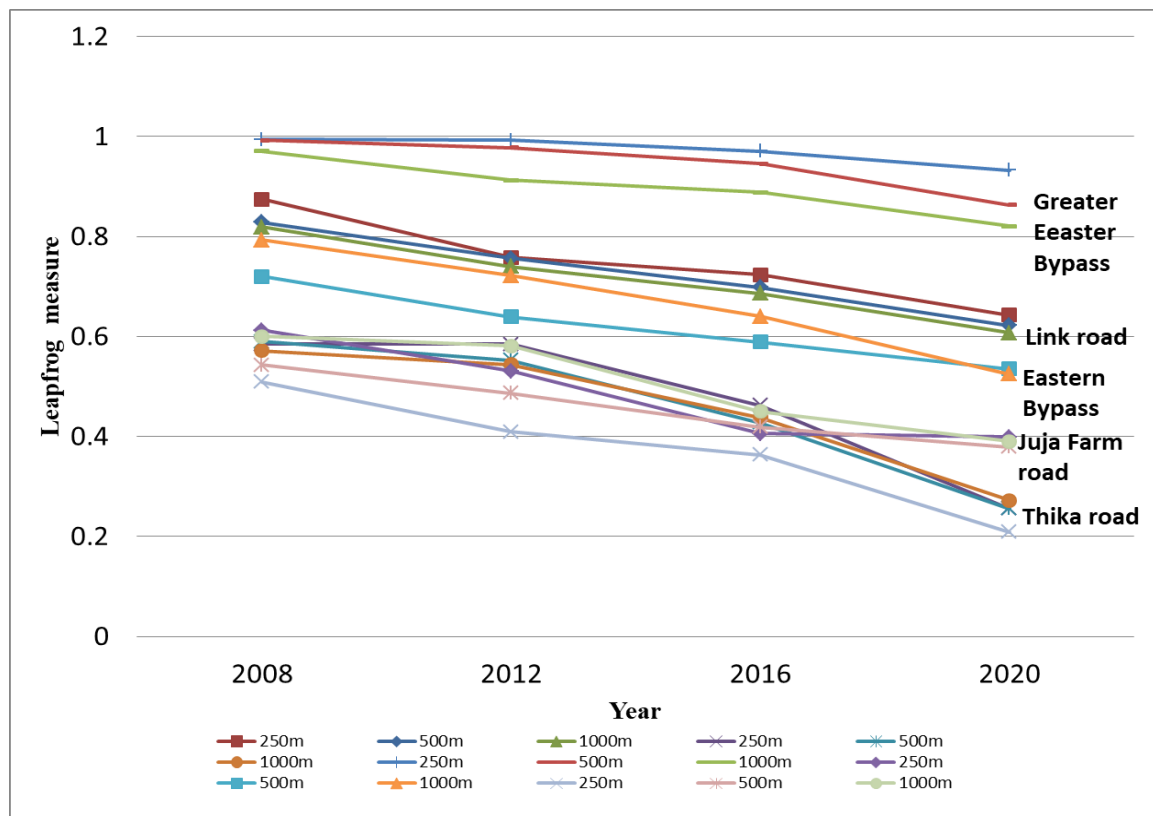


Figure 4-18. Leapfrog measure in (Greater) Eastern Bypass

Leapfrog measure along the Greater Eastern Bypass and Link Road is significantly high ranging between 0.978 and 0.929 in 2008 and the change or decline from one period to the other is minimal. However, leapfrog measure for Juja Farm Trading Centre is lower in 2008 at around 0.7 and it decreases to 0.4 in 2020. The land abutting the Link Road

and Greater Eastern Bypass has been a hot bed for land speculation from early 2010 when planning and design of the road was in process. The land along the two roads has the highest leapfrog measure ranging between from 0.9 and 0.75, thereby suggesting that presence of land speculation does not necessarily infer development of land. A notable observation is that leapfrog measure along all the roads declined over a period of time albeit at different rates. Leapfrog development is therefore temporary, transitional and it depends on a myriad of factors that triggers development in a given area.

Correlation analysis between the number of subdivided parcels and leapfrog measure for Eastern Bypass and East of Greater Eastern Bypass indicates positive correlation of 0.749 to 0.96 (Table 4-6). This implies that as distance increases from the road, leapfrogging increases between 2012 and 2020. On the contrary, there is a negative correlation (-0.99 to -0.283) between leapfrog measure and number of subdivided parcels along the Link Road and West side of Greater Eastern Bypass, which suggests that increase in subdivision did not increase leapfrogging. Juja Farm Trading Centre, which is 4km west of Greater Eastern Bypass, may have influenced more land development around the town. In 2008, which is before planning of Greater Eastern Bypass, land development around the town is minimal, while the correlation is positive. The negative correlation along the Link Road can be explained by the fact that the road has not been constructed and the proposed location of the road is along the edge of proposed Northland City, which is private land hence easiest access to the land along Link Road is through Eastern Bypass, which is a longer route. The distances of subdivided land from the major roads are therefore, a useful base indicator for

leapfrogging. There is a relationship between subdivision and development (Table 4-6) since development occurs on land subdivided and allocated for that purpose.

Table 4-6. Correlational between leapfrog measure and number of subdivided parcels

Subdivided parcels from the road	Leapfrog Measure (1000m buffer)			
	2008	2012	2016	2020
Link Road	-0.97962	-0.93259	-0.99034	-0.9844
West Greater Eastern Bypass	0.990669	-0.90723	-0.28355	-0.7771
East Greater Eastern Bypass	0.995892	0.953413	1.00	0.95044
Eastern Bypass	0.037033	0.749419	0.736876	0.96895

4.4 Land Prices in (Greater) Eastern Bypass Area

Land along the Eastern Bypass has the highest land values with land prices changing by over 1200% from 2008 to 2018 (Figure 4-19). A parcel of land that costed Ksh 200,000 in 2008 increased to Ksh 5,000,000 in 2018. Along the Link Road, the variance in land prices is about 300% while along the Greater Eastern Bypass the variance ranges between 250% and 360% (Figure 4-19). Before construction of Eastern Bypass, land prices per hectare ranged between Ksh 6,000,000 and Ksh1, 800,000. Proximity to a major road and accessibility are two factors that dictate the highest and lowest price of land. Land closer to Thika Highway and at the junction between Eastern Bypass and Thika Highway is the most expensive while the cheapest land is along the Greater Eastern Bypass, which is yet to be developed and where minimal infrastructure existed. Figure 4-20 illustrates the mean prices per hectare of land in (Greater) Eastern Bypass between 2008 and 2018. There is a steep rise in land prices along the Eastern Bypass between 2014 and 2016, probably attributed to increased infill development and commercial frontier development along the Eastern Bypass. Land along the Greater

Eastern Bypass has the lowest land values attributable to undeveloped infrastructure such as the Greater Eastern Bypass that would have increased accessibility and connectivity to surrounding urban centres.

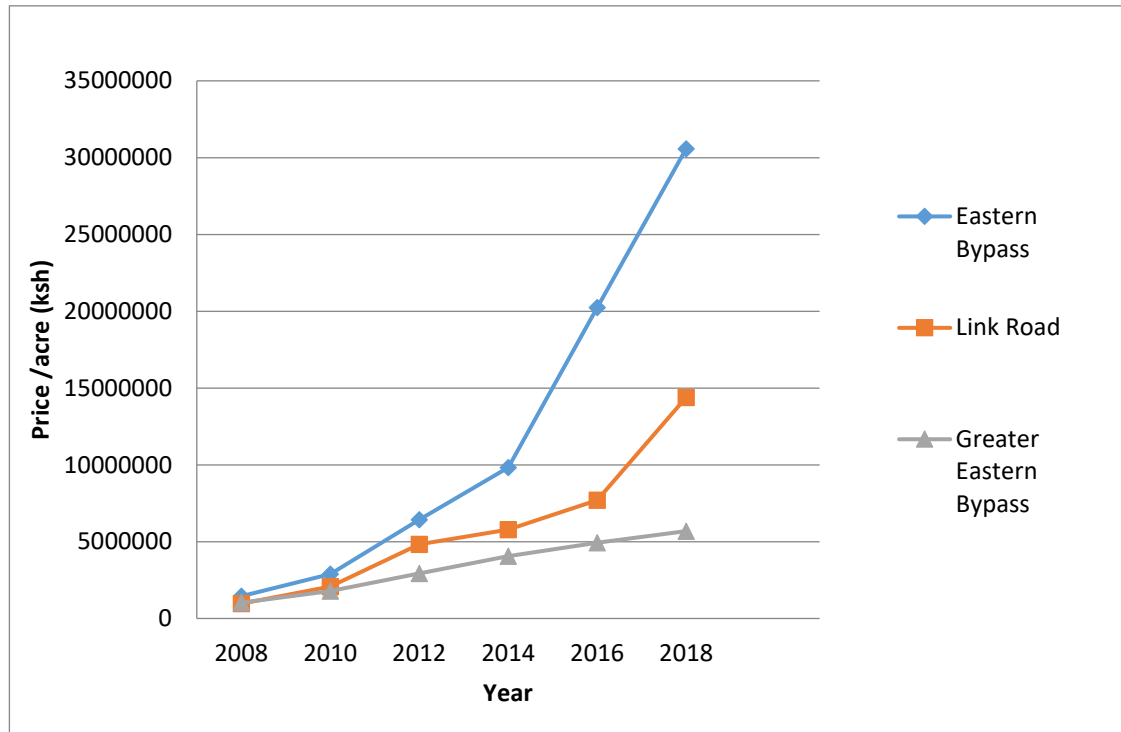


Figure 4-19. Mean prices per acre in (Greater) Eastern Bypass

The sampled land transactions have varying land sizes between 0.022Ha and 0.056Ha, with the average land size being 0.035Ha. A distinct variance in land prices for a given plot size within a given area is noted. For instance, the price of 0.03Ha of land along the Eastern Bypass in 2008 varied between Ksh 150,000 and 450,000 attributed to proximity to the bypass and thus accessibility. The land sale documents obtained from district valuers did not give physical characteristics of land such as location, soil type, terrain of the land and proximity to surrounding amenities, which would have assisted in evaluating the value of land besides using land prices. Therefore, the variance in

prices could also be attributed to land speculation and forces of supply and demand. Regressing land prices against distance from the Eastern Bypass and Greater Eastern Bypass holding all the other factors constant, land prices increased up to 8 times within 5km distance from the roads. An acre of land within 250m buffer along Eastern Bypass was costing Ksh 1,000,000 in 2008 when road construction began and price increased to about Ksh 31,000,000 in 2018. As more land is subdivided and consequently developed, land prices continue to rise.

4.4.1 Trend in Speculative Gain

Speculative gain from land sale is the key motivating factor for land speculation in peri-urban areas of Nairobi. It was observed the profit margin for land sale along the three roads in (Greater) Eastern Bypass increased significantly from 2008 to 2018 (Table 4-7, Figure 4-20). Speculative gain was highest along Eastern Bypass with 375% increase from 2012 to 2018 the period after road construction (Figure 4-20). This can be attributed to the fact that land in 500m buffer of developed roads in Kenya is taken up for commercial use where there is no land use plan to guide development. Chain stores, fuelling stations and food eateries were the main businesses along the road that took advantage of traffic flowing from Jomo Kenyatta International Airport and Southern part of Nairobi City. Speculative gain along Greater Eastern Bypass was the lowest possibly because land was more marginal (Figure 4-20), less accessible since the bypass had not been developed. Construction of the Eastern Bypass partially improved accessibility of land along the Link Road, leading to a spike in the profit margin between 2012 and 2018. The study used land subdivision charges espoused in land regulation documents; however it was noted that charges varied depending on the location of the

land to be subdivided. The extra cost was to cater for transport for land surveyor's team during land subdivision and beaconing. Notably, as the speculative gain increased the number of land enterprises increased in the land market hence translating into increased land subdivision.

Table 4-7. Speculative gain per 0.03Ha along 500m buffer of (Greater) Eastern Bypass

Eastern Bypass				
Year	Land Purchase Price (LPP) in Ksh	Land subdivision Charges (LSC) in Ksh	Land Sale Price (LSP) in Ksh	Speculative Gain (SG) in Ksh <i>SG=LSP-(LPP+LSC)</i>
2008	200,000.00	6,800.00	350,000.00	143,200.00
2010	350,000.00	6,800.00	550,000.00	193,200.00
2012	550,000.00	7,300.00	850,000.00	292,700.00
2014	868,000.00	7,300.00	1,600,000.00	724,700.00
2016	1,600,000.00	9,100.00	2,400,000.00	1,092,700.00
2018	2,200,000.00	9,100.00	3,600,000.00	1,390,900.00
Link Road				
2008	80,000.00	6,800.00	150,000.00	63,200.00
2010	150,000.00	6,800.00	300,000.00	143,200.00
2012	200,000.00	7,300.00	600,000.00	392,700.00
2014	350,000.00	7,300.00	800,000.00	442,700.00
2016	600,000.00	9,100.00	1,200,000.00	592,700.00
2018	800,000.00	9,100.00	1,800,000.00	990,900.00
Greater Eastern Bypass				
2008	50,000.00	6,800.00	80,000.00	23,200.00
2010	120,000.00	6,800.00	150,000.00	23,200.00
2012	150,000.00	7,300.00	250,000.00	92,700.00
2014	200,000.00	7,300.00	350,000.00	142,700.00
2016	250,000.00	9,100.00	450,000.00	192,700.00
2018	350,000.00	9,100.00	650,000.00	290,900.00

(Source: Field Data, 2020)

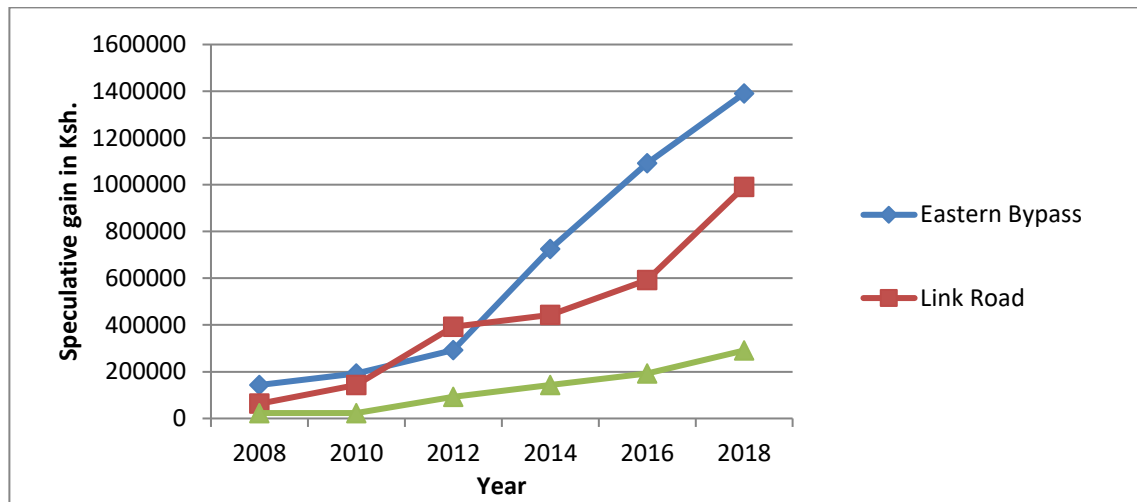


Figure 4-20. Trend in Speculative gain in (Greater) Eastern Bypass

4.4.2 Does Change in Distance Influence Land Prices in (Greater) Eastern Bypass?

The estimates of plot prices for the years 2008, 2014 and 2018 along (Greater) Eastern Bypass were regressed against distance from the road (Table 4-8).

Table 4-8. Regression of plot prices against distance in (Greater) Eastern Bypass

Eastern Bypass					
Year	Constant	h_1	h_2	R^2	P-value
2008	412,990.60	-0.11352	-0.08807	0.6469	0.0004069
2014	2,636,651	-0.15182	-0.09193	0.4054	0.02027
2018	5,476,572	-0.11932	-0.18583	0.6181	0.0007321
Greater Eastern Bypass					
Year	Constant	h_1	h_2	R^2	P-value
2008	112,323.7	-0.05968	0.04733	0.7523	1.335e-11
2014	477,466.8	-0.01942	-0.08905	0.6385	1.636e-08
2018	809,781.7	-0.01970	-0.06569	0.7301	6.732e-11
Link Road					
Year	Constant	h_1	h_2	R^2	P-value
2008	268,761.60	0.13154	-0.22440	0.9187	1.029e-12
2014	2,164,998	-0.01575	-0.16144	0.8679	2.140e-10
2018	4,154,946	0.07529	-0.20641	0.8516	7.700e-10

The results indicate a negative coefficient for both Thika Highway and Eastern Bypass indicating that a single unit change i.e. increment in the distance of the plots from the two roads causes their price to go down. For the considered three years the models returned p-values of 0.0004069 in 2008, 0.02027 in 2014 and 0.0007321 in 2018 which was less than 0.05 indicating that the change in distance from the two roads were significant in determining the prices of the plots in this area (Table 4-8). The obtained R squared values indicate that much variation in the prices of the plots, across the years, is accounted for by the development of the Thika Highway and Eastern Bypass. More specifically for the year 2008, 64.69% of the variations in the prices of the plots are accounted for by the commencement of construction of Eastern Bypass while for the year 2014, (40.54%) and 2018, (61.81%) of the variations in the plot prices is attributed to completion of construction of the two roads.

The results for price estimate along Greater Eastern Bypass and Juja Farm Road indicate a negative coefficient for both roads indicating that an increase in distance of the plots from the two roads causes prices to go down (Table 4-8). However, for the year 2008 the coefficient for the distance to the Great Eastern Bypass is positive, which indicates an increment on the distance from the roads did not cause a decrease in price of the plots (Table 4-7). This can be explained by the fact that planning of Greater Eastern Bypass had just begun hence there was minimal speculation to trigger change in prices. The p-values were 0.00001335 in 2008, 0.00001636 in 2014 and 0.000006732 in 2018, which were less than 0.05 indicating that the change in distance from the two roads is significant in determining the prices of the plots in this area. The R squared values indicate that much variations in the prices of the plots, across the years, is accounted for

by the existence of Juja Farm Trading Centre, Juja Farm Road and planning of Greater Eastern Bypass for the year 2014 at 63.85% and 2018 at 73.01%. The results further indicate that the underdevelopment in the eastern side of the Greater Eastern Bypass creates a decrease in price of the plots as distance from Greater Eastern Bypass increases.

Along the Link Road where distances from Link Road and Eastern Bypass are used, results indicate a negative coefficient, which indicates that a single unit change i.e. increment in the distance of the plots from the Eastern bypass causes their price to go down. The p-values from the model were 0.0000012 in 2008, 0.000214 in 2014 and 0.000077 in 2018, which were less than 0.05 indicating that the change in distance from the two roads is significant in determining the prices of the plots in this area. The R squared values indicate that the two roads account for variations in the prices of the plots, across the years. For the year 2008, 91.87% of the variations in the prices of the plots were accounted for by the commencement of construction of Eastern Bypass. For the year 2014, (86.79%) and 2018, (85.16%) of the variations in the plot prices are attributed to the planning of the Link Road and development of Eastern Bypass. There is significant change in land prices due to change in distance in (Greater) Eastern Bypass hence the null hypothesis is rejected.

Accessibility and proximity to and from the major roads is one of the key determinants of land prices. Price decreases six times from 0.2km to 8km along the Link Road in 2016 and 2018 (Figure 4-20), with highest prices being for plots at the junction between the Link Road and Eastern Bypass. Change in land prices in 2008 and 2010 ranges from

24% to 30% along the Link Road as distance increases from the road. Significant change in prices along the Link Road is seen from 2014 when the Eastern Bypass was completed and accessibility into the land abutting the Link was partially improved. As distance increases from the Eastern Bypass the land prices decrease, land parcels on 250m buffer from the road were most expensive with a price range of 1,000,000 to 8,500,000 between 2008 and 2018 (Figure 4-21).

Prices along the East part of Greater Eastern Bypass are relatively low in 2008 with 0.045ha selling at between Ksh 50,000 and 65,000, with 20% change in price as distance increases from 0.5Km to 4Km from the road (Figure 4-21). Spike in prices is observed in 2014 and 2016 at 1.5Km distance from the road and this could be attributed to proximity to upcoming towns along the Greater Eastern Bypass such as Mumba town. The behaviour of changes in land prices on the western side of the Greater Eastern Bypass is different from the eastern side, an increase in distance from the road did not automatically generate a decrease in land prices, but prices increased. 4Km from the Greater Eastern Bypass is Juja Farm Trading Centre, an old colonial centre, price of plots around the town ranges between Ksh. 80,000 and 120,000 in 2008 and in 2012, two years after the planning and design of Greater Eastern Bypass the prices increase by 25-35%. Prices are higher around the town than closer to the bypass (Figure 4-20), which could be explained by the fact that Greater Eastern Bypass has not been developed and Juja town has developed in the past years due to factors such as increased transport connectivity and connection to electricity and piped water.

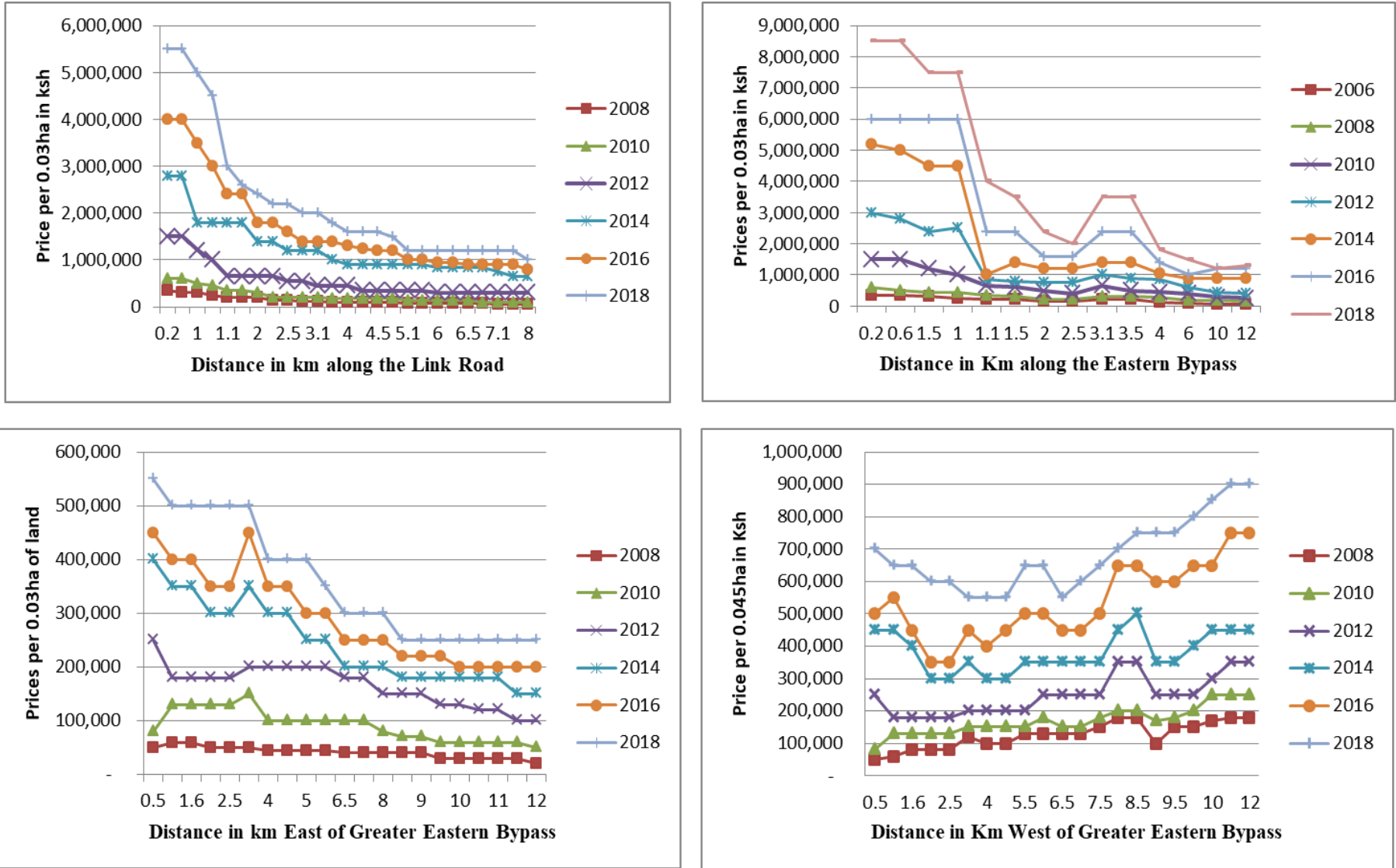


Figure 4-21. Land prices against distance from (Greater) Eastern Bypass 2008-2018

4.5 Public Programmes and Development Patterns in (Greater) Eastern Bypass

4.5.1 Distribution of Utilities and Amenities in (Greater) Eastern Bypass Area

The first subdivision was adjudicating of land to shareholders depending on shares bought by a member. It carried out between 1983 and 1988 and yielded about 2400 parcels along Eastern Bypass, 3003 along the Link Road and 4220 along the Greater Eastern Bypass. During these subdivisions, the Physical Planning Handbook (Physical Planning Department, 2007) dictates a surrender of 4% or more of land for every subdivision of 10Ha for public use in peri-urban areas. The approximate area of land in the area is about 12,000Ha where 314Ha of land was set apart for public purposes as shown in Table 4-8. Out of the 12,000Ha that was subdivided between 1983 and 1988, approximately 2.52% was set apart for public purposes, which has been used for development of a few amenities such as schools while some of them has been encroached on for settlement (Figure 4-12). Recreation has the least allocation while public purpose has the highest Table 4-9.

Table 4-9. Land set apart for public uses in (Greater) Eastern Bypass Area

Land Use	Area in Ha	Assigned Uses
Public purpose	112.8003	Health centres, community centres, cemetery, police stations, post office, administrative offices
Educational	87.6398	Nursery schools, primary school, secondary schools and polytechnics
Recreational	0.8792	Play area
Commercial	4.1709	Markets, commercial centres
Transport	2.3605	Bus-parks, car parks and fuel station
Public utilities	100.1393	Power way leaves, dams and water points

The second phase of subdivision started in early 2005 and is still taking place, where the 0.5Ha and 1.3Ha parcels meant for small-scale farming, are subdivided into plots for urban use. These subdivisions yielded approximately 23083 plots along Eastern Bypass, 19644 along the Link Road and 28448 (Figure 4-2) along Greater Eastern Bypass with average plot size of 0.04Ha. Unlike in the first subdivision of large to small-scale farms that led to setting aside of land for public use, the second phase of subdivision into urban use i.e. residential and commercial plots has not led to any additional land being set apart for public use despite the projected increase in population as a result of development of new subdivisions.

On land set apart for public use, several amenities have been developed such as schools, health facilities, sewer plant and police stations. However, land set apart for amenities such as community centres, fire stations, markets, cemeteries and bus stations has not been developed. There are ten public primary and four secondary schools in (Greater) Eastern Bypass (Figure 4-22). 80% of the schools are located along the Eastern Bypass and Greater Eastern Bypass where development is concentrated. The public schools are at least 10km apart and the primary and secondary schools are built close together on reserved land. All the public schools in the area were developed before 2008 except Athi Primary and Secondary school along Greater Eastern Bypass, which were started in 2013. Other public learning institutions in the area are polytechnics where two are located along the Eastern Bypass and one along the Greater Eastern Bypass. The number of private schools along Eastern Bypass and Juja Farm Trading Centre is 2-3 times that of public schools, which suggests that proprietors of the schools, targets developed and

developing areas where population is increasing and public schools may not be adequate to serve the population.

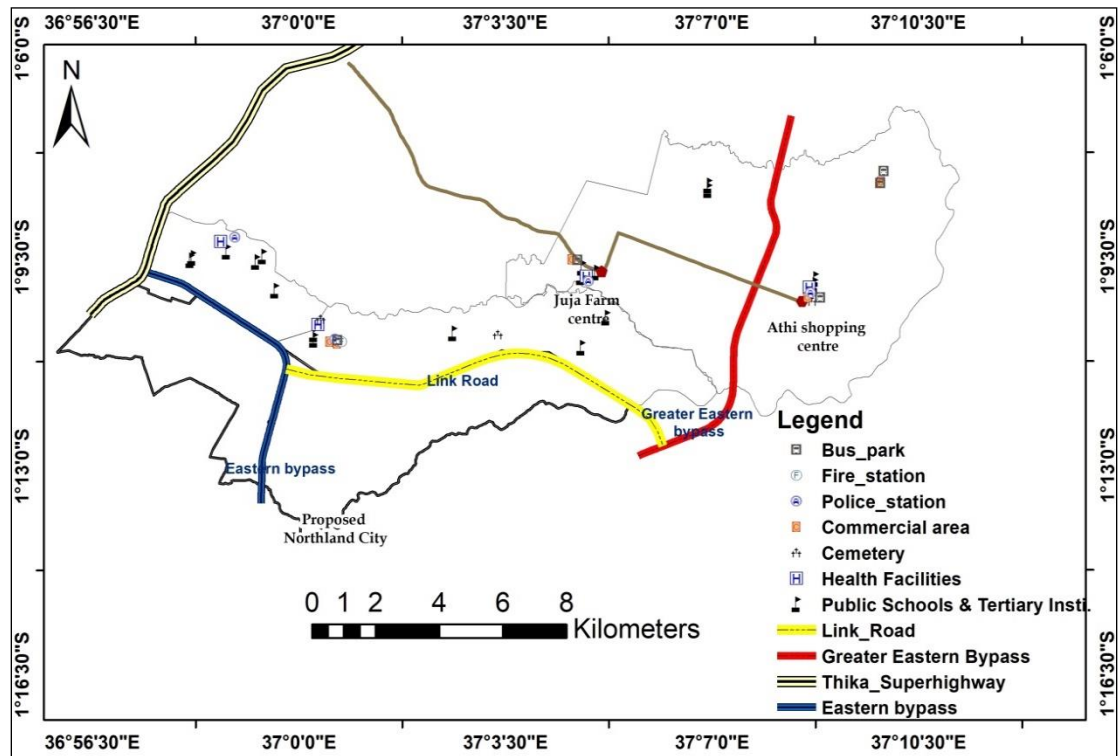


Figure 4-22. Distribution of public schools and other amenities in (Greater) Eastern Bypass

There are two public health facilities along (Greater) Eastern Bypass, one health centre with a ward along the Greater Eastern Bypass and a dispensary along the Eastern Bypass (Figure 4-22). There is an upcoming private hospital in Juja Farm Trading Centre being developed by Catholic Missionaries. Other essential amenities such as fire stations, bus parks and cemeteries are yet to be developed, despite the growth in human settlements and population. Notably, there is minimal land reserved for open spaces.

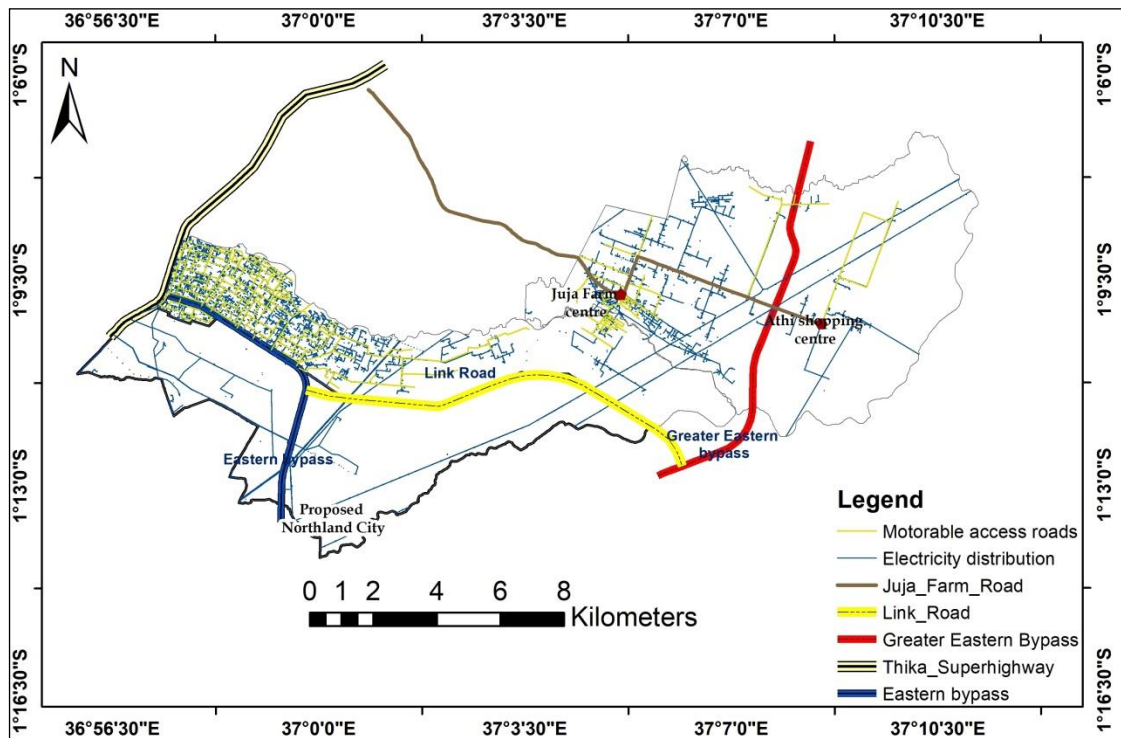


Figure 4-23. Electricity distribution and motorable access roads in the (Greater) Eastern Bypass

Coverage of electricity distribution is approximately 90% along the Eastern Bypass while along Greater Eastern Bypass and Link Road the coverage is below 20% (Figure 4-23). Juja Farm Trading Centre along the Greater Eastern Bypass is the first place to get electricity connection in early 2012 during election campaigns and at least 90% of homes within 1.5km radius from the centre are connected. Electricity connection into the interior along Greater Eastern Bypass has been on going, connectivity to smaller centres such as Athi and Mumba shopping centre has triggered their growth with businesses like salons, welding and retail shops coming up. Piped water and electricity connection in the area began during the 2013 political campaign and the year when devolved governments began operation. Although, a small portion gained connection, these services triggered development of land around the trading centres.

Access roads are key element in influencing land development. Along the Eastern Bypass, 85% of the roads are all-weather road while on the land along the Link Road and Greater Eastern Bypass, 90% of the roads are impassable during rainy seasons (Figure 4-23). This is uncommon in Kenya since the local government focuses on improving roads and provision of services in areas with high development density and political pressure. Local access roads and streets in the (Greater) Eastern Bypass are under Kiambu County Government while the major roads i.e. Thika Highway, Eastern Bypass, Link Road, Greater Eastern Bypass and Juja Farm Road are developed and maintained by the National government. Juja Farm Road was initially under Kiambu County, but in 2020 the national government due to political wrangles that impeded the construction and upgrading of the road to asphalt concrete took it. The construction of Juja Farm Road was used as a political rhetoric from 2013 to 2017, the County Government of Kiambu awarded the contract in 2018, but construction works did not begin albeit the contractor being on site for more than a year. The road was taken over by the national government, a new contract was awarded, and construction work began in November 2020. Passable murram roads are concentrated in 1km radius around Juja Farm Trading Centre and that linking the centre to Athi and Mumba shopping centres. The public service vehicles (PSV) that are the most common means of transport in and out of Juja Farm, ply the route along the murram road connecting Athi, Juja Farm Trading Centre and Juja Town. Parts of the access roads along Eastern Bypass improved through the concerted effort of residents, associations and the county government to improve accessibility and value of the properties.

Distribution of municipal water is concentrated along the land abutting Eastern Bypass and Thika Highway, with land along Link Road, Greater Eastern Bypass and Juja Farm having 15-20% coverage (Figure 4-24). Due to low coverage of municipal water distribution, most homeowners source water from private boreholes of which 90% are concentrated on land abutting Eastern Bypass. There are 3 county boreholes and 27 private boreholes in (Greater) Eastern Bypass, suggesting that the municipal water is absent and where available it is not reliable; compelling residents to rely on boreholes. Interview with a technical staff in charge of regulating sinking of boreholes from Water Regulation Authority (WRA) revealed that there are more illegally sunk boreholes in the area, reason being that selling of water in the neighbourhood is a lucrative business. The land along Greater Eastern Bypass has the lowest municipal water connection and most homes get their supply from private boreholes supplemented by rainwater harvesting. The private boreholes are concentrated around Juja Farm Trading Centre where 60% of land is developed. Land along the Link Road has two municipal boreholes sunk in 2017 and 2018 respectively and two private boreholes. The process of distributing municipal water from the two county boreholes to homes is currently under way.

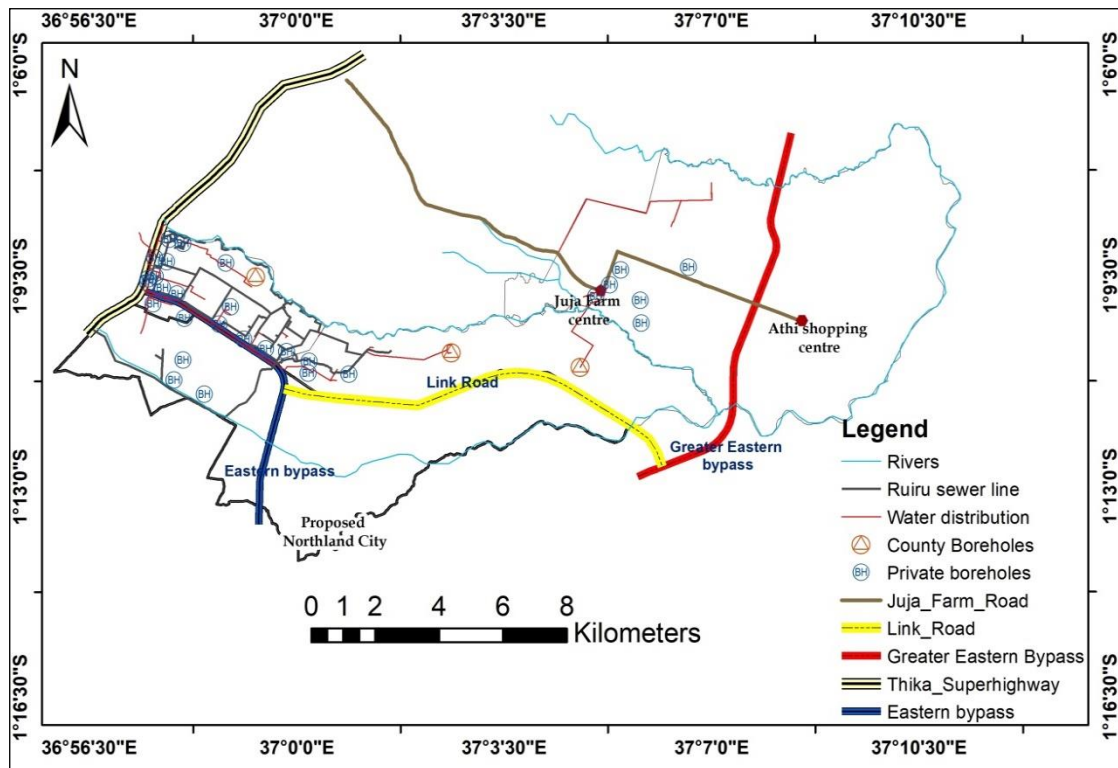


Figure 4-24. Distribution of piped water, sewer line and boreholes in (Greater) Eastern Bypass

The sewerage treatment plant in the area was developed in 2017 and connection to homes on land abutting Eastern Bypass is currently on going (Figure 4-24). There is no connection to land along Greater Eastern Bypass and Link Road; hence, existing developments rely on onsite sanitation systems, with most homes using septic tanks. Although there are provisions on management of onsite waste disposal such as septic tanks in Planning and Building Regulation of 2009 (RoK, 2009) the regulations have not been enforced in the area, thus increasing threats of groundwater pollution. Development of Ruiru sewerage treatment plant in 2017 has not increased land development along the Link Road probably because developers are accustomed to other already developed on-site sanitation and there has not been a push, sensitisation or requirement for connections to a sewer line as per the Public Health Act (RoK, 2012b).

4.5.2 Adequacy of Utilities and Amenities in (Greater) Eastern Bypass

Adequacy of utilities and amenities is analysed in relation to provisions given in Physical Planning Handbook, 2007 (Physical Planning Department, 2007) and Urban Areas and Cities Act of 2019 (RoK, 2011, 2012, 2019). Character and type of development on 500m is high-density comprising of high-rise residential developments, office blocks, eateries, chain stores, hardware shops and warehouses, while 80% of plots beyond the 500m buffer comprised of low-density residential development. Analysis of land development pattern showed that 85% of plots on 500m buffer along Thika Highway and Eastern Bypass had been developed by 2020. Developed parcels on 500m buffer are 1126 by 2020 each approximately 0.5Ha with an average of 30 dwelling units each and average household size of three, hence the estimated population size when fully developed is about 101,340. Based on the population estimate the area along Eastern Bypass fits as a developing major centre Provision of utilities and amenities along Eastern Bypass was compared to provisions given in Physical Planning Handbook, 2007 (Physical Planning Department, 2007) and Urban Areas and Cities Act of 2019 (RoK, 2011, 2012, 2019) (Table 4-10).

Table 4-10. Adequacy of utilities and amenities in (Greater) Eastern Bypass

Provisions in Physical Planning Handbook 2007 And Urban Area and Cities Act of 2019	500m buffer Eastern bypass	Dist	Level of adequacy
Population size 100,000-150,000	101,340		
Major centre-Amenities req.	Major centre		
50-60 shops of general convenience goods	80-120 shops		High
4-5 major supermarkets or departmental stores dealing in specialist and luxury goods.	3 supermarkets		medium
4-5 banks	1 bank		Low
Commercial offices	Available		High
Branch library	Not available		Poor
Cinema halls	Not available		Poor
Fire station	Not available		Poor
Assembly hall	Not available		Poor
Police station	Available	2 km away	Low
Sports and recreation centre	Not available		Poor
1-2 restaurants/hotels	Available		High
Small cafes and bars near bus station			
Bus station	Not available		Poor
Hospital	Not available		Poor

The land abutting the Eastern Bypass is devoid of basic amenities such as a fire station, hospital, sports and recreation centre, library and bus station. Although 80% of the land has been developed, utilities like sewerage system, have not been installed, creating a likelihood of ground water pollution as wastewater management is left to individual

households. Kiambu County Government has initiated efforts to control development, but failure to provide basic utilities and amenities in a densely populated area may intensify the effects of urban sprawl such as lack of green spaces, poor transport connectivity and air and water pollution. New developments such as proposed Northland City and proposed dualing of Eastern Bypass are likely to trigger infill development and an increase in population hence exacerbating the situation.

There are three public nursery schools, two primary and two secondary schools within a 2Km radius along the Eastern Bypass. Although they were planned earlier when the land was for agricultural use, they are not adequate for the current population in relation to provisions given in the Physical Planning Handbook, 2007 where a population catchment of 5000 should have two nurseries and one primary school while for a population catchment of 25,000, one secondary school. Although land for some essential amenities such as fire station and bus stations has been reserved, the amenities have not been developed. Failure by government to provide basic amenities leaves the task to the private actors who only invest where there are opportunities of better returns. Thus, amenities such as recreational spaces, fire stations and library are lacking hence posing safety and health risks.

4.5.3 Influence of Public Programmes on Land Development Pattern

Different development patterns are observed at different periods in (Greater) Eastern Bypass as discussed in section 4.3.2. These patterns of development can be explained by a combination of factors. Continuous development observed on 1km buffer along Eastern Bypass and Thika Highway, which are the major roads, is attributed to enhanced

connectivity to Thika town, Nairobi City and other nearby towns. Linear continuous development is observed along the developed Eastern Bypass and not on the Link Road and Greater Eastern Bypass, which have been planned, but not developed. Leapfrog development is observed along Greater Eastern Bypass and Link Road is because of planning of the roads that triggered subdivision of peri-urban land into residential and urban plots. Mason (2009) notes that speculative subdivision of peri-urban land leads to partial development causing people to spread out in more and more land with limited amenities and utilities.

Leapfrogging along (Greater) Eastern Bypass is characterized by cluster and dispersed development, comprising of urban poor who are among the initial settlers and developers of peri-urban land. In search of cheap housing, that takes a large portion of urban dweller's income. To ensure smoother settling process, they organize themselves in small groups mostly of close family members or workmates, then buy, and develop land together. Clustering by these groups acted as a source of security and an avenue for residents to lobby and collaborate for supply of utilities such as electricity. As more clusters develop, access to utilities and services becomes easier and small centres start developing to serve the incoming population. Residential associations, families and small groupings drive development in the peri-urban areas and have one aspect in common, that they work together to bring people to develop a certain area and collaborate in provision of utilities such as water and security with the county government. In addition, they contribute to leapfrogging, which characterizes initial development of peri-urban land during planning and before infrastructures development such as Greater Eastern Bypass is developed. Residential associations have contributed

to compact low density in (Greater) Eastern Bypass as they promote “gated communities” where amenities such as piped water, which the county government has not provided adequately, are available. Kombe (2005) implied that the organic pattern of peri-urban land development in Sub-Saharan Africa is informed by urban poverty level. These initial settlers prefer cheap housing in the peri-urban areas as they use alternative means to cater for transport cost and urban agriculture for food supply.

The ribbon pattern of land development along the rivers is an aspect of agrarian civilization where rivers support small-scale farming and are a source of livelihood. Lack of water programmes led to people settling along the rivers, which are a reliable source of water. Gatong’ora Water Development Community along the Eastern Bypass started the first water programme in 1998. The company sunk a borehole where people would fetch domestic water; later in 2005, they began distribution to homes. It is the availability of water distributed, that triggered nucleated development in this area. This explains the increase in number of private boreholes in (Greater) Eastern Bypass area. While boreholes have led to clustered development, utilities like electricity have not impact on development patterns perhaps because it is not a basic need compared to water.

Radial development pattern observed around Juja Farm Trading Centre, which is a pre-colonial town with amenities such as primary and secondary schools, hospital, police station, polytechnic, developed during the colonial days. Development around this centre was further influenced by settlement of Catholic Missionaries in 2003, who built a primary and secondary school, a convent, a monastery and sunk two boreholes that

supply water to the neighbourhood. Kleemann *et al.*(2017) points out that development of the urban and peri-urban areas can be traced to the history and post-colonial administration and governance of a place. Juja Farm Trading Centre is growth nuclei likely to attract provision of more amenities such as administrative offices, which could contribute in bringing more utilities and amenities closer.

Provision of public utilities and amenities follows land development and triggers further development and increased population in an area. However, it was noted that private developers ride on the government to provide primary infrastructure such as primary roads and electricity, which will start development and later they can introduce other social amenities such as borehole water, recreation facilities and paved access roads that entice home owners and buyers into these planned communities. Planning of infrastructure prompts leapfrog development on the subdivided residential and urban plots, but it is construction of infrastructure that leads to continuous and dense development.

4.6 Reflection on Theories

Land speculation is discerned from political economy and urban regime theories where private interests dominate policymaking process and the ability of local growth regimes to enact and enforce land laws and policies at local level. It emanates from the political economy of planning and developing infrastructure in Kenya coupled with the competing interests of various political regimes. The political regimes have influence on location, type of infrastructure to be developed and the budgetary allocation. This marks the onset of land speculation as politicians and their henchmen seek an

opportunity to benefit from planning and development of infrastructure. The planning authorities such as KURA are charged with planning and development of infrastructure, which involves establishing priority areas and thereafter designing and development of planned infrastructure. The individual speculative interests are seen during the preliminary planning, awarding of infrastructure development contract, land valuation, acquisition and compensation. During the preliminary planning, the location of the infrastructure is critical and some political notables may manipulate the process to ensure they benefit maximally from the alignment of the road. The political class and their henchmen aim at benefitting from compensation of land, increased value of land along the corridor and development opportunities. Politicians, state officials, planning authorities, Ministry of Lands and Physical Planning, Commissioner of Land-in charge of acquisition, valuation and compensation of land on proposed areas for development, were identified as key actors in structural land speculation, which is institution embedded and happens in earlier stages of infrastructural planning. The collusion of land enterprises with Land Control Boards and land registries to expedite land transfers and subdivision process further exacerbates the effects of land speculation such as irregular subdivision of land.

Normal land speculation is seen slightly before and immediately after public notification of infrastructure development. Before public notification land enterprises are zealous to obtain information on location of infrastructure and commencement of infrastructure development which they use to identify speculation hotspots where they acquire large tracts of land for speculation purposes. Axial theory explains how transport corridors contribute to expansion of urban areas and why land speculators target peri-urban areas

with potential for infrastructure development. The land enterprises optimize their land businesses by acquiring large tracts land close to the upcoming infrastructure, which they leverage on to sell the accumulated land.

Bid rent theory explains why there are more land enterprises along Greater Eastern Bypass, which is located marginally compared to land along Link Road and Eastern Bypass. Prices of marginal agricultural land tend to be cheaper hence land enterprises target to buy and hoard this land before public notification of new developments such as new roads, which trigger increase in land prices. The prices of land increases with decreases in distance to the proposed infrastructure location, although, planning of Greater Eastern Bypass and Link Road caused an increase in land prices, the construction of Eastern Bypass triggered a higher spike in land prices. This can be explained by bid rent and economic theory; development of peri-urban land pushes agricultural use further into the margin where land rent is lower. Land enterprises do not sell all the subdivided plots but hold a few as they wait for developments that result into higher land prices.

County governments in Kenya benefit from fees paid during land transfers and subdivision. However, failure by county governments to plan peri-urban land and enforce land laws related to subdivision paves way for irregular subdivisions and possibilities of sprawled development. Institutions in charge of planning and controlling land uses and enforcing land laws seem to condone land speculation possibly because of the perceived benefit. However, long-term effects of land speculation such as haphazard land development may be hard to avert and these institutions may be faced

with much more complex urban problems to resolve in the future. The planning and conceptualization of public policies has a long term effect on the physical planning of peri-urban land and is likely to mark onset of sprawled development due to lack of prior planning and poor enforcement of land laws; coupled with political economy of public infrastructure.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of research findings, conclusion and recommendation on peri-urban land speculation and its implication on land development in (Greater) Eastern Bypass. Summary is based on objectives of the study where each paragraph summarizes an objective.

5.2 Summary of Findings

Different stages of infrastructure planning influences changes in land transfers, subdivision and prices than others. The period just before and immediately after public notification number of land subdivisions, transfers and enterprises was observed to have increased tremendously. During land acquisition and construction phase a decline in subdivisions is noted. The timing when land agents learnt about the development of (Greater) Eastern Bypass is significant in determining the quantity of subdivided land that translates into level of land speculation within a given period. Land enterprises that had prior information on development of (Greater) Eastern Bypass subdivided more land, implying that they are structural speculator who acquired land before public notification. Structural speculation as explained by political economy and urban regime theory is seen along (Greater) Eastern Bypass during initial planning, preparation of preliminary design, land acquisition, valuation and compensation, where private interest dominate the process to accrue personal or corporate benefits. About a third of new subdivisions does not meet the standards espoused in the Physical Planning Handbook of 2007 on subdivision sizes, suggesting that land enterprises are majorly after

profiteering. Lack of proper enforcement of land laws, standards and guidelines, coupled by lack of land use plans to guide land subdivision incentivizes irregular land subdivisions that accompany peri-urban land speculation in (Greater) Eastern Bypass. Land speculation is institution embedded and enforcement of current land laws, standards and regulations may not fully address the problem and effect of land speculation. Corruption in the planning offices, land registration and other state offices make the situation worse and gives room for land speculation and its effects. Land speculation, whether normal or structural is driven by private interest and land speculators take advantage of interstices in governing systems, which agrees with the urban regime and political economy theories.

The conversion of land from agriculture to urban use leads to decrease in acreage of land under farming while built up area and grassland increases. Grassland area increases at higher rate than built up area because after land is transferred from original owners, it is subdivided into uneconomical units of 0.02Ha to 0.042Ha, which could not support farming. After subdivision, the plots are sold to individuals who hold the land while waiting to develop or resell it. The subdivided land is left unused and natural vegetation grows, thereby increasing grassland coverage. The conversion of land along the (Greater) Eastern Bypass, from agriculture to urban does not follow any given pattern, but land development in the area is characterized by such patterns as ribbon along the rivers, linear along roads and cluster around historical centres and other growth nuclei like water sources. The conversion of agricultural to urban depends on availability of marginal land for subdivision. The land abutting Greater Eastern bypass has the highest number of land subdivisions although it is more marginal compared to land along the

Eastern Bypass and Link Road. This is because land speculators prefer cheap agricultural land, on urban fringes with likelihood developing, for better returns. The conversion of peri-urban land from agriculture to urban foreruns leapfrog development. The land along the Link road is bypassed by development and is more leapfrogged compared to land along the Greater Eastern Bypass, which is marginal and less accessible. The rate of leapfrogging decreased over a period of time depending on infill development triggered by drivers of development such as improved access roads, connectivity to utilities and presence of private developers.

The construction of Eastern Bypass and the planning of Greater Eastern Bypass and Link Road have led to increase in land prices in the area. However, the completion of Eastern Bypass that triggered sharp spikes in land prices. Although land keeps appreciating from time to time due to factors such as accessibility, proximity to urban centres and amenities, construction of (Greater) Eastern Bypass opened up development thereby the land prices keep increasing due to enhanced accessibility. However, land prices along the Link Road and Greater Eastern Bypass, which have been planned, but not developed, the prices increase with a smaller margin. The increment in land prices is not uniform along the (Greater) Eastern Bypass as land closer to urban centres like Juja Farm Trading Centre is more expensive compared to land along the 100m buffer of Link Road and Greater Eastern Bypass. Completion of the Eastern Bypass created growth nuclei with road junctions having highest land prices since they are likely to grow into urban centres and this behaviour of land prices is in line with the axial and bid rent theories. Land speculation contributes to inconsistencies in land prices because the amount paid for a given parcel depends on the marketing skills of an agent and the

ability of the buyer to negotiate for a better price. This explains why land enterprises would retain some plots in different subdivisions because there is a likely potential of the prices increasing further. In addition, enterprises prefer to sell first, plots located far from roads or proposed corridors and retain those that are closer as they are likely increase in land prices before, during and after road construction.

Provision of utilities and amenities follows land development along (Greater) Eastern Bypass. Speculative subdivision of land in the peri-urban opens land for residential and urban use. Leapfrog development marks onset of land development along (Greater) Eastern Bypass during the planning of the bypasses. Linear development is observed during and after construction of Eastern Bypass. While planning of bypasses triggers leapfrogging construction of roads prompts linear and continuous development of abutting land. Cluster development, which is part of leapfrogging results from initial settlers in such of cheap housing, and residential associations that develop land and provide some unavailable amenities to attract homebuyers. The cluster settlement by the initial settler and residential association provides an avenue to lobby for provision of public programmes and contribute in extending the programmes to the peri-urban thereby prompting infill development and compact development. Presence of public amenities such as schools, prompts cluster development as they facilitate access to utilities such as electricity. In absence of public water programmes, rivers provide alternative water for domestic use thereby prompting ribbon development while emergence of reliable water sources such as boreholes triggers nucleated development. Historical towns though with few amenities are growth nuclei in the peri-urban that

triggers radial development because they have a likelihood of attracting some public amenities such administrative offices.

5.3 Conclusion

From the study findings, the following conclusion can be derived based on the study objectives.

1. Public policy planning influence land speculation, which results into subdivision of agricultural land into urban use, plots, along corridors of proposed development in peri-urban areas. At different stages of infrastructure, planning aspects of land speculation are seen characterized by acquisition of land by structural speculators during planning and before public notification of proposed development. Most structural speculators aim at benefiting from compensation of acquired land and increased value of their properties. Normal land speculation is seen slightly before and after public notification of proposed development until onset of construction phase. It is characterized by increase in land subdivisions, transfers and number of land enterprises along the corridors of the proposed infrastructure.
2. Speculative subdivision of peri-urban land opens up unplanned land for development and triggers leapfrog development characterized by development patterns such as ribbon, radial, linear and cluster. Leapfrog development is observed early before public amenities and utilities are provided, while cluster and radial development is noted where a growth nucleus exists such as a small town, reliable water sources and schools that influence provision of some

utilities there such as electricity, security and improved access roads. Linear development is observed slightly before onset of road construction and towards completion of the road. Completion of construction primary roads prompts continuous development along the road and infill development into interior land as more access roads are developed.

3. Land speculation triggers increase in land prices due to change in land use, from agriculture to urban use brought about by speculative land subdivision. Planning of public infrastructure triggers an increase in land prices due to speculation of the upcoming development. Increased in distance from the planned or developed infrastructure causes an increase in land prices. However, Construction of planned infrastructure triggers sharp increases in prices while areas where infrastructures have been planned, but not developed the increase in prices is moderate. Uncapped land values seen during acquisition for road construction and compensation of that land, is attributed to manipulation of land valuation process and contributes towards increase in land prices.
4. Speculative land subdivision foreruns land use planning, hence land for essential amenities are not reserved and thus a likelihood of urban sprawled development without amenities. Leapfrog development happens early when subdivided land is devoid of most public amenities and cluster development is seen around few public programmes such as school. Historical town in the peri-urban act as growth nuclei that attract radial development along roads radiating from it. This is because it is core of development with provision of public amenities in the peri-urban area. Construction of a road and not the planning prompt linear

development and infill development into the interior due to enhanced accessibility.

5.4 Recommendations

Based on the study findings the following recommendations are suggested;

- i. The planning and conceptualization of public policies and programmes has a long term effect on the physical planning of the urban fringes and is likely to mark onset of sprawled development due to lack of prior land use planning and poor enforcement of land laws. Public policy planning should be accompanied by land use planning to ensure the resultant effect of developing public infrastructure on abutting land is predicted and abates adherence.
- ii. County governments should put resources in planning departments to control speculative land subdivision, which largely reduces leapfrog development. This leaves land not ready for development to be used for other non-urban uses such as agriculture until it is ready for urban use and pre-requisite amenities and utilities can be planned prior.
- iii. National and county governments should carry out land market assessment often to assess the trend in land prices and introduce mechanisms of capturing the increase in land value so that the capital gain is used in development of infrastructure in the area.
- iv. National and county governments should carry out an analysis to take stock of agriculturally productive land in the peri-urban and enact policies to lock this

land for given period to ensure it is not taken out of land use too early. Prior plans can be prepared to open up land for development when ready.

5.5 Areas for Further Study

- i. This study mainly focussed on land speculation and its implication on land development in the peri-urban of Nairobi Metropolitan because of road infrastructure planning and development. However, other major infrastructure has not been studied such as Lamu Port South Sudan and Ethiopia Transport corridor (LAPSSSET), standard gauge railway between Mombasa and Naivasha to show extent of land speculation in relation to political and regime theories. Further studies in relation to other major infrastructure would be valuable for comparison purposes.
- ii. It was difficult to analyse the influence of land speculation on land value in Kenya due to lack of necessary data on land value parameters hence land price was used as a variable of land value. Further study is needed that explores the influence of land speculation on land values.
- iii. The study focussed on (Greater) Eastern Bypass, which comprised of one developed and two undeveloped but planned roads, hence land speculation, was studied in relation to road planning and development. Further studies can explore land speculation in light of other public or private programmes such as development of planned communities in the peri-urban.

REFERENCES

- Abdu, M., Kamunyori S., Choi, N., & Kahindo, L. (2016). *In Search of Land: Public Land Management, Compulsory Land Acquisition and Resettlement in Kenya*. Nairobi: The World Bank.
- Abuya, D., Oyugi, M., & Oyaro, E. (2019). Management of the Effects of Land Use Changes on Urban Infrastructure Capacity: A Case Study of Ruaka Town, Kiambu County, Kenya. *Civil and Environmental Research*, 8(4), 158–190. <https://doi.org/10.5923/j.ajgis.20190804.02>
- Aldrick, J. (2012). *Northrup: The life of Sir William Northrup McMillan: 1872-1925*. Kijabe: Old Africa Books.
- Al-Dosary, A. S., & Khan, F. (2010). A GIS based assessment of urban sprawl in North Khobar. *International Journal of Arab Culture, Management and Sustainable Development*, 1(3), 254-275.
- Ambrose, B. W. (2005). Forced development and urban land prices. *Journal of Real Estate Finance and Economics*, 30(3), 245–265. <https://doi.org/10.1007/s11146-005-6406-y>
- Archer, R. W. (1973). Land Speculation and Scattered Development; Failures in the Urban-Fringe Land Market. *Urban Studies*, 10(3), 367–372. Retrieved from <http://www.jstor.org/stable/43194618>
- Atack, J., & Margo, R. A. (1998). “Location, Location, Location!” the Price Gradient for Vacant Urban Land: New York, 1835 to 1900. *Journal of Real Estate Finance and Economics*, 16(2), 151–172. <https://doi.org/10.1023/A:1007703701062>
- Ayonga, N. J. (2015). Real Estate Development Outside the City County of Nairobi and the Escalation of Urban Sprawl: Could Developers be Avoiding Zoning-related Costs in the City? *Journal of Geography and Regional Planning*, 8(10), 261.
- Bahl, R. W. (1968). A Land Speculation Model: the Role of the Property Tax As a Constraint To Urban Sprawl. *Journal of Regional Science*, 8(2), 199–208. <https://doi.org/10.1111/j.1467-9787.1968.tb01324.x>
- Baiman, R., Boushey, H., & Saunders, D. (2000). *Political Economy and Contemporary Capitalism*. New York: M. E. Sharpe.

- Barrows, R., & Roth, M. (2017). Land Tenure and Investment in African Agriculture: Theory and Evidence. *Journal of African Modern Studies*, 28(2), 265–297. Retrieved from <http://www.jstor.org/stable/160863>
- Bassett, E. M. (2018). The challenge of reforming land governance in Kenya under the 2010 Constitution. *Journal of Modern African Studies*, 55(4), 537–566. <https://doi.org/doi:10.1017/S0022278X17000441>
- Bear, L. (2020). Speculation: a political economy of technologies of imagination. *Economy and Society*, 5147. <https://doi.org/10.1080/03085147.2020.1715604>
- Bird, R. M., & Slack, E. (2005). Land and Property Taxation in 25 Countries: A Comparative Review. CES Press, London (March), 34–42. Retrieved from <http://hdl.handle.net/10419/166852>
- Boone, C. (2011). Politically Allocated Land Rights and the Geography of Electoral Violence: The Case of Kenya in the 1990s. *Comparative Political Studies*, 44(10), 1311–1342. <https://doi.org/10.1177/0010414011407465>
- Boone, C. (2012). Land Conflict and Distributive Politics in Kenya. *African Studies Review*, 55(1), 75–103. <https://doi.org/10.1353/arw.2012.0010>
- Bowman, A. O., & Pagano, M. A. (2000). Vacant Land in Cities: An Urban Resource. *Center on Urban & Metropolitan Policy*, (December), 1–9.
- Branch, D., & Cheeseman, N. (2016). The politics of control in Kenya: Understanding the Bureaucratic-executive state, 1952-78. *Review of African Political Economy*, 33(107), 11–31. <https://doi.org/10.1080/03056240600671183>
- Brown, H. J., Phillips, R. S., & Roberts, N. A. (1981). Land markets at the urban fringe: New insights for policy makers. *Journal of the American Planning Association*, 47(2), 131–144. <https://doi.org/10.1080/01944368108977098>
- Brzezicka, J. (2016). Speculative bubbles and their components on the real estate market: A preliminary analysis. *Real Estate Management and Valuation*, 24(1), 87–99. <https://doi.org/10.1515/remav-2016-0008>
- Byamugisha, F. F. (2013). *Securing Africa's land for shared prosperity: A program to scale up reforms and investments*. Washington DC: The World Bank.
- Caporaso, J. A., & Levine, D. P. (2005). *Theories of Political Economy* (13th Edition). Cambridge: Cambridge University Press.

- Capozza, D. R. (1976). The efficiency of speculation in urban land. *Environment and Planning A*, 8(4), 411–422. <https://doi.org/10.1068/a080411>.
- Carruthers, J. I., & Ulfarsson, G. F. (2003). Urban sprawl and the cost of public services. *Environment and Planning B: Planning and Design*, 30(4), 203–522. <https://doi.org/10.1068/b12847>
- Cartier, C. (2001). “Zone fever”, the arable land debate, and real estate speculation: China’s evolving land use regime and its geographical contradictions. *Journal of Contemporary China*, 10(28), 445–469. <https://doi.org/10.1080/10670560120067135>
- Cavailhes, J. (2003). Urban influences on periurban farmland prices. *European Review of Agriculture Economics*, 30(3), 333–357. <https://doi.org/10.1093/erae/30.3.333>
- Cho, S., Lee, G., & Kim, D. (2016). A Framework for Identifying Spatiotemporal Hot-spots of Speculative Land Transactions using Prospective Monitoring Procedures: The Case of South Korea. *Cartography and Geographic Information Science*, 43(3), 223–232. <https://doi.org/10.1080/15230406.2015.1065760>
- Clawson, M. (1962). Urban sprawl and speculation in suburban land. *Land Economics*, 38(2), 99–111. Retrieved from <http://www.jstor.org/stable/3144612>.
- Clawson, M. (2013). *Suburban land conversion in the United States: An Economic and Governmental Process* (1st Editio). New York: Routledge.
- Colsaet, A., Laurans, Y., & Levrel, H. (2018). What drives land take and urban land expansion? A systematic review. *Land Use Policy*, 79(3), 339–349. <https://doi.org/doi.org/10.1016/j.landusepol.2018.08.017>
- Connor, S. V. (1954). Land Speculation in Texas. *Southwest Review*, 39(2), 138–143. Retrieved from <http://www.jstor.org/stable/43463968>
- County Government of Kiambu. (2018). *County Intergrated Development Plan 2018-2022*. Government Printer, Nairobi.
- Cotteleer, G., Gardebroek, C., Luijt, J., Cotteleer, G., Gardebroek, C., & Luijt, J. (2019). Market Power in a GIS-Based Hedonic Price Model of Local Farmland Markets, *Southern Review* 84(4), 573–592. Retrieved from <https://www.jstor.org/stable/27647848>

- David, E. M. (1981). Growth, speculation and sprawl in a monocentric city. *Journal of Urban Economics*, 10(3), 201–226.
- Deng, J. S., Wang, K., Hong, Y., & Qi, J. G. (2009). Spatio-temporal dynamics and evolution of land use change and landscape pattern in response to rapid urbanization. *Landscape and Urban Planning*, 92(3–4), 187–198. <https://doi.org/10.1016/j.landurbplan.2009.05.001>
- Dewar, D. (2007). Eighteenth-Century Land Speculation at the Margins of the Anglo-American World. *History Compass*, 5(1), 251–261.
- Donoghue, C. O., Lopez, J., Neill, S. O., & Ryan, M. (2015). A Hedonic Price Model of Self-Assessed Agricultural Land Values. *Journal of Real Estate Finance and Economics*, 16(2)
- Dowall, D. E. (1996). *A framework for reforming urban land policies in developing countries* (1st Edition). Washington DC: The World Bank.
- Du, J., & Peiser, R. B. (2014). Land supply, pricing and local governments' land hoarding in China. *Regional Science and Urban Economics*, 48, 180–189. <https://doi.org/10.1016/j.regsciurbeco.2014.07.002>
- Du, J., Thill, J. C., & Peiser, R. B. (2016). Land pricing and its impact on land use efficiency in post-land-reform China: A case study of Beijing. *Cities*, 50, 68–74. <https://doi.org/10.1016/j.cities.2015.08.014>
- Emanuel, F., & Andrea, L. (2017). Land Use Policy The taxation of land value as the means towards optimal urban development and the extirpation of excessive economic inequality. *Land Use Policy*, 69(April), 331–337. <https://doi.org/10.1016/j.landusepol.2017.09.022>
- Evans, A. W. (1983). The Determination of the Price of Land. *Urban Studies*, 20(2), 119–129. <https://doi.org/10.1080/00420988320080271>
- Evans, A. W. (2008). *Economic, Real Estate and the Supply of Land* (1 st Editi). Oxford: Blackwell Publishing.
- Evans, A. W. (2017). *Economics and Land Use Planning. Economics and Land Use Planning* (1st Edition, Vol. 8). Oxford: Blackwell Publishing. <https://doi.org/10.4324/9781315112022>
- Ewing, R. (1994). Causes, characteristics, and effects of sprawl: a literature review. *Environmental and Urban Issues*, 21(2), 1–15.

- Filatova, T., Parker, D., & van der Veen, A. (2009). Agent-based urban land markets: Agent's pricing behavior, land prices and urban land use change. *Jass*, 12(1).
- Foldvary, F. (1998). Market-Hampering Land Speculation: Fiscal and Monetary Origins and Remedies. *American Journal of Economics and Sociology*, 57(4), 615–637.
- Foldvary, F. E., & Minola, L. A. (2017). The taxation of land value as the means towards optimal urban development and the extirpation of excessive economic inequality. *Land Use Policy*, 69(April), 331–337
. <https://doi.org/10.1016/j.landusepol.2017.09.022>
- Frederic, D. F., & Huang, Y. (2004). Uneven land reform and urban sprawl in China: The case of Beijing. *Progress in Planning*, 61(3), 211–236.
<https://doi.org/10.1016/j.progress.2003.10.004>.
- Fujita, M. (1989). *Urban economic theory: land use and city size*. Cambridge. Cambridge University Press.
- Elena, G., Bockstael, N. (1999). Interacting Agents , Spatial Externalities and of Residential Land Use Patterns the Evolution in Interacting Agents, Spatial Externalities and the Evolution of Residential Land Use Patterns. *Evolution*, 2 (November), 31–54.
- Gatauwa, J. M., & Murungi, M. (2015). Infrastructure Development and Real Estate Values in Meru County, Kenya. *Research Journal of Finance and Accounting*, 6(8), 44. Retrieved from www.iiste.org
- Gateri C. (2017). Implications of Highway Development on Land Values, Land Use and Livelihoods Along the Northern Bypass Corridor Kimabu and Nairobi Counties, Kenya, (Unpublished Doctoral Thesis) Kenyatta University.
- Gemeda, B. S., Abebe, B. G., & Cirella, G. T. (2020). How Efficient is Urban Land Speculation? In *Advances in 21st Century Human Settlements* (pp. 101–121). Singapore: Springer. https://doi.org/10.1007/978-981-15-3049-4_6
- Glumac, B., Herrera-Gomez, M., & Licheron, J. (2019). Land Use Policy A hedonic urban land price index. *Land Use Policy*, 81(March 2018), 802–812.
<https://doi.org/10.1016/j.landusepol.2018.11.032>

- Gul, A., Nawaz, M., Basheer, M. A., Tariq, F., & Raheel Shah, S. A. (2018). Built houses as a tool to control residential land speculation: A case study of Bahria Town, Lahore. *Habitat International*, 71(5), 81–87. <https://doi.org/doi.org/10.1016/j.habitatint.2017.11.007>
- Hall, R., Scoones, I., & Tsikata, D. (2015). *Africa's land rush: rural livelihoods and agrarian change*. Woodbridge: James Currey.
- Harbeson, J. W. (1971). Land Reforms and Politics in Kenya, 1954–70. *The Journal of Modern African Studies*, 9(2), 231–251. <https://doi.org/10.1017/S0022278X00024915>.
- Heim, C. E. (2001). Leapfrogging, Urban Sprawl, and Growth Management: Phoenix, 1950–2000. *The American Journal of Economics and Sociology*, 60(1), 245–283. Retrieved from <https://www.jstor.org/stable/3487953>
- Ho, M. H. C., & Kwong, T. M. (2002). Speculation and property price: Chicken and egg paradox. *Habitat International*, 26(3), 347–361. [https://doi.org/10.1016/S0197-3975\(02\)00012-7](https://doi.org/10.1016/S0197-3975(02)00012-7)
- Hovinen, G. R. (1977). Leapfrog Developments in Lancaster County: A Study of Residents' Perception and Attitudes. *The Professional Geographer*, 29(2), 194–199.
- Ilesanmi, F. A. (2016). The Effects of Land Speculation on Urban Planning and Development in Bajabure Area , Girei Local Government , Adamawa State. *Journal of Environmental and Earth Science*, 6(4), 128–133.
- Intriligator, M. D., & Sheshinski, E. (1986). *Toward a theory of planning*. Cambridge: Cambridge University Press.
- Irwin, E. G., & Bockstael, N. E. (2007). The evolution of urban sprawl: Evidence of spatial heterogeneity and increasing land fragmentation. *Proceedings of the National Academy of Sciences*, 104(52), 20672–20677. <https://doi.org/10.1073/pnas.0705527105>.
- Irwin, E. G., & Bockstael, N. E. (2004). Land use externalities, open space preservation, and urban sprawl. *Regional Science and Urban Economics*, 34(6), 705–725. <https://doi.org/10.1016/j.regsciurbeco.2004.03.002>
- Jimu, M. (2017). *Peri-urban Land Transactions: Everyday Practices and Relations in Peri-urban Blantyre, Malawi*. Bamenda: Langaa Research & Publishing CIG.

- Jones G., Jiménez E., W. P. (1994). Snapshot analysis and the impact of public policy on land valorization. In *Methodology for Land and Housing Market Analysis* (1st Editio). London: UCL Press Limited.
- Jonker, J., & Bartjan, P. (2018). *The Essence of Research Methodology: A Concise Guide for Master and PhD Students in Managment Science. Angewandte Chemie International Edition*, 6(11), 951–952. (1st Editio). London: Springer. <https://doi.org/10.1007/978-3-540-71659-4>
- Kalkuhl, M., Fernandez Milan, B., Schwerhoff, G., Jakob, M., Hahnen, M., & Creutzig, F. (2018). Can land taxes foster sustainable development? An assessment of fiscal, distributional and implementation issues. *Land Use Policy*, 78(May), 338–352. <https://doi.org/10.1016/j.landusepol.2018.07.008>
- Kanasugi, H., & Ushijima, K. (2017). The impact of a high-speed railway on residential land prices. *Regional Science*, 97(4), 1305–1335. <https://doi.org/10.1111/pirs.12293>
- Kanyinga, K. (2009). The Legacy of the White Highlands : Land Rights , Ethnicity and the Post-2007 Election Violence in Kenya. *Journal of Contemporary African Studies*, 27(3), 325–344. <https://doi.org/10.1080/0258900090315483>
- Kariko, M. E. (2009). *Factors contributing to illegal occupation and developments on alienated public land for road corridors in Kenya: The Case of Nairobi Northern Bypass*. (Unpublished Thesis) University of Nairobi.
- Kenya Urban Roads Authority. (2012). *Feasibility Study Report For Eastern and Northern Bypasses*. Nairobi.Unpublished Report
- Kenya National Bureau of Statistics. (2020). *2019 Kenya population and housing census - population by county and subcounty. Kenya Data Portal* (Vol. I). Nairobi: Government Printer.
- Kirk, R. W., Bolstad, P. V., & Manson, S. M. (2012). Spatio-temporal trend analysis of long-term development patterns (1900–2030) in a Southern Appalachian County. *Landscape and Urban Planning*, 104(1), 47-58
- Kim, G., Miller, P. A., & Nowak, D. J. (2018). Urban vacant land typology: A tool for managing urban vacant land. *Sustainable Cities and Society*, 36(October 2017), 144–156. <https://doi.org/10.1016/j.scs.2017.09.014>

- Kim, K., & Lee, H. S. (2000). Real Estate Price Bubble and Price Forecasts in Korea. In *Asian Real Estate Society* (pp. 28–30). Beijing: Sogang University Press.
- Kittrell, K. (2012). Impacts of Vacant Land Values. *Transportation Research Record: Journal of the Transportation Research Board*, 2276(1), 138–145. <https://doi.org/10.3141/2276-17>
- Kleemann, J., Inkoom, J. N., Thiel, M., Shankar, S., Lautenbach, S., & Fürst, C. (2017). Peri-urban land use pattern and its relation to land use planning in Ghana, West Africa. *Landscape and Urban Planning*, 165, 280–294. <https://doi.org/10.1016/j.landurbplan.2017.02.004>
- Knaap, G., Ding, C., & Hopkins, L. (2001). Do Plans Matter ? The Effects of Light Rail Plans on Land Values in Station Areas. *Journal of Planning Education and Research*, 21(1), 32–39.
- Kombe, W. J. (2005). Land use dynamics in peri-urban areas and their implications on the urban growth and form: The case of Dar es Salaam, Tanzania. *Habitat International*, 29(1), 113–135. [https://doi.org/10.1016/S0197-3975\(03\)00076-6](https://doi.org/10.1016/S0197-3975(03)00076-6)
- Konyimbih, T. M. (2000). *Land Value Taxation: Rating Principles and Guidelines for Kenya*. New Hampshire: Lincoln Institute of Land Policy.
- Kothari, C. R. (2004). *Research Methodology: Methods and Techniques*. New Delhi: New age International Limited.
- Krabben, E. Van Der, & Needham, B. (2008). Land readjustment for value capturing: A new planning tool for urban redevelopment. *The Town Planning Review*, 79(6), 651–672.
- Kumar, R. (2011). *Research Methodology: A Step by Step Guide for Beginnners* (2nd Editio). New Delhi: Sage.
- Laloo, K. (2002). The Politics of Place: Land Speculation and Infrastructure Development in Early 19th-Century Western New York. *Public Works Management and Policy*, 6(3), 215–228.
- Lee, J. S. (1990). Land Speculation in Korea: Causes, Economic Impact and a Proposal for Institutional Reforms. *The Korean Economic Review*, 6(2).
- Levien, M. (2012). The land question : Special Economic Zones and the Political Economy of Dispossession in India. *Journal of Peasant Studies*, 39(3), 933–969. <https://doi.org/10.1080/03066150.2012.656268>

- Lindeman, B. (1976). Anatomy of Land Speculation. *Journal of the American Institute of Planners*, 42(2), 142–152. Retrieved from <http://dx.doi.org/10.1080/01944367608977715>
- Logan, J. R., & Molotch, H. (1976). Growth Machine-Toward a Comparative Political Economy of Place. *American Journal of Sociology*, 82(2), 349–352.
- Malpezzi, S., & Wachter, S. M. (2005). The role of speculation in real estate cycles. *Journal of Real Estate Literature*, 13(2), 143–164.
- Manji, A. (2012). The grabbed state: Lawyers, politics and public land in Kenya. *Journal of Modern African Studies*, 50(3), 467–492. <https://doi.org/10.1017/S0022278X12000201>
- Mason, G. (2009). The Role of Land Markets in Economic Crisis. *American Journal of Economics and Sociology*, 68(4), 855–888.
- Mather, A. S. (1986). *Land Use*. New York: Longman Publishing Group.
- McCluskey, W. J., & Franzsen, R. C. D. (2016). *Land value taxation: An applied analysis*. London: Routledge. <https://doi.org/https://doi.org/10.4324/9781315250946>
- McConnell, V., Walls, M., & Kopits, E. (2006). Zoning, TDRs and the density of development. *Journal of Urban Economics*, 59(3), 440–457. <https://doi.org/10.1016/j.jue.2005.12.005>
- Miceli, T. J., Sirmans, C. F., & Kieyah, J. (2001). The Demand for Land Title Registration: Theory with Evidence from Kenya. *American Law and Economics Association*, (860), 275–287.
- Mickey, L. (1997). Reconstructing Urban Regime Theory. In M. Lauria (Ed.), *Reconstructing Urban Regime Theory: Regulating Urban Politics in a Global Economy* (1st Edition, pp. 1–13). London: Sage Publications.
- Miranda, J., Börner, J., Kalkuhl, M., & Soares-Filho, B. (2019). Land Speculation and Conservation Policy Leakage in Brazil. *Environmental Research Letters*, 14(4), 045006
- Ministry of Lands and Physical Planning. (2016). *National Land Policy*. Nairobi: Government Printer.
- Morandé, F., Petermann, A., & Vargas, M. (2010). Determinants of urban vacant land: Evidence from Santiago, Chile. *Journal of Real Estate Finance and Economics*, 40(2), 188–202. <https://doi.org/10.1007/s11146-008-9123-5>

- Mwende, J. (2013, April 24). Mega Projects Eastern Bypass: Africa's most expensive urban road. *Construction Kenya Review*.
- Napier Mark, Stephen Berrisford, Caroline Wanjiku Kihato, Rob McGaffin, L. R. (2013). *Trading Places: Accessing Land in African Cities*. Somerset West: African Minds.
- Nassiuma, D. K. (2001). *Survey Sampling: Theory and Methods*. Nairobi: University of Nairobi Press.
- Ng'ayu, M. (2016) "What Are The Drivers Of Growth On The Rural-Urban Fringes? A Case Study of The Nairobi-Kiambu Corridor." *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)* 6.6 (2016): 414-431
- Njiru, E. B. (2016). *Evaluation of Urban Expansion and Its Implications on*. (Unpublished Thesis). University of Nairobi.
- Nyongesa, C. B. (2018). *Assessing Functions of Bypass Roads in Cities and Towns- a Case Study of Eastern Bypass in the City of Nairobi*. (Unpublished Thesis). University of Nairobi.
- Ochieng', W. R., & Maxon, R. M. (1992). *An Economic History of Kenya*. Nairobi: East African Educational Publishers.
- Okoth-Ogendo, H. W. O. (1991). *Tenants of the Crown: Evolution of Agrarian Law and Institutions in Kenya*. Nairobi: African Centre for Technology Studies.
- Ottensmann, J. R. (2006). Urban Sprawl, Land Values and the Density of Development. *Land Economics*, 53(4), 389. <https://doi.org/10.2307/3145984>
- Ouna, V. (2017). *Land Governance in Urban Areas: Case of Nairobi City County*. Nairobi: The World Bank.
- Oyugi, M., & Owiti, K. (2007). Land Use Management Challenges for the City of Nairobi. *Urban Forum*, 18(1), 94–114.
- Philip, M. (2013). *Modern Urban and Regional Economics* (2nd Edition). Oxford: Oxford University Press.
- Physical Planning Department (2007). *Physical Planning Handbook*. Nairobi: Ministry of Lands and Physical Planning.

- Rakodi, C. (2003). Applying a political-economy approach to land and housing markets in Zimbabwe. In G. Jones (Ed.) *Methodology for Land and Housing Market Analysis* (2nd Edition, pp. 70–88). London: University College London (UCL) Press Limited.
- Razak, M. Z., Khalid, H., & Mohamad, A. (2018). Speculative Behavior in Vacant Land Development: Evidence for Real Options in Malaysia. *The Developing Economies*, 56(4), 245–266. <https://doi.org/10.1111/deve.12184>
- Republic of Kenya (1968). *Land Acquisition Act*. Nairobi: Government Printer.
- Republic of Kenya (2007). *The Kenya Vision 2030, 2007*. Nairobi: Government Printer.
- Republic of Kenya (2009). *Planning and Building Regulation of 2009*. Nairobi: Government Printer.
- Republic of Kenya (2010). *Gazette Notice 5608: Eastern Bypass Mombasa Road, Intention to Acquire Land*. Nairobi: Government Printer.
- Republic of Kenya (2010b). *Survey Act*. Nairobi: Government Printer.
- Republic of Kenya (2011). *Gazette Notice 5610 & 5611: Nairobi Eastern Bypass Road, Intention to Acquire*. Nairobi: Government Printer.
- Republic of Kenya (2012a). *Land Control Act. Kenya Gazette*. Nairobi: Government Printer.
- Republic of Kenya (2012b). *Public Health Act*. Nairobi: Government Printer.
- Republic of Kenya (2012c). *Valuation for Rating Act*. Nairobi: Government Printer.
- Republic of Kenya (2012d). *Land Registration Act No. 3 of 2012*. Nairobi: Government Printer.
- Republic of Kenya (2012e). *Physical Planning Act*. Nairobi: Government Printer.
- Republic of Kenya (2012f). *The National Land Commission Act, 2012* (Vol. 71). Nairobi: Government Printer.
- Republic of Kenya (2013). *Gazette Notice No. 1795: Eastern Bypass–North Airport Road, Intention to Acquire Land*. Nairobi: Government Printer.
- Republic of Kenya (2016). *Gazette Notice No. 3016: Revocation of Membership. Kenya Gazette*. Nairobi.

- Republic of Kenya (2017). *Land Control Act. Kenya Gazette*. Nairobi: Government Printer.
- Republic of Kenya (2019a). *Land Act No. 6 of 2012*. Nairobi: Government Printer.
- Republic of Kenya (2019b). *Land Value Act*. Nairobi: Government Printer.
- Republic of Kenya (2019c). *The Physical Planning and Land Use Act, 2019*. Nairobi: Government Printer.
- Republic of Kenya (2019d). *Urban and Cities Act of 2019*. Nairobi: Government Printer.
- Ronge, E., & Moyi, E. (2006). *Taxation and Tax Modernization in Kenya*. Nairobi: Institute of Economic Affairs.
- Ross, M. W. (1927). *Kenya From Within: A Short Political History* (1st ed.). London: Unwin Brothers Ltd.
- Sargent, C. S. (1976). Land Speculation and Urban Morphology. In John S. Adams (Ed.), *Urban Policy- making and Metropolitan Dynamic* (1st Edition). Cambridge: Ballinger Publishing Company.
- Schmid, A. A. (1970). Suburban Land Appreciation and Public Policy. *Journal of the American Planning Association*, 36(1), 38–43.
- Sheehan, M. F. (1982). Land Speculation in Southern California: The Roles of Railroads, Trolley Lines and Autos. *American Journal of Economics and Sociology*, 41(2), 187–197.
- Shiuh-Shen, C. (2013). Chinese eco-cities: A perspective of land-speculation-oriented local entrepreneurialism. *China Information*, 27(2), 173–196. <https://doi.org/10.1177/0920203X13485702>
- Sisson, A., Rogers, D., & Gibson, C. (2018). Property speculation, global capital, urban planning and financialisation: Sydney Boom, Sydney Bust redux. *Australian Geographer*, 50(1), 1–9.
- Smith, J., JoséVicente, C., & Alvaro, R. (1997). Land speculation and intensification at the frontier: a seeming paradox in the Colombian savanna. *Agricultural Systems*, 54(4), 501–527.
- Stanley, B. W. (2016). Leveraging Public Land Development Initiatives for Private Gain: The Political Economy of Vacant Land Speculation in Phoenix, Arizona. *Urban Affairs Review*, 52(4), 559-590.

- Stanley, B. W. (2017). *Transparent urban development: Building sustainability amid speculation in phoenix*. New York: Palgrave Macmillan.
- Stanley, W. J. (2013). *The Theory of Political Economy* (4th Editio). New Hampshire: Pagrave Macmillan.
- Syagga, P. M. (2006). Land Ownership and Use in Kenya: Policy Prescriptions from an Inequality Perspective. In *Readings on Inequality in Kenya: Sectoral Dynamics and Perspectives* (1st Edition, pp. 289–344). Nairobi: Society for International Development, East Africa.
- Thompson, A. W., & Prokopy, L. S. (2009). Tracking urban sprawl: Using spatial data to inform farmland preservation policy. *Land use policy*, 26(2), 194–202.
- Thontteh, E. O., & Babarinde, J. A. (2018). Analysis of land speculation in the urban fringe of Lagos, Nigeria. *Pacific Rim Property Research Journal*, 24(2), 161–184.
- Thuo, A. M. D. (2013). Impacts Of Urbanization on Land Use Planning, Livelihood and Environment in the Nairobi Rural-Urban Fringe, Kenya. *International Journal of Scientific & Technology Research*, 2(7), 70–79.
- Thuo, M. (2013a). Exploring Land Development Dynamics in Rural-Urban Fringes: A Reflection on Why Agriculture is Being Squeezed out by Urban Land Uses in the Nairobi Rural–Urban Fringe? *International Journal of Rural Management*, 9(2), 105–134.
<https://doi.org/https://doi.org/10.1177/0973005213499088>
- Thuo, M. (2013b). Genealogy of Land Ownership, Use and Management Problems in Kenya During the Pre-August 2010 Constitution Period. A Review. *International Journal of Engineering Research & Technology*, 2(8), 1526–1542.
- Triantafyllopoulos, N. (2017). On the origins of tourist urbanisation in Greece: Land speculation and property market (in)efficiency. *Land Use Policy*, 68, 15–27.
- Walters, L. (2012). *Land and Property Tax: A Policy Guide*. Nairobi: UN-HABITAT. <https://doi.org/10.1016/B978-0-434-98606-4.50010-7>.
- Walters, L. (2012). Land Value Capture in Policy and Practice. Nairobi. *World Bank Land Conference 2012*.

- Wyatt, M. D. (1994). A Critical View of Land Value Taxation as a Progressive Strategy for Urban Revitalization, Rational Land Use, and Tax Relief. *Review of Radical Political Economics*, 26(1), 1–25.
<https://doi.org/10.1177/048661349402600101/>
- Yang, X., Wu, Y., Shen, Q., & Dang, H. (2017). Measuring the degree of speculation in the residential housing market: A spatial econometric model and its application in China. *Habitat International*, 67, 96–104.
<https://doi.org/10.1016/j.habitatint.2017.06.005>
- Yang, Z. (2018). Differential effects of land value taxation. *Journal of Housing Economics*, 39 (December 2016), 33–39.
<https://doi.org/10.1016/j.jhe.2017.11.002>
- Zhang, J., Li, L., Yu, T., Zhang, D., Zhao, G., & Wen, H. (2020). Marketization Allocation, Land Price, and Local Government Land Speculation , China. *International Journal of Strategic Property Management*, 24(5), 335–347.
- Zhang, W., Wrenn, D. H., & Irwin, E. G. (2017). Spatial heterogeneity, accessibility, and zoning: An empirical investigation of leapfrog development. *Journal of Economic Geography*, 17(3), 547–570.
<https://doi.org/10.1093/jeg/lbw007>

APPENDICES

Appendix 1: Questionnaire for Land Enterprises

Name of Interviewer: _____ Date of Interview:

*My name is Hannah Kinuthia, a PhD student from Kenyatta University. I am carrying research on **Peri Urban Land Speculation and its implication on Land Development along (Greater) Eastern Bypass**. The information shared will only be used for research purposes and will be treated with utmost confidentiality.*

Section one: General Information

1. Name of the land or real estate company/firm_____ (optional)
2. How long have you worked as land agent or as a land/real estate company?
 - a) 1-5 years[] b) 5 to 10 years[] c) 10-15years[] d) 15-20 years[]
 - e) 20 years and above[]
3. What type of land sales do you deal with?
 - a) Residential [] b) Commercial/Industrial [] c) Agriculture []
 - d) Other [] specify____
4. What motivates you in land sale business?_____
5. From whom do you buy your land?_____
6. Other Land companies [] b) Individual's [] c) SACCOs/Self Help group []
- d) Others [] Specify_____
7. How did you access information on available land for sale?
 - a) Social media[] b) Print media[] c) Mainstream media[] d)
 - Others_____
8. Who are the major buyers/customers of your subdivided lands? _____
 - a) Individuals [] b) Self-help/investment groups [] c) Institutions [] d)
 - others
9. How do you raise money for buying the land?
 - a) Bank/Sacco loan[] b) Personal savings[] c) Group savings[] d)
 - Mortgage [] e) others__

Section Two: Land Subdivision

1. Have you subdivided land close to any of the following developments along (Greater) Eastern Bypass between 2005 and 2018?

- a) Greater Eastern Bypass (Juja Farm) Yes [] No []
- b) Link Road Yes [] No []
- c) Eastern Yes [] No []

If Yes,

	Land size before sub-division	Sub-division sizes	No. of sub-division (No. of plots)	Year of sub-division	Land purchase value	Year of purchase	Original land use	Current land use
Juja farm								
Juja farm								
Juja farm								
Link road								
Link road								
Link road								
Eastern byp								
Eastern byp								
Eastern byp								

- 2. a) When did you first hear about the construction of Eastern Bypass?_____
- b) When did you first hear about the proposed Greater Eastern Bypass?_____
- 3. Where did you obtain the information on proposed Greater Eastern Bypass/ Eastern Bypass?_____
- 4. How did the information on development of Eastern Bypass and Greater Eastern Bypass influence your

business?_____

5. Do you carry out any form of improvement before or after subdividing?

- a) Yes b) No

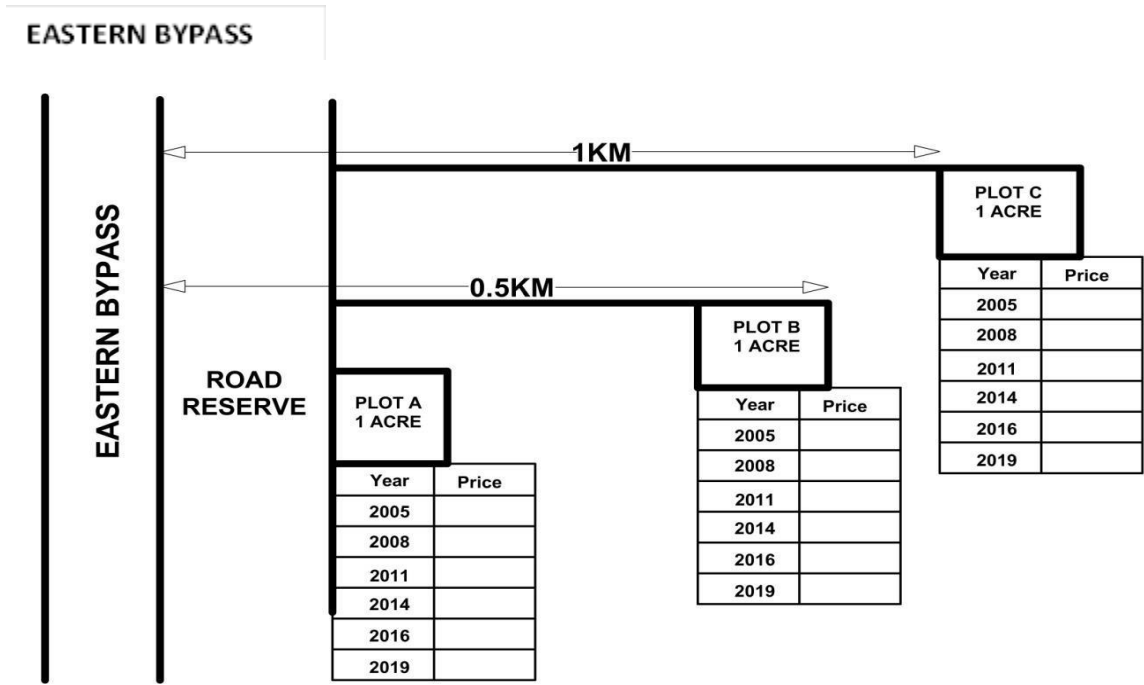
6. If Yes, What kind of improvement?

7. While buying land for sale, how do you establish land that will give you maximum benefit?_____

8. What considerations do you make while subdividing a given parcel of land?

Section Three: Change in Land Prices

1. How has the land prices varied between 2005 and 2018 for particular plots of land you sold along Eastern Bypass, Greater Eastern Bypass and Link Road?



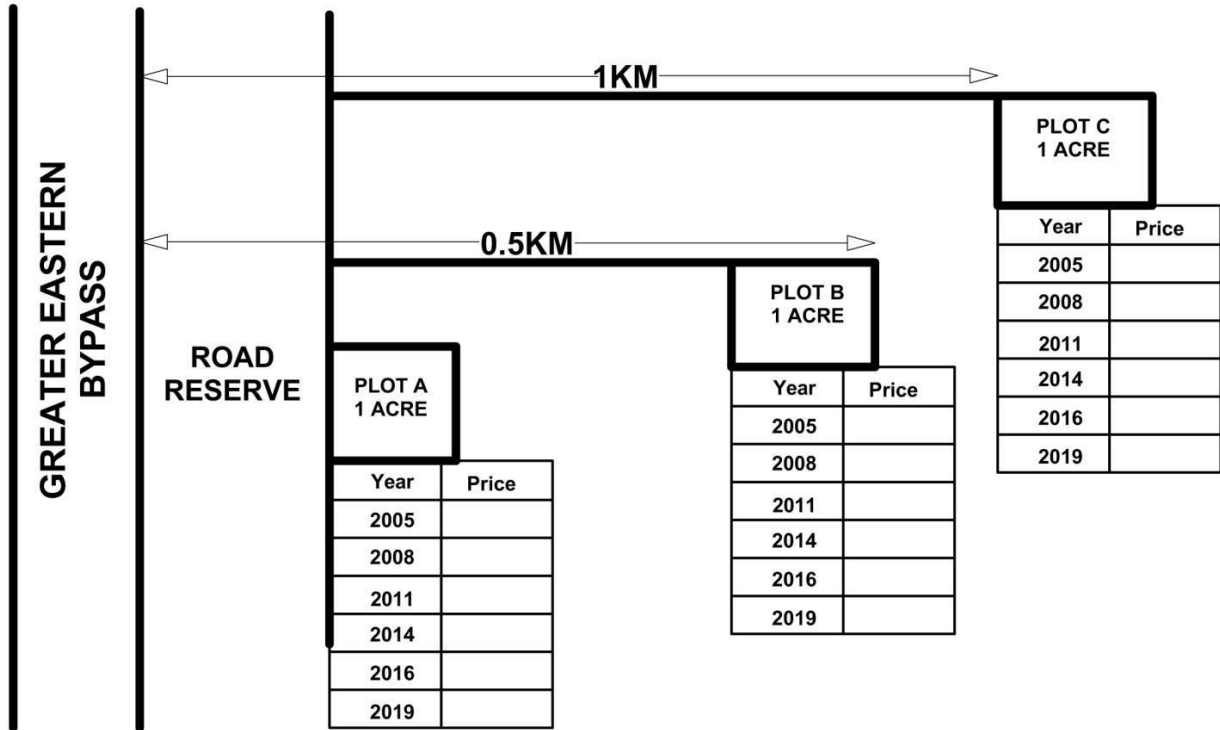
2. What triggers changes in land prices?_____

3. Are there any implications of buying and selling land close to major projects?

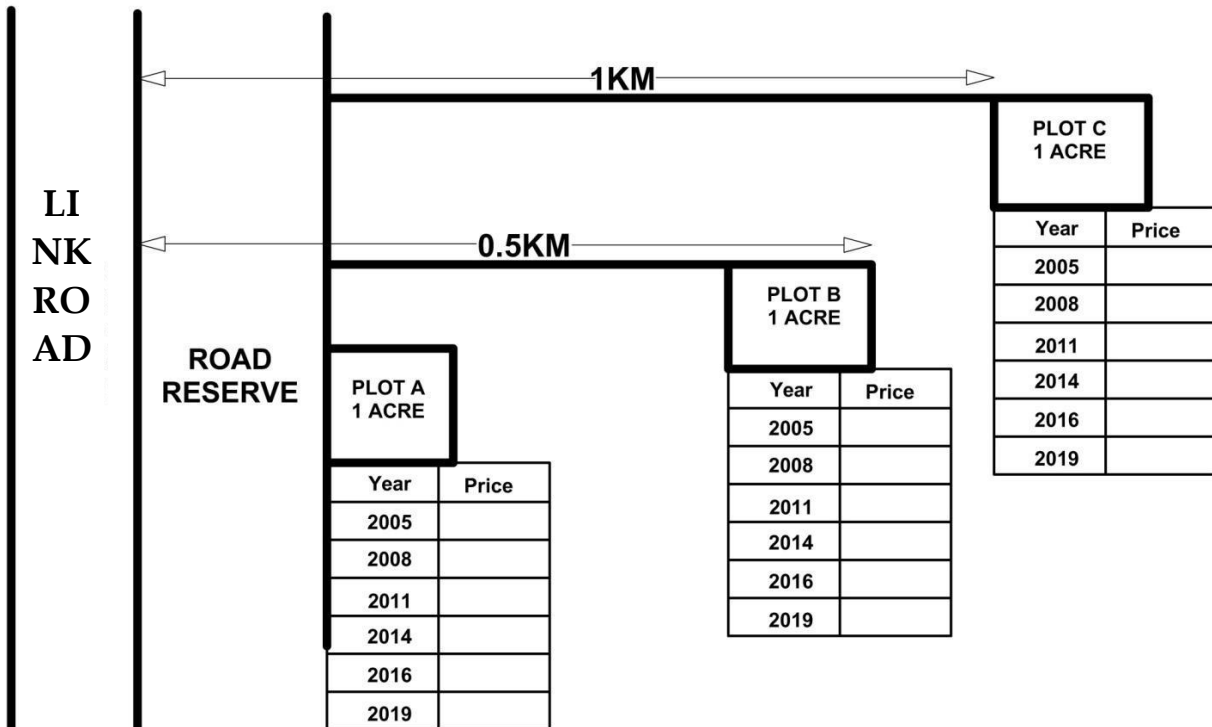
4. Yes b) No

5. If yes, what are the effects?_____

GREATER EASTERN BYPASS-JUJA FARM



LINK ROAD-



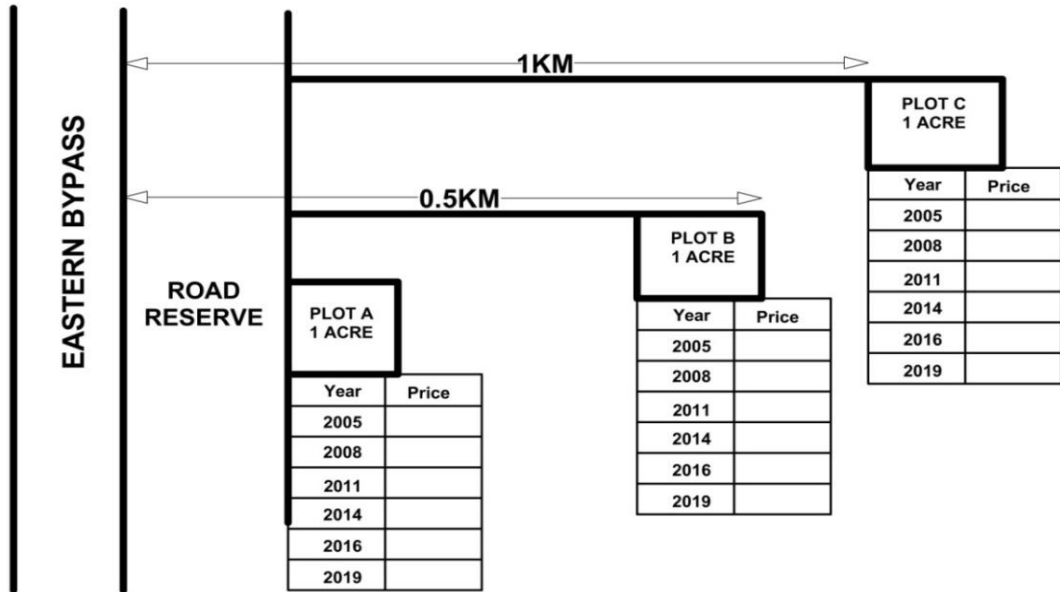
Appendix 2: Land Enterprises Interview Schedule

Name of Interviewer: _____ Date of Interview: _____

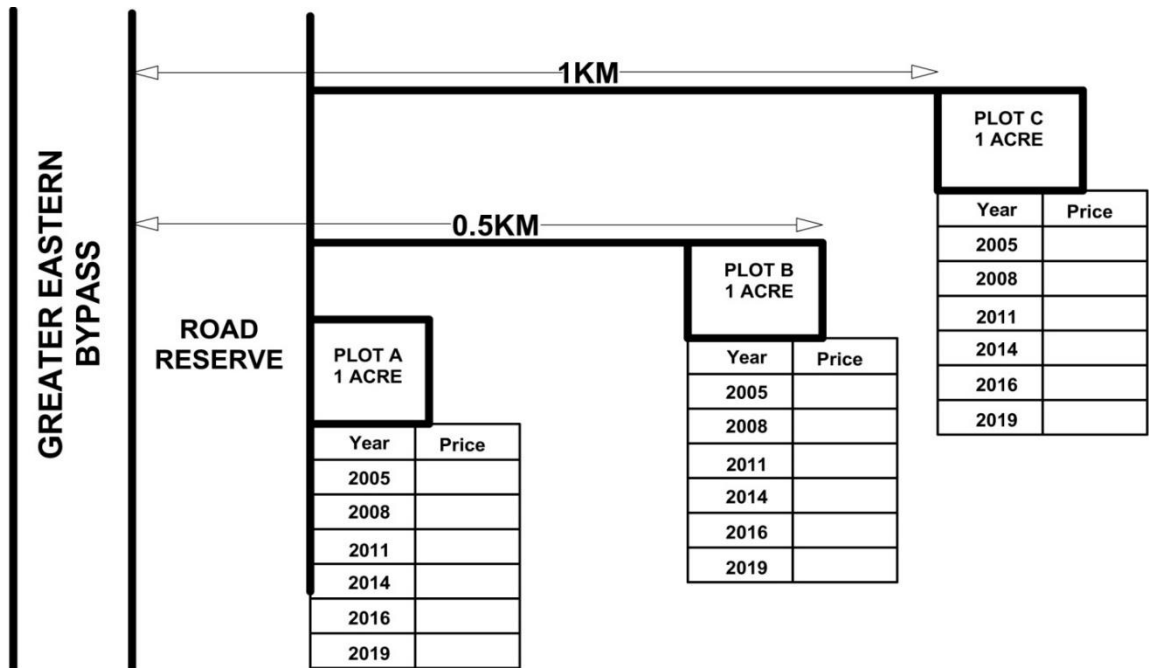
*My name is Hannah Kinuthia, a PhD student from Kenyatta University. I am carrying research on **Peri Urban Land Speculation and its implication on Land Development along (Greater) Eastern Bypass..** The information shared will only be used for research purposes and will be treated with utmost confidentiality.*

1. What amount of land have you sold along the a) Eastern Bypass and b) Greater Eastern Bypass (Juja farm)_____
2. What other areas have you sold/are selling large quantity of land?_____
3. Why have you selected this particular places to buy and sell land?_____
4. How long have you been in land sale/investment business?_____
5. How do you source/ raise money or capital to buy land for selling?_____
6. What challenges do you face in land sale business?_____
7. Using the figure below please indicate how the land prices have changed over years along the Eastern bypass and Greater Eastern Bypass in Juja farm.

EASTERN BYPASS



GREATER EASTERN BYPASS-JUJA FARM



8. Did you have any prior information before you bought land for selling in Juja farm or along the Eastern Bypass? _____

Appendix 3: Interview Schedule to Planning Authority (KURA)

Name of Interviewer: _____ Date of Interview: _____

*My name is Hannah Kinuthia, a PhD student from Kenyatta University. I am carrying research on **Peri Urban Land Speculation and its implication on Land Development along (Greater) Eastern Bypass**. The information shared will only be used for research purposes and will be treated with utmost confidentiality.*

1. When were Eastern Bypass/Greater Eastern Bypass planned and conceptualized?
2. When was the initial design drawing for Eastern Bypass/ Greater Eastern Bypass done?
3. i) Were there any changes in design?
ii) What occasioned the changes and when were they carried out?
4. When were the consultancy and construction contract awarded?
5. When were feasibility studies/EIA conducted?
6. When was the gazette notification done?
7. How was land acquisition and compensation carried? (Number of phases) why was it done in phases?
8. Were government institutions along the Eastern Bypass/ Greater Eastern Bypass compensated?

Appendix 4: Interview schedule to Kiambu County Planners/FGD guide

Name of Interviewer: _____ Date of Interview: _____

*My name is Hannah Kinuthia, a PhD student from Kenyatta University. I am carrying research on **Peri Urban Land Speculation and its implication on Land Development along (Greater) Eastern Bypass**. The information shared will only be used for research purposes and will be treated with utmost confidentiality.*

1. What is land speculation from your understanding?
2. How would you describe the nature of land speculation in Kiambu County?
3. Is there any land speculation in Kiambu County?
4. Which areas in Kiambu County are currently experiencing land speculation?
5. How has land speculation affected land subdivision in Kiambu County?
6. What measures has the County Government put in place to curb land speculation?
7. What causes land speculation in the peri urban areas of Kenya?
8. What are effects of land speculation in the peri urban areas of Kenya?
9. How has land speculation affected land development in Kiambu County?
10. Does land acquisition and compensation influence land speculation in Kenya?
11. Who do you think are the main land speculators in Kenya?

Appendix 5: Observation Checklist

Indicator	Sub-Indicator	No./Km	Location	Remarks
Amenities	Public schools			
	Public market			
	Cemetery			
	Bus station			
	Police office			
	Health facilities			
	Community centres			
	Fire stations			
	Public libraries			
Utilities	Boreholes			
	Electricity lines			
	Water lines			
Accessibility	Motorable roads			
Type of land use activities	Farming			
	Grass land			
	Riparian and water bodies			
	Built up area			

Appendix 6: Factor Analysis of Constructs in Hypothesis Testing

Component	Extraction
Period of time land enterprise existed	.826
Capital for Land business	.824
Period an enterprise learnt about development of Eastern Bypass	.474
Period an enterprise learnt about development of Greater Eastern Bypass	.690
Total quantity of land subdivided in Greater Eastern Bypass	.791
Total quantity of land subdivided in along Link Road	.789
Total quantity of land subdivided along Eastern Bypass	.836
Period between buying and land subdivision	.673
Extraction Method: Principal Component Analysis	

Appendix 7: Memo on Land Subdivision in Kiambu County

REPUBLIC OF KENYA

Telegraphic Address
'Governor' Kiambu

Tel: 067 20374
E-mail: kiambucountygovernment@gmail.com

When replying please quote Ref No. & Date



Lands, Housing & Physical Planning
Kiambu County
P O Box 2344 - 00900
KIAMBU, KENYA

COUNTY GOVERNMENT OF KIAMBU

REF: KCG/LHPP/RE-DC/S2/VOL1/39

Date: 27th August 2014

THE CHAIRMAN,

- 1) Kiambu Sub County Land Control Board
- 2) Kiambaa Sub County Land Control Board
- 3) Githunguri Sub County Land Control Board
- 4) Kikuyu Sub County Land Control Board
- 5) Limuru Sub County Land Control Board
- 6) Lari Sub County Land Control Board
- 7) Thika Sub County Land Control Board
- 8) Juja Sub County Land Control Board
- 9) Ruiru Sub County Land Control Board
- 10) Gatundu North Sub County Land Control Board
- 11) Gatundu South Sub County Land Control Board
- 12) Kabete Sub County Land Control Board

RE: LAND TRANSACTIONS ON SUBDIVIDED PARCELS OF LAND IN KIAMBU COUNTY

It has been noted with concern that parcels of land that have undergone un-procedural subdivision and surveying have been presented to the Land Boards in Kiambu County and given consent in total contravention of Part V Clause 29(b) of the Physical Planning Act.

Please be advised that all subdivision transactions presented to the board must be accompanied by a stamped and signed scheme plan together with Form PPA.2 (Notification of Approval of Development Permission) issued by the County Government.

Your strict adherence to this requirement will eliminate any conflicts that may arise on physical planning standards compliance.

Eunice M. Karoki
CECM – LANDS, HOUSING & PHYSICAL PLANNING

0745 631472



**NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION**

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/18/72846/26376**

Date: **27th November, 2018**

Hannah Wanjiru Kinuthia
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “*Peri urban land speculation and its implication on land development in Ruiru, Kiambu County, Kenya*” I am pleased to inform you that you have been authorized to undertake research in **Kiambu County** for the period ending **26th November, 2019**.

You are advised to report to **the County Commissioner and the County Director of Education, Kiambu County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a **copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

**DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner
Kiambu County.

The County Director of Education
Kiambu County.

Appendix 9: Research Authorization from KURA



KENYA URBAN ROADS AUTHORITY

Efficient and safe urban roads

IKM PLACE, Bishops Road, Tel: 254-020-8013844
 Email: info@kura.go.ke Web: www.kura.go.ke
 P.O. Box 41727-00100, GPO, NAIROBI

KURA/CS/HRM/3 (1)

22nd March 2019

Hannah W. Kinuthia
 P. O. Box 43844 - 00100
 NAIROBI

Dear Hannah

AUTHORITY TO ACCESS RESEARCH INFORMATION FOR PhD RESEARCH

Reference is made to your letter dated 12th March 2019 seeking authority to access information for your research titled '*Peri Urban Land Speculation and Its Implication on Land Development in Ruiru and Juja Sub-County in Kiambu County*'.

We have reviewed your application together with the introduction letter from Kenyatta University and the clearance from the National Commission for Science, Technology & Innovation (NACOSTI) and are glad to grant your request.

You may thus contact the Ag. Director, Urban Roads Planning and Design at Kenya Urban Roads Authority (KURA), IKM Place Tower B, 3rd Floor for assistance.

You will be required to treat the information availed to you confidentially and use it only for purposes of writing the academic paper.

We shall be grateful to receive a copy of the final research report upon completion of the study.

Yours sincerely

Eng. Silas M. Kinoti
 Ag. DIRECTOR GENERAL

FCB - DD (HRMA) *Seen 22/3/19*

cc: Ag. Director (URP&D)

