INVESTIGATING THE POTENTIAL FOR INDUSTRIAL DEVELOPMENT IN JUJA TOWN, KIAMBU COUNTY.

BEATRICE BITENGO OGORA

B. Environmental Planning and Management (Hons). Kenyatta University.

A Research Project Submitted in Partial Fulfillment of the Requirement for the Master of Arts Degree in Planning

Department of Urban and Regional Planning

School of the Built Environment

University of Nairobi

2018

DECLARATION

This research work is my original work and has not been submitted in this or any other university for admission, examination or award:

BEATRICE BITENGO OGORA

Signature……..Date……

This research project has been submitted for examination with my approval as university supervisor:

DR. MARGARET M. NG'AYU

Signature……Date……

DEDICATION

I dedicate this research to my late mum and sister ‘Naomi Nyabwari and Ruth’

RIP

To my dad, siblings and my family:

Your motivation was God sent, while your patience is God given.

ACKNOWLEDGEMENT

I would like to acknowledge all persons who contributed to the successful completion of this research Project. First, I would like to thank the Almighty God for the strength and wisdom.

My Supervisor, Dr. Margaret Ng'ayu, for her intellectual support, mentorship and wonderful insights, and directions without which the development and completion of the project could not have been possible. I will also like to extend my appreciation to DURP programme lecturers, for the support they granted me during my studies and research. They have inspired planning skills into my life.

In the list, Department of Landscape Architecture (JKUAT) cannot be forgotten for support received during this study.

I am so grateful to the key resource persons for the information and support received during this research: They include the County government of Kiambu – Departments of physical Planning, Transport, Trade and Industry, the County enterprise directorate department, Education department, Health, Survey of Kenya. I do acknowledge my classmates for moral support. Thank you for being best colleagues in the academic journey. The technical team, who, in whatever form, I received their support without which the completion could probably not have been successful.

I am greatly indebted to the following institutions that made my research possible: CBOs and FBOs in Juja; UCCD (JKUAT) through Prof Ngunjiri despite his commitment guided me to appreciate the community aspects. Thanks to the local leaders, especially area chief, local elders who was helpful during my field studies. Special thanks go to my dear family, for your overwhelming support. Finally, may the Lord bless all those who are not mentioned but contributed in one way or another towards the successful realization of this project.

ABSTRACT

The study finds its foundation from the fact that industrial activities are referenced to having a role in development and economic growth. Nations have strongly related the activities to transport corridors and argued that, either of the two can induce the image of the other. Globally, the concept of industrial development therefore, continues to emerge as part of literature review in regional as well as urban design. Kenya identifies the sector as being critical to the advancement of its economy, intending to provide support systems to boost its performance, in turn contribute to social economic growth of the nation. However, areas of potential growth have not been clearly identified nor the industrial manifestation defined to guiding and achieving sustainable planning. The research focused on investigating the potential growth of industrial activities in Juja town which falls within Nairobi metropolitan and along the Nairobi-Thika transport corridor. The research identified the proportionate industrial land use in Juja town. It also identified and analyzed the conditions of supporting infrastructural and community services; and examined the contribution of the activities to this town. It has recommended intervention measures for attainment of sustainable inclusion of industrial development in Juja town; it has further used the manifestation of Juja to make recommendations on policy measures that can advance industrial growth in similar areas for sustainable development in Kenya. The study used a survey design, collected both qualitative and quantitative data. Quota, simple and stratified random sampling were used to sample 100 households from the 3 sub locations, 30 number commercial enterprises and 20 industrialists. The key informants included: the sub-county physical planner, officials from various county departments, including Trade and industry; transport service providers among others. Focus Group Discussions were conducted; physical measurements were carried on the ground and by use of satellite images; and photography was also carried. Results showed that industrial activities hold second land user at 10%, as residential was at approximately 70%. PBCC a historical industrial company is among the large, medium and small enterprises. Quarries which hold a major share of land show a depleting trend, however, other forms of industries are emerging. Despite highly subdividing land, expansion opportunists exist. Contribution to the town include: household income, employment and it also forms as a source of revenue; infrastructural and community services indicated to support the sector with Nairobi-Thika highway among the influencing attributes. The study concluded that the town was ‘a potential industrial hub’ for industrial development. Recommendations include safeguarding existing

functional land; preparation of land -use plan in order to expand industrial land and ensure compatibility for sustainable development**.**

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LIST OF ABBREVIATIONS

CBD	Central Business District
CIDP	County Integrated Development Plan
ECDE	Early Childhood Development Education
EIA	Environmental Impact Assessment
EMCA	Environment Management and Co-ordination Act
Ft.	Feet
GIS	Geographic Information System
G.o.K	Government of Kenya
GPS	Geodetic Positioning System
HQs	Head Quarters
ICT	Information and Communication Technology
IGUs	Income Generating Units
ISUDP	Integrated Spatial Urban Development Plan
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KNBS	Kenya National Bureau of Statistics
KNHPC	Kenya National Housing and Population Census
NEMA	National Environment Management Authority
NLC	National Land Commission:
NMR	Nairobi Metropolitan Region
PBCC	Premier Bag and Cordage Company
RIMs	Registry Index Maps
RUJWASCO	Ruiru and Juja Water and Sewerage Company
SWOT	Strengths, Weaknesses, Opportunities and Threats
TORs	Terms of Reference
UCCD	University Community Collaboration Department

WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Since World War II, urban growth and its impacts has been a subject of concern worldwide. Traditionally, industrial activities with related opportunities were restricted to the CBD of major cities, thus encouraging immigration into these areas for the purpose of seeking for employment. These necessitated the continued global concerns in addressing their developments for sustainability. However, with evolution of transport networks urbanization has emerged in new landscapes.

Major transport corridors have played a role in evolution of spatial planning. The corridors provide accessibility and connectivity because they act as a network axis while changing landscapes through which they traverse (Antrop, 2004). Urban features emerge along these corridors replacing land reserved for other uses, (Ng'ayu 2015) and an important aspect is the capacity for the corridors to accommodate economic activities along the infrastructure development (van Duinen, 2013). The emergence of a development corridor that would require application of spatial planning principles and guidelines for sustainable development calls for relevant strategies to ensure a desired end.

The relationship of these corridors to development is not a new phenomenon in the world. The East –West rail road, followed by federal highway networks allowed United States to utilize their underutilized resource-base especially in the western part which was locked (McNamara, n.d). Rodrigue 2016 has also noted that the current level of concentration of economic and industrial activities along the transport routes in North America, has contributed to the shaping of its economic development. In Netherlands research indicates that industrial developers and employers at some instance pointed to the economic potential provided by development corridors (van Duinen, 2013).

In Africa the Maputo development corridor is referenced as a spatial engineering concept that has played a core role in industrial policy in South Africa (Rogerson and Crush, 2001). The abandoned industrial spaces (during the apartheid industrialization) are now unlocked. In Kenya, history reveals the existence of industrial development along the Kenya - Uganda corridor. Since 1920, the Athi River is one town that has grown from a small railway substation to becoming the leading industrialized town in Kenya (Mireri, 1992). On the other hand history reveals under-utilized potential for industrial development (Sessional paper no.

10 of 1986; Development plans of 1979/83; 1989/93 among others) and vision 2030 is a leading policy with intentions of coming up with transformation programmes.

Currently, Kenya like other countries is pointing to the LAPSSET development corridor as an approach to improving the general economy, as well address the imbalances that were created by the northern corridor (Kasuku, 2014). The project that is envisioned to contribute 8-10% of the country's economic growth a stride 50km on either side of where industrial investment will be situated, (Kasuku, 2014) clarifies.

However, with high expectations of investments influenced by development corridors, researchers warn that their delivery in most cases is hindered by challenges (Crush and Rodgerson 2001). These include lack of political will to: - identify opportunities, coordinate different entities, disseminate information, provide relevant infrastructure and community services; and most importantly lack of capacity to unblock the potentials (inadequate capital, skills and tools). In his contribution, while evaluating industrial development in Kenya. Mireri 2000, concurs with Rodgerson particularly pointing to little research; non conducive environments; poor performance of promotion of industrial efforts inertia as challenges that have hindered successful architecture to industrialization.

The Nairobi - Thika highway is a transport corridor that connects Nairobi city to central Kenya and to the North-Trans Africa Highway, Ethiopia border and the Northern Corridor in Kenya. Since its upgrade in 2013, it has emerged as one of the most important economic corridors in the country. Transformation of landscape along corridors in Kenya is a major spatial impact that raises concern over optimal use of land to enhance development.

Juja is a vibrant town, which is growing rapidly along this corridor. This node accommodates a public university, residential developments and numerous economic activities including industry, commerce and agriculture. The major challenge in such a node is to establish the economic and growth niche that will influence and spur further development. This research work is an attempt to assess the potential of Juja town as an industrial growth center given the massive flat land and its location between Nairobi and Thika. The project also aspires to contribute to probable answers to vision 2030, as of the essence of having seamless connectivity with an aim of providing hope to any potential area of development.

1.2 Problem Statement

With the diminishing agricultural production, coupled with expansive land, Juja town presents high potential for industrial development. Prospective developers are however biased to residential development and thus the town is rapidly sprawling with residential activities to a level of diminishing the open land.

The area is traversed by a railway line and a major road transport that connects it to Nairobi and other towns in central Kenya. These important infrastructure elements, together with other major networks centrally place the town in Kenya as well extending it to the East Africa region. Coupled with proximity to major industrial towns of Nairobi, Thika, Athi River, which again form major markets, potentially defining the town a 'Potential industrial hub'. Proximity to the Jomo Kenyatta international airways (JKIA) again increases its accessibility. Planning authorities should guide development such that the infrastructure should influence or support industrial investments and limit the characterization of the Juja as a dormitory town.

History, states that the major economic activity in Juja, as agro-based industry, mostly sisal and coffee growing as well as quarrying. The East African sisal Factory (now PBCC) occupies a good percentage of private industrial land and has supportive facilities that can encourage the industrial activities. But for decades Juja's potential for industrial development has not been given the attention in planning. For instance, the pressures revolving around residential attraction may result in negative effect to the Premier Bag and Cordage Company (PBCC), and quarry lands. On the other hand quarries are getting depleted and the exhausted quarry-land cannot support other activities. The town need to build on this historical heritage, utilize its natural endowment of flat expansive land to expand thus improving the welfare of the population within, spur the development at regional level consequently respond to vision 2030 as well SGDs.

The town has the opportunity to utilize opportunities offered by the expanding population, skills and land capacity to tap into the potential for industrial growth. Kenya has high dependency ratio, but industrial development has the capacity to create formal jobs to skilled and unskilled Kenyans.

Industrial growth has the potential to spur economic development. The corridor has emerged as an industrial corridor including: clay works, flower firms, quarrying, sisal industry, food processing among others. However the nature, type and magnitude of this industrial activities

is not known. How much the sector is contributing to the household income and Juja as a whole nor the current challenges to its growth is not disseminated. The understanding of the attributes is necessary if the sector has to play a crucial role in the economy. The lack of information then forms vacuum in knowledge that this study aims to fill. This research work, therefore, will seek to explore into the spatial definition of industrial activities scenarios in Juja while understanding complexities, as well potentials of this land use and services with an aim of developing proposals to establish functioning industrial development on a sustainable development corridor.

1.3 Research Questions

i) What is the existing nature and characteristics of land uses in Juja town?

ii) What is the contribution of industry as an economic activity in Juja town?

iii) What are the categories and conditions of the infrastructure in support of industrial activities in Juja town?

iv) What policy and planning interventions can be proposed for industrial activities in Juja town?

1.4 Objectives

i) To analyze existing nature and characteristics of land uses in Juja town

ii) To identify the contribution of industry as an economic activity in the town.

iii) To examine the categories and conditions of the infrastructure in support of industrial activities in Juja town

iv) To propose policy and planning interventions for industrial activities in Juja town.

1.5 Scope of the Study

The study focused on assessing the potential for industrial growth in Juja town. The assessment comprised an examination into the current land uses, the proportionate land alienated to industries; the availability of infrastructure and community services that support industrial development. The study carried in Juja town that lies a stride Nairobi-Thika highway. The area covered is 49.97 km^2; bounded precisely at coordinate {(P1)274497.1; 9879883.7 (P2)277312.4; 79882380.3} to the North, and at {(P3)280790.3; 9872803.6, (P4) 283356.7; 9873488.7, (P5) 283531.2; 9877772.8}, in Kiaora, Mirima-ini, and Kalimoni sub locations within Juja Sub-County, Kiambu county.

1.6 Justification

Juja town exhibits great dynamics of rapid growth and transformation coupled with phenomenal informal development**.** It is evident that the landscape in this area is changing, attracting industrial activities, commercial and increased residential developments. How to sustainably integrate industrial growth in this town remains a challenge since some development took place ahead of planning. If planning is not consulted, incompatibility and land conflicts will remain to inform the current and the future story. Among them, encroachment to road reserves, and, river riparian zones. Additionally mushrooming of informalities, land sprawl, and land fragmentation will continually undermine the optimal use of the expansive land.

Development which is following market forces, characterized by speculations, and yet the town was originally defined as, *'an Industrial base',* provided jobs to many Kenyans. The research, therefore, will contribute to providing solution to problems by studying different components and suggesting for relevant proposal.

The study partly plays a role in unearthing the potential contributions of the town to the Nairobi - Thika development corridor. Coordinated and continued planning for both transport infrastructure and adjacent landscapes is essential for co-evolution overtime. Without which reversed value attributes of the corridor will be calling for resurgence. Justified, as it responds to the current policy; '*Vision 2030'*. While Kenya wants to industrialize, manufacturing is targeted: it is one of the government's 'Big 4 Agenda'. Continued evaluation of industrial development to provision of information required by potential areas becomes a research agenda, therefore filling a knowledge gap for industrial development related professionals; uninformed policies with final results of sustainable development.

1.7 Assumptions of the Study

1. The influence of Nairobi - Thika highway will continue to spur development along its surge.
2. Juja town will continue to attract investors due to its strategic location.

1.8 Operational Terms

a. Industrial Growth

Spatial organization in relation to relevant subsystems of social –economic and ecological aspects, and, characteristics that include: distribution, expansion pattern, (in numbers and size of land) levels and types of activities.

b. **Potential:** The concept will be applied to mean; the ability to comprehensively integrate different aspects at the economic, social, ecological and physical levels to the realization of sustainable corridor development.

c. Development corridors: The study defines development corridor as spatial growth approach that occurs along a linearly element. In this research the growth is expressed as a development process and a pattern of land. The value aspects are elaborated to exhibit it as a system of development**.**

d. **Planning:** Planning is defined as a comprehensive design to find the best use of scarce resources in both current and future societal systems.

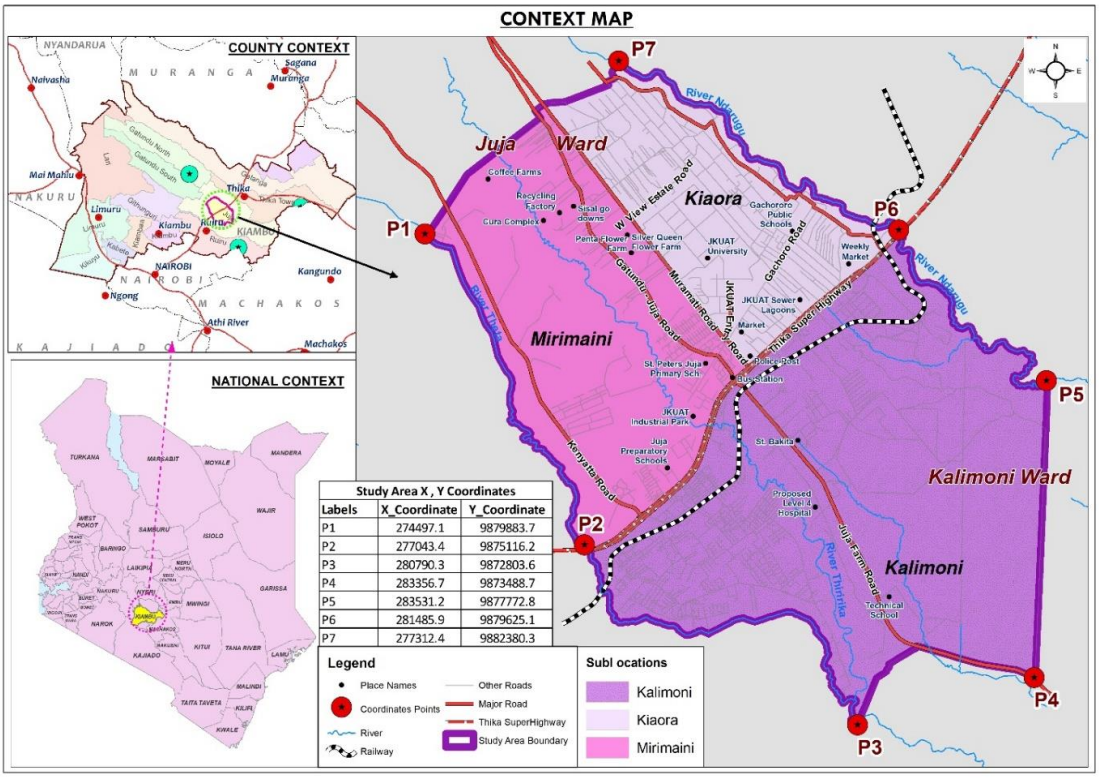
e. Sustainability: Using the Brundtland report, "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The research defines sustainability as the optimal use of the available resources in the current and future landscapes.

1.9 Background to the Study Area

1.9.1 The Study Area

The context of the study is analyzed from the National, regional (county) and local levels. The analysis of the Nairobi - Thika transport corridor is also provided to show its location and context along the transport corridor.

Figure 1.1: Context Map



Source: Satellite Images and Modification by Author

The area of study is in Juja Sub County, Thika west district, Kiambu County in Kenya. It is one of the satellite towns, located at 30 Km from the Nairobi CBD and 10 Km to Thika town and it is traversed by the Nairobi Thika highway commonly referred to as, 'the super highway'. In its context along the Nairobi – Thika corridor, it is surrounded by; Ruiru town to the west and Thika town to the East. The highway connects this study area to the larger Central Kenya, to Eastern and North-Eastern parts of Kenya, finally to Ethiopia, in the North Eastern direction while to the South west; it connects to Nairobi, western Kenya, Uganda and Tanzania. It is bounded by River Ndarugu to North East, River Theta to the South West.

1.9.2 Climate

The climate of the study area exhibits that of the whole sub-county and Thika area in general. The months of December to March are hot and dry, while June, July, August are cool and dry. The rest of the months are fairly moderate and uniform. The average rainfall ranges between 900 mm and 1,250 mm per annum, which presents a bimodal pattern, i.e. the long rains occurs between March and June while the short rainy period occurs from October to December.

The annual mean maximum temperature is 25.58°C, while the annual mean minimum temperature is 15.43ºC. The annual average temperature is 20.51°C.

1.9.3 Topography

Juja Sub County lies approximately 1500 meters above sea level. Slopes of the Aberdares are extended to Juja with long elongated parallel ridges characterized by visible main drainage channels, Thiririka, Theta and Ndarugu Rivers.

The study area is relatively flat. It lies between 1570m and 1450 above sea level.

The highest points located towards the North West, the lowest areas located to South East, as contour map in figure 1.2 below indicates.

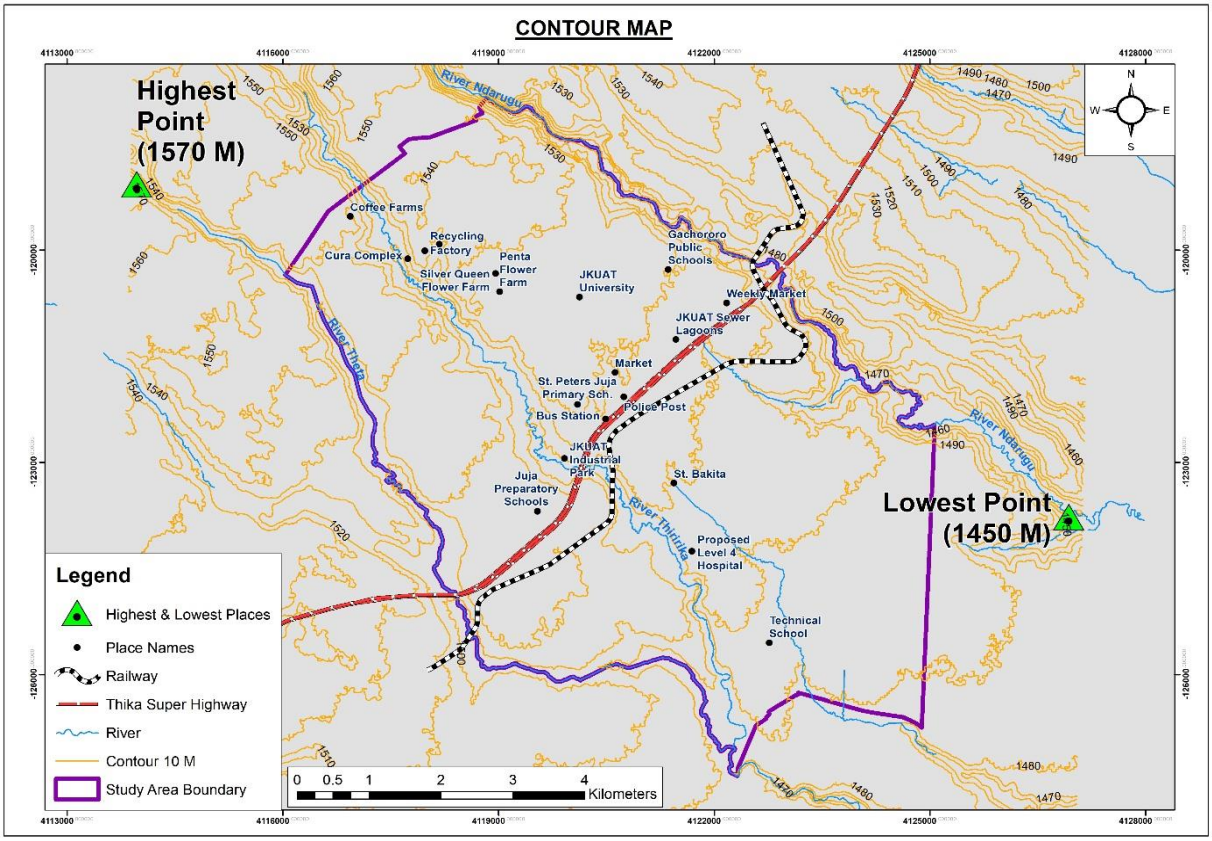


Figure 1.2: Contour App

Source: Author, 2017

1.9.4 Drainage and Soils

The area is rocky; however, the depth to rock varies considerably throughout the area; some areas are rocky with murram as the topmost layer. These areas are easy to construct.

However, most of the area has black cotton soils which are poor to drain and difficult to construct. In either, the deeper layers of the soil are mixed with murram or weathered rock material.

The study area forms part of the larger Athi river basin consisting 3 perennial Rivers forming the natural drainage system: River Ndarugo lies to the Eastern, River Theta to the Western while River Thiririka traverses the study area.

1.9.5 Vegetation Cover

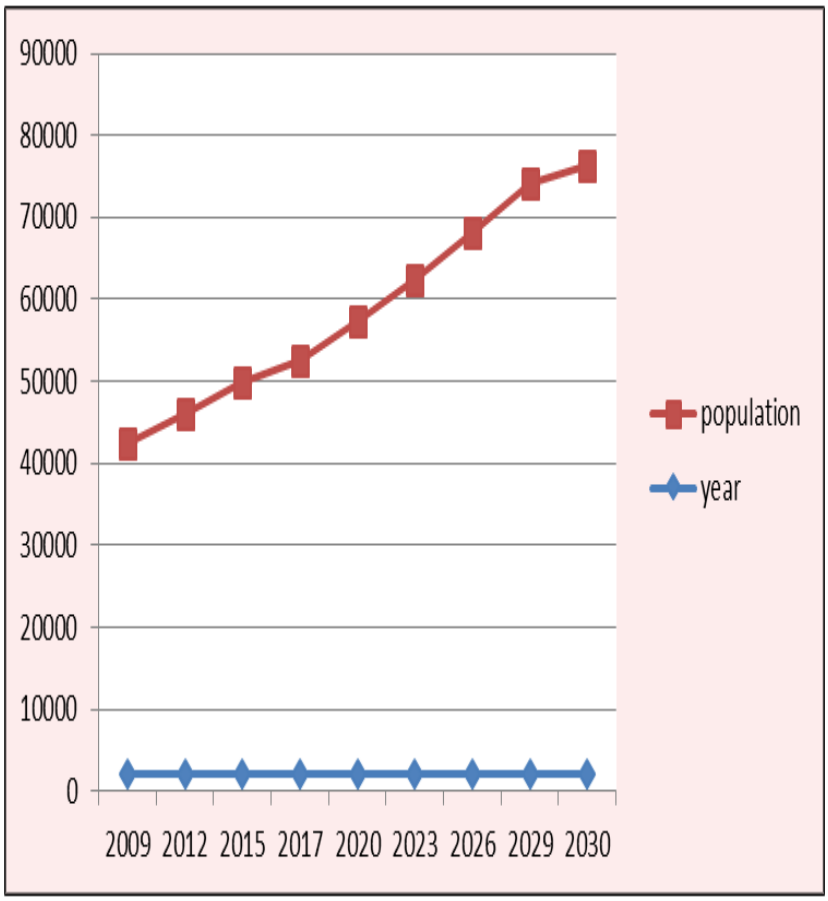
The area is dominantly covered by Shrubs. Man-made tree cover has been provided by JKUAT and other institutions.

1.9.6 Population

Table 1.1: Study area various administrative divisions, their population and population densities in 3 sub locations of Juja Sub County

Sub Location	**Population**			**Households**	**Area(Km2**	**Density**
	Male	Female	Total			
Kiaora	11,008	10,888	21,896	7,137	15.5	1412
Miri-maini	6,290	5,948	12,238	4,096	30.4	403
Kalimoni	10,165	9,696	19,861	6,039	121.3	164
Total	27,463	26,532	53,995	17272	167.2	1979

Source: KNBS (2009)



Year	Population
2009	40446
2012	44003
2015	47874
2017	50641
2020	55336
2023	60467
2026	66074
2029	72201
2030	74367
2033	81263
2036	88798
2039	97032
2042	106029
2045	115861
2048	126604
2050	134314

(A) **(B)**

Figure 1.3: (A&B) Juja Urban Population Projection from 2009 Census

Source: KNBS (2009) as modified by author

Table 1.1: Approximated Population within the Study Area

Sub location (Division)	Density (2009)	Area within the scope	Approximate Population {Within Scope,} in 2009	Approximate Projected Population(2017) {Within Scope}
Kiaora	1412	9.42	13,301	(P_{n1}) 16,849
Mirimaini	403	14.7	5,924	(P_{n2}) 7,504
Kalimoni	164	25.85	4,239	(P_{n3}) 5,370
Total		49.97	23,464	P_n29,723

Source: Kiambu CIDP as modified by author

1.9 Organization of the Research

The study comprises five chapters, organized as follows:

Chapter 1: Introduction

This section is the initial conceptualization of the study. It includes the background of the problem by giving a general overview of the study topic, problem statement, research questions and research objectives, justification of the study the purpose of study, study assumptions, scope and organization of the study. An overview of the area of study formed part of this section.

Chapter 2: Literature Review

This chapter encompasses a review of theories and concepts explaining the topic of study, historical backgrounds and findings of past related studies. The exploration to policy, planning standards, theories, institutional and legal frameworks as industrial activities relate to development in Kenya apply. At the end of this section, conceptual framework was formulated. The focus was how industrial activities organize themselves in potential areas of development.

Chapter 3: Methodology of the Study

The section summarizes the overall research design, indicating the data needs, and all procedures that were followed in order to acquire, process and analyze as well as present the results. The procedures were evaluated to ensure reliability.

Chapter 4: Study Findings and analysis

This section shows the results of the study. The study objectives defined how the findings are organized. Summary of findings informed planning recommendations and conclusion.

Chapter 5: Conclusion and Recommendations

This chapter draws from the previous chapters mainly the literature review and study findings, and provides a detailed presentation of the study conclusion and recommendations. The conclusion included areas for further research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The chapter is introduced defining the role of industrial development while appreciating the existence of relationship in transport corridor development and industrial activities, thus further focus on potential factors the development. Urban development is mentioned in relation to the growth of the urban area in question for instance, at regional level basing major argument on the expansion of the metropolitan region into the peripheries. The chapter therefore, explores literature review on: (i)industrial development ((ii) theories of transport and industrial development, (iii) transport corridors and industrial development, (iv) industrial policy review, legal and institutional frameworks, (v) urban development, vi) case studies. This will form the basis for development of the conceptual framework, which the study uses to elaborate on the relationship of independent and dependent variables.

2.2 Role of Industrial Development

Industrial activities are regarded in their contributions to GDP of any country. Policy planning endeavors aspire to intensify industrial activities and therefore increased GDP. For instance in his article, 'Beyond the Impasse of African Industrial Development', Kapunda, vividly outlines the attempts of policy intervention strategies that meant to diversify the means of GDP of African countries. McLaughlin (1930), support this adventure by indicating a variety of employment opportunities as a byproduct of diversification of economies. It is an opportunity to involve a number of populations in actual number of stages of production, provision of inputs, and transportation actual production inertia as McLaughlin elaborate/ Industrial development has been used to decentralize population, economic activities, social activities, social services away from primate urban areas. It is termed as an all-inclusive strategy with opportunities to involve a number of researches and the reducing factor of exclusion, while drawing a variety of labor force and consequently reducing factors of exclusion in the society. A variety of the activities bring diversification and series of economic development while supporting employment of a population in growing towns.

History indicates Juja, a university town with activities revolving around student affiliated activities. The expansion of the transport corridor increases the aspect of the dormitory by supporting accommodation of workers from different towns.

A variety of industrial activities in this growing towns however if provided, may, introduce a mix of activities therefore reducing any seasonal fluctuations in economic endeavors. Without a variety of the above as McLaughlin (1930), alludes a town is exposed to economic damage within seasonal variations e.g. un-employment.

2.3 Transport Corridors and Industrial Development

History reveals transport corridor, play a significant role in industrial activity dynamics. It is argued that the provision and improvement of these corridors contribute to improvement in the Industrial sector. The Kenya-Uganda railway transport corridor whose main purpose was to link Lake Victoria to the Indian Ocean, unconsciously attracted industrial activities, along to form a strong development corridor. This has necessitated the government to initiate a northern corridor to spur the same development. With the LAPSSET project (Vision 2030 flagship project) new roads are targeted as transport corridors to transport products throughout the country and this is geared towards industrialization.

The Nairobi - Thika highway whose expansion is mainly objected to enhance transport services for the rapidly expanding of Nairobi into the periphery, which is witnessing rapid developments including residential, commercial and industrial activities.

This commonly referred to as Thika Road, has evolved from a transport corridor and now turning into a development corridor. Due to its immense attraction from various investors, in this research, it will be viewed on to show the potential it portends to industrial investments in Juja Town.

2.4 An Overview of Industrial Development in the Developing World.

An outlined variation between population growth and growth production formed the basic context within which third world countries' industrialization concerns were born. The activities were to take the role of multiplier; acceleration mechanism to overcome the 'low level equilibrium trap' (as commonly referred by world economist).

To mainstream industrial activities, planning was presumed to solve difficulties like: supply of technical and administration management, availability of raw materials and equipment as well as inadequacies in provision of infrastructure systems. Foreign investments and aid funds were perceived to spearhead the industrialization while trickle down effects were to lead wide spread fruits of development, consequently introducing more people to employment.

New technology of land use through mechanization, tourism, establishment of urban settlements, purely introduced new approach to economic management of resources. Equally an effective infrastructure and service systems was a prerequisite to the accessing of resource base, an action that ended in opening of interior sections. A good example is Kenya-Uganda railway with agro industrial points along which later became urban centers (like the case of Nakuru).

Despite the highly accorded development policies industrialization in the developing world remain a challenge: Firstly most countries inherit policies without proper scrutiny. While some countries like Cambodia and Vietnam explosively excelled after abandoning policies like growth centre strategy for alternatives (noted Newman) the attempt by some e.g. Kenya was unfruitful. Sometimes patterns like center-periphery complications emerged with more benefits going to the external economy, an example of Nairobi's primacy to the entire Kenya and with the associated international benefits. Conroy (1973) arguably conform to Newman by expressing his concern on the dangers of aligning one's national economy with a global pattern. Mireri (2000) also asserts that until more research is done some policy programmes like EPZ bear minimal fruits. Together other researchers agree while scrutinizing other strategies among them import substitution by indicating little indication towards solving problems of unemployment, poverty among others.

Furthermore neocolonialism continues to guide the process of industrialization. Foreign investment is impressed as the only feasible means to obtaining requisite large scale, dynamic high tech propulsive industries, What Perroux, describes as one of ever polarized development, and as such developing countries remain ever in debts. In Africa for instance industrialization focused on large-scale production, in large cities therefore giving Africans limited chance in the competitive world. On the other hand political interferences negatively implicate good attempts whenever they emerge, either at conceptualization or at implementation stage while disintegrated industrial policies continue to promote inequalities.

Failure to define resource base with incomplete knowledge of local resources is a hindrance to industrial development. Africa as an example if optimally utilizes its agricultural abundance while embracing industries without 'Smoke tacks' it may grow faster than the manufacturer oriented countries. However as the definition imply developing economies are poor, still developing subjecting their high population to low wages and therefore low

investment. Significant deficiencies in infrastructure development hinder production and marketability while uncoordinated policies again individualize good processes.

In the 21st century the world's focus on information systems is arguably and agreeable convincing that the manufacturing industry may not be given the same emphasis extended to information systems and service industry. In this context therefore (while in information age), the developing countries are over emphasizing on education system geared towards service industrialization instead of production industrialization. Coupled with an over emphasis on formal education, with little or no knowledge in the informal education, manufacturing may not be given the impetus required in the economies of developing world. Strategic theories to highlight realities on the ground and shift them to spatial planning are however a requirement to avoid randomness and complexities attached to this scenario.

On the above basis a recall on historical approach as reflected in the developed economies, is a reminder of the theories of evolution. Walt Rostow indicates 5 number stages through which these developed countries passed to be at the current level of economy (Stuart, 1976). While it ought to be the case in the developing economy, and with a SWOT analysis to ensure sustainability, instead some stages are bypassed.

2.5 An Overview of Industrial Policy in Kenya

The industrial policy has evolved, exhibiting Kenya's industrial under-utilized capacity. However, transformations and changing scenarios are witnessed over years.

During the colonial period the policy favored the colonial government and with time Asian community efforts emerged in a form of industrial extension of their trading activities .The protection policy inherited into the post-colonial brought inequalities in industrialization across the Kenyan community .This later resulted into dispersion policies (The ministry of industry, 1980).

The import substitution strategy, after independence, targeted to improve domestic production but the private entity was ignored. In the Kenyanization strategy through the industrial estate programme policy aimed to facilitate indigenous into industrial production and to raise the production level. However it was not without complexities including the high costs involved, uncoordinated spatial components, and the reason why some components e.g. parking are a problem to date. Through WB, the structural adjustment programme strategies in 1990s aimed to open industrial activities to foreign investment and privatization and consequently the improvement in GDP were recorded (Osengo, 1997).

The EPZ in the 1990s enabled the expansion of industrial activities by attracting foreign investors. The zones, as Mireri (2000), confirms, comprised earmarked areas; either near an airport or seaport provided with various physical and service facilities and custom services.

In a nutshell the historical journey exhibits more of economic development without comprehensive guidelines for sustainable industrialization (sessional paper of 1986; Development Plans of 1979/83; 1989/93; etc.).Currently vision 2030 recognizes the under-utilized potential of industrial activities .It recognizes transformation programs including construction of new roads e.g. the utilizing of the LAPSSET corridor towards the needed industrial improvement.

Among the expected outcomes of this project is the manufacturing along the corridor, value chain investment opportunities. In the process of answering vision 2030, the aspiration to have seamless connectivity in the country gives hope to any potential area of development.

However the policy remains disjointed: It has not recognized areas with potential for industrial growth; the strategies are more limited to economic sphere; with little or no coordination of spatial entities as well as stages of development.

2.6 Trends in Manufacturing Industry in Kenya

This section captures the rate at which the manufacturing industry has grown/ declined over the period 2005-2016.

Table 2.1: Percentage growth rate of the manufacturing sector

	YEAR											
Manufacturing	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Percentage	10.5	10.3	10.4	10.6	9.9	7.7	7.6	6.8	9.7	5.5	3.6	3.5

Source: KNBS, 2014

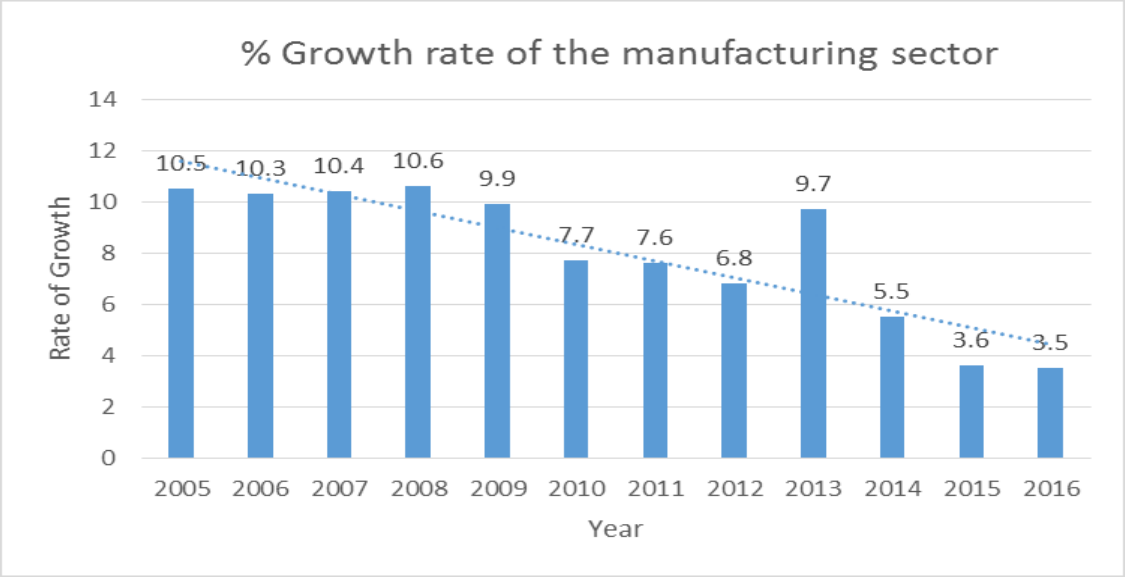


Figure 2.1: Growth rate of the manufacturing sector

Source: Author, 2017

The figure above illustrates annual growth rates of the manufacturing sector for 2005-2016 period. The highest growth rate was recorded in 2008 with 10.6% growth and the lowest in 2016 when the sector grew by 3.5%. These growth rates currently are way below the anticipated growth rate of 10% as aspired under Vision 2030.

2.7 Contribution of Industrial Activities on the Gross Domestic Product (GDP).

The manufacturing sector, on average, accounts for 66 % of the industrial sector's real GDP and 10.7 % of national GDP (KNBS, 2016). The industrial sector contribution to GDP slowed down from 10.4 per cent in 2013/14 to 9.3 per cent in 2014/15. (Kenya Economic Report, 2016).The real output of the manufacturing sector grew by 3.5 per cent in 2016 compared to a revised growth of 3.6 per cent in 2015. The growth was as a result of reduced cost of production and increased volume output. The volume of output of the manufacturing sector grew by 4.9 per cent in 2016 on account of increased production of tea, wearing apparel, pharmaceutical products and basic metals. Credit to the manufacturing sector decreased by 4.6 per cent to Ksh 277.4 billion in 2016. Formal employment in the manufacturing sector went up marginally by 1.8 per cent to 300.9 thousand persons in 2016 accounting for 11.8 per cent of the total formal employment (Economic Survey, 2017)

About 89.6% (2.5million jobs) of the industrial sector employment is in the informal sector (KNBS, 2017). A number of factors such as tax evasion, registration and regulatory costs explain the choice to remain informal. (World Bank, 2013)

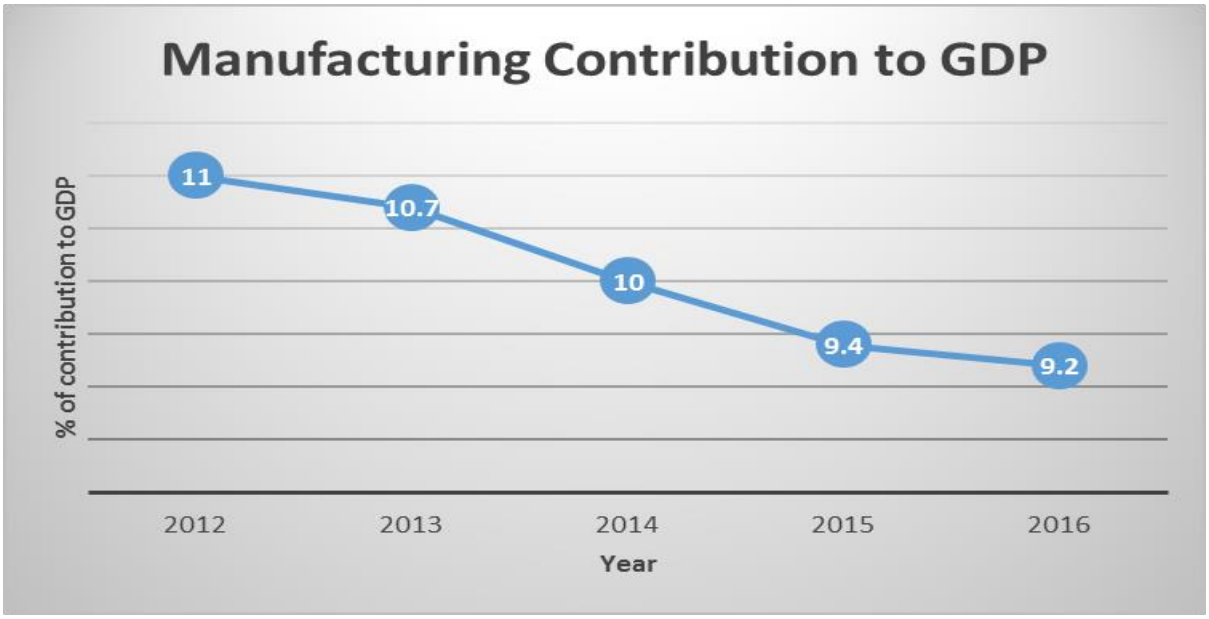


Figure 2.2: Manufacturing Contribution to GDP

Source: Author, 2018

From the graph above it is noticeable that the contribution of the manufacturing sector was highest in 2012 with a record of 11% contribution to GDP and has been declining ever since with 2016 recording the lowest percentage contribution to GDP at 9.2%.

Table 2.2: Manufacturing Industry Output, Compensation of Employees and Value Added, 2013-2016 Current Prices - Ksh Million

YEAR	Value of Output	Intermediate Consumption	Value Added	Compensation of Employees
2012	1,619,622	1,150,518	469,104	105,714
2013	1,737,699	1,231,087	506,612	127,186
2014	1,820,369	1,282,369	537,999	147,453
2015	1,977,169	1,388,274	588,896	163,392
2016	2,120,718	1,466,879	653,839	174,767

Source: Kenya Economic Survey, 2017

The Economic pillar identified in the Kiambu County Annual Development Plan, 2013-2017 aims to achieve an average GDP growth rate of 10 percent per annum and sustain the same till 2030. The key sectors in this pillar include: tourism, agriculture and livestock, **manufacturing**, wholesale and retail trade, Business Process Outsourcing (BPO) and financial services (CADP, 2013-2017)

2.8 Theories and Concepts of Transport/Industrial Development

Planning is a superior concept in spatial understanding. Friedman (1993) makes it clear that it is a core concept and all other concepts within it are bound to one of the principles, 'the futuristic'. He further describes it as a connector (ancillary) of all forms of knowledge and forms of action leading to the future. As a contested concept it calls for a wide range of theories in order to filter /evaluate processes and procedures for a desired future.

Location Theories

This placement of an activity has been explored by the location theories. The justification of these theories pertains to: what activity; where it is located and the reason of location.

i.) Von Thunen's model illustrates various farming activities in relation to the city using the concentric rings. The concentric rings were based on various assumptions such as, an ideal flat land and fertile soils and transportation efficiency of the products produced at the farm.

However, at the time of this research the dynamics that did not exist in the theory come into play: for instance improved transport systems, modernized production facilities and enhanced technological processing means. They have made it possible for such highly perishable products produced in the hinterlands to be easily delivered to the city markets. Nevertheless it is the founding informer of geographical location of industries.

ii.) Alonso's Theory: In an extrapolation of the Von Thunen model**, Alonso's theory** (1964) advances the discussion showing land changes and how they influence the spatial distribution of various land use activities over space. It is notable that industrial activities require quite spacious land space. Given the mono centric nature of the primate Nairobi city where most economical land uses have been concentrated, it has triggered for its high demand that has gone in hand with high land premiums pegged on the pieces available.

As a result, there is a tendency of new firm setting up relocating to areas outside the city center where the land costs are fairly cheaper and the sizes are as well large.

iii.**) Bid-rent theory**: On the main premise of the theory on the housing rents focus, it is clear that the larger workforce in Nairobi city commute to the city centre where most job opportunities are located. The workers prefer residing in areas where they pay cheaper rent over commuting costs and distance.

Therefore, based on the bid-rent theory, the industrial proprietors are ready to incur the transport cost at the cost of having expansive cheaper land and equally attaining their desired profit margins. The transport costs in this scenario are downplayed by the improved transport corridors and proximity to the market niches, which enhance thus justifying their location in the suburbanized areas.

v.) The Least Cost Location Principle

Launhardt provides essential basis for an understanding of industrial location.

Together with Von Thunen and Weber they present the least cost approach while explaining on the optimum location of industry as it is determined by differences in cost and demand in alternative locations.

Hoover (1963), also followed the argument while generating other valuable factors of site selection including, transport and the cost of productive factors (Land, Labour). This are examined till the location and transfer costs are minimized.

However, further argument in this theory is provided to include mutual repulsive forces between sellers thus avoiding competition, to the extent that this mutual repulsion outweighs conflicting locational considerations. Producers tend to be spread out in a pattern similar to that of market demand, so that market areas are formed.

As far as orientation of industries is concerned, generally early stages of production are material oriented and late stages are market-oriented while intermediate stages are relatively 'footloose' as to transfer considerations.

The most important argument for the analysis of the least cost theory as relates to this study is the spreading effect to understand Juja as a potential node for industrial activities within a pattern, resulting from some of the above factors.

2.9 Urban Development

Urban development is a system that helps to create cities through residential expansion. Cities are defined as a specific form of human association by some scholars based on the criteria

built environment form, population size criteria, and their economic function (Wirth 1938). This definition gives us three major indicators of urbanism. For instance, the first definition is apprehensive about the number of people who are confined within a specified political-administrative boundary, such as state territories and municipalities (Minx, et al. 2013).

The second definition is the morphological or physical, which is given by the extent and layout of infrastructure, the built environment, and land uses of a city (Seto, Parnell & Elmqvist 2013). Finally, the third definition is concerned with urban function, which is defined by mobility, economic, operational and informational connections between the urban cores and the outside areas, (Fujita 1989).

According to the World Bank 2017, currently 54% of the population are dwell in the urban areas, and this trend is projected to progress – by 2045, with the number of people living in the cities increasing by 1.5 times to reach 6 billion, which will add 2 billion more people into the urban residents.

However, the urbanization scale and speed brings challenges, such as meeting accelerated demand for well-connected transport systems, affordable housing, and other basic services, infrastructure, as well as jobs to specifically to the nearly 1 billion urban poor living in the informal settlements to be at the convenience of their opportunities.

Intensive policy coordination and investment choices are required in Building cities that "work", resiliently, inclusively, sustainably, and safely. The reverse is that physical forms and land use patterns of an area are locked once an urban area is built, which lead to an unsustainable sprawl.

The completion of the Kenya –Uganda railway in the early 1900s laid down the spatial framework of Kenya's present urban system (Obudho & Aduwo, 1990). Towns such as Eldoret, Nakuru, Kitale, and Nyahururu were developed during the period that the country experienced large scale colonial European settlement and commercial cash crop farming in the fertile and temperate central highlands region. The towns were mainly established to serve the purpose of agricultural collection and distribution centers and also as the European settlement and administration bases of the Kenyan colony. The population of the Indians and the Europeans, level of economic activity in their hinterlands, accessibility, and location greatly impacted the emerging urban centers, which made them to grow at varying rates (Obudho &Aduwo, 1990).

2.9.1 Categories of urban land uses/issues of compatibility

The land use representation begins with the assessment of the land cover that is the observed physical cover of the Earth's surface, (Manual of concepts on land cover and land use information systems, 2001). During the last few decades the land use concept has been defined in two different ways: the *purpose* underlying that transformation (the functional dimension); and the *activities* undertaken on a surface that induce land cover transformation (the management dimension) (Lambin, Geist and Rind fuss, 2006).

Land utilization can be considered as to mirror the level of human exercises straightforwardly identified with land and making utilization of its assets or having an effect (Young, 1994).The purpose for which land has value to man determines its use hence the classification type:

- Agricultural
- Residential
- Commercial
- Industrial
- Educational
- Public Purpose
- Public Utility
- Recreational
- Conservational
- Transportation
- Deferred

Compatibility of land use relates to locating of land uses in a manner that is logical and ensuring that the land uses do not cause undesired effects to the neighbouring land uses for instance locating a school in a residential area is desirable.

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2.9.2 The Growth Perspectives of Nairobi's Periphery

History reveals Nairobi as a colonial town originally developed under British urban planning standards. The social economic realities, including, rapid urbanization, high population growth, are currently informing the expansion of the town that was designed with boundaries.

The resultant of the growth in urban population is the growth of suburbs. Ng'ayu (2015), differentiates this growth in Kenya, a developing country, with that experienced in affluence

American and European urban areas. Complexities are major characteristic of this suburbs with volume of unguided developments but with opportunities for the growing population.

The provocation of the expansion of this city of Nairobi into Metropolitan was necessitated by population growth in the surrounding urban areas such as Kiambu, Limuru, Ruiru, Thika, Machakos and Murang'a, resulting to the need for expansion of the city physically, structurally and in terms of institutional framework (Nairobi Metro 2030, 2008). The region covers 32000 square kilometers consisting of areas that depend on the Nairobi city for employment and social facilities and it is located at 40kilometre radius from the city. The re-planning aimed to meet diverse needs of different population and landscapes covered by the region to ensure there is increased economic, social and environmental growth.

The successful expansion of Thika highway contributes to growth of the metropolitan as it eases accessibility and distribution of land uses, consequently decentralizing the urban economy and stimulating suburbanization. However, Nairobi Metropolitan lacks an effective planning for development corridors. The concept has also been complicated, with the creation of county governments in 2013.

2.9.3 Causes of Peri-Urban Growth in the Developing Countries / Kenya

Peri-urban growth remains a challenge in the developing world. The significantly, complex, dynamic ranges of factors are a cause of the expansion. Lessons learnt from the urbanization processes (UN Habitat, 2013) indicate high rate of urbanization in these countries and the traumatic movement generating diverse socio-economic aftermaths. Poor as the definition of the developing world signalize, the huge funds required to house and offer the expected life are not readily available. Thus urban crisis with unregulated land use, low sanitary conditions and increased poverty. Other than the inequalities that tend to heighten rural-urban exodus, a different perspective of inequalities then emerge. A portion of population is consequently forced to move to the outskirts where land and other social facilities are perceived affordable. On the other hand another segment will tend to move further from the highly concentrated urban focal points in search for refugee camps.

Additional to scarcity of resources, developing governments have failed to guide planning. In the process private companies come into play, essentially to cater for preferences of different classes, offering housing spaces and land, mostly at the peripheries.

The spatial expression may also be a revolutionary concern. A developing country like Kenya's prime cities were designed by colonial governments and their functionality may not be culturally right and in the process of seeking for preferences urban sprawl occur. A good example is drawn from Nairobi's Eastland estates like Kaloleni, Mbotela among others whose colonial design of 1948 is no more favorable.

The spatial evolution to include in fills and extension symbolizes the neighborhoods, which are illegally transforming to accommodate growing family population. The then well-designed areas are then conceptualized as decaying/decayed urban neighborhoods (2017 study of MA class of 2014). A portion of the population is forcefully ejected from within to outer regions.

The centripetal forces are not without the urban mobility growth. Mumford 1989, explains how the car became the chief mode of transport. The same scenario in developing countries has enabled space congruency beyond the inner cities.

While associated technology enables some areas to start as refugee neighborhoods with time becoming part of inescapable metropolis and further movement to the fringe areas.

For instance, with advanced accessibility and automobiles, Kitengela and Ngong in Kenya continue expanding and changing Nairobi's fringe landscapes. Equally at the stage of rapid physical transformation of Nairobi - Thika corridor continues to drift off functions presumed to belong to the inner city, including the industrial, commercial and residential. Together with other factors, /small towns such as Juja are transforming and rapidly changing while enhancing industrial activities.

2.10 Role of Transport Corridors in Urban Development

Transport has a most important impact on the economic and spatial development of regions and cities. The networks enhance accessibility with increased attractiveness of locations along, as well as at the nodal points.

Banister 1995, argues that transport investments have induced highly localized land use changes and triggered development of real estates in remote areas especially the rapidly growing suburbs. He further posits that sprawling metropolises like Los Angeles, Phoenix, and Houston are examples of prevailing decentralizing effects of regional transport.

On another account Holl (2004) argues that, the improved transport ways disperse the economies away from the core urban areas, and this is followed by reorganization of relevant

activities. He further posits that the increased potential of interactions among the economic agents are strengthened thus creating or expanding small urban areas.

The growth of most urban centres in Africa has been shaped by transport infrastructure. Accessibility among the major principles necessitates settlement as enhanced networks increasingly affect other developments.

Settlements usually develop when transport routes converge; where major transport networks pass; where modes of transport converge [e.g. convergence of water and land forms of transport] they start as market centres growing into major urban centres.

The 'Akamba and Agikuyu' place of goods exchange [as historically referred] has grown into a major industrial town, the current *Thika.* It lies along the Nairobi – Nyeri highway. Together with supplements of Nairobi – Nanyuki railway line the town has grown from a market to a settlement and finally as an industrial town with other diversified activities.

*Eldore*t has grown from settlement of commercial farms in earlier 1900s serving as a collecting and marketing centre for agricultural produces into a rapidly populated town. It is highly accessed through Mombasa – Kampala highway as well as the railway line passing through the same direction branching to Kitale town.

Together with the international airport major settlements are created including major activities e.g. to make it an educational hub as well an industrial hub. *Chaka urban centres* serve as the most recent example of an urban centre rapidly growing at a junction to Mt Kenya along the Nyeri - Nanyuki highway [Maleche 2015, lecture notes]

Over years the transport corridors necessitated urban areas to grow becoming focal points, attracting local as well as international trade. For instance the road, railway and lake transport routes have made Kisumu {a place of exchange of goods as traditionally referred}, now Kisumu a trade focal point and a third major urban centre in Kenya. (Kibuka et. al., 2005). Roads converge at this historically known as western rail road terminus. It is worth noting that, transfer of goods to other countries, either served or not served by water transport originates from Kisumu and Mombasa in Kenya. Secondly it is also worth noting, that the network as regional coordination in trade. E.g. The East Africa community, (EAC) and COMESA.

Besides of renowned support growth from small centres to major urban areas transport corridors are known to cause urban sprawl. (i) During establishment or expansion urban

settlements along are sometimes displaced to create enough land for expansion. (ii) Equally the growth of other attracted activities including commercial, industrial, dislocate original settlements creating more settlements hinterland. (iii) Development of other activities attracts job seekers, consequently the settlements become new homes for this attracted migrants.

Thika for example continues to attract settlers from its neighbouring Murang'a, the larger Kiambu and finally from the entire county to even national migrants.

Enhanced social service set in to support the growing urban population; creating more employment opportunities, as well as creating social groups; thus creating different residential zone as well as spreading the population into diversified pattern depended on favouring structuring elements. In the study area, The Nairobi - Thika highway is the major structuring element.

Other examples in Africa include Tanga town in Tanzania located in the coast of Indian Ocean, it has grown using transport strategies, with resource based upcountry to become 5th largest town in the home country. India and china have successfully integrated global economy through use of transport corridors and urban centres. Together with target of middle level populations the two economies are able to trade globally.

2.11 An Overview of Railway Transport in Kenya

The Transportation of trains on rails in Africa was developed at the beginning of 1900 mainly to promote agriculture and industrial activities. Tazara railway in Zambia, aimed to connect into copper belts. To reach mines in South Africa several networks were created. The Uganda-Kenya railway extended to numerous branches into interiors rich in farming and mining in Kenya .They include:

a. Voi-Taveta;
b. Konza-Magadi
c. Nairobi-Magadi
d. Gilgil-Nyahururu
e. Kisumu-Butere

Under the Kenya Railway Authority since 1779 revival for the services has been targeted to serve the public. Together with road networks it is appreciated to foster national and economic integration while promoting national and international trade.

It is valued for its large carrying capacity, reliability and efficiency. Road networks that were built to serve the railways, however, later developed to become major competitors (Kinuthia 2015) consequently splitting the systems. The split from the transport system over years continue provoking the economic growth policies that include, the 2009 the integrated transport policy2009, vision 2030 among others.

2.12 Policy, Legal and Institutional Framework

This sub-section of the study articulates the key policies and strategies that have been formulated to steer the industrial development process in Kenya; and the planning/environmental legislation that guides the implementation of these processes. The policies presented for this purpose include, Constitution of Kenya (2010) Vision 2030 Kenya national industrialization policy framework. While the acts of parliament, amongst others are Physical planning Act, CAP 286, 1996 County Government Act 2012, Land Act, 2012 among others.

2.12.1 Policy Framework

Vision 2030

The Kenya vision 2030 is a blue print development strategy document, which cover the development plans from 2008 to 2030.

The major aim of Vision 2030 is to transform Kenya into "a newly-industrializing, middle-income country providing a high quality of life to its citizens by 2030". Major emphasize has been put on the industrial sector, which has been identified as the major sector in addressing incidences in the inter alia disparities in regional development. Among other benefits associated with the industries, of essentiality to this research is the relation of which the industrial developments on space would be congruently planned for in order to curb these disparities through socio-economic gain in regional development especially in accordance to gaining optimum benefits of the large sums of money invested in transport corridors projects. The growth of the industrial sector will positively impact the growth of other sector because it has strong linkages with other sectors.

With an extensive improved infrastructure developments of major by passes and corridors flagship projects proposed in the vision 2030, they are giving a new lifeline to potential new industrial investments along the areas traversed by the transport corridors. In this case the Thika Road corridor is in the main focus with the sub-centers that are developing along

which are turning out to be attractive centers to industrial developments. In the process of dissecting into the industrial development potential along this corridor, it is critical to get relevant information within spatial dimension in Juja, one of the nodes.

Kenya National Industrialization Policy Framework

This drafted policy on industrial framework is meant to guide the industrial processes in Kenya. Due to the existence of numerous laws, weak legal framework and overlapping ministerial mandates, uncoordinated and slow industrialization guidance exist in Kenya. This Policy has therefore been developed as a framework to synchronize and coordinate the various policies, strategies and activities within Kenya's industrialization process.

The policy has highlighted the importance of physical infrastructure for industrialization. It is noted that effective and reliable infrastructure is an important key enabler for growth and sustainability of industrialization. The key infrastructure entails transport and logistics systems, road and rail networks. For this research, the main infrastructure is the transport corridor, Thika Road, which has evolved from a transport corridor and now turning into a development corridor. Due to its immense attraction from various investors, in this research, it will be looked on the potential the corridor portends to industrial investments in Juja Town

Sustainable Development Goals

According to the global goals by the United Nations, the goal number 9 has specifically dwelt on the infrastructure, industrialization and innovation. It is clearly indicated that provision of key infrastructure guarantees the necessary physical structures that are critical to operation of different enterprises. On the other hand industrialization is a major element in boosting the economic growth and to a further extent contributes to the general regional and local spatial developments through the catalytic nature of the industrial establishments that induces/informs other land uses.

2.12.2 Legal Framework

This section outlines the provisions of the Constitution and all relevant statutes on matters concerning spatial planning.

Constitution of Kenya (2010)

Land utilization and physical planning in Kenya has been anchored in the country's constitution and should be conducted in conformity with such laws. The Kenyan constitution stipulates in article 10 that there should be sustainable development. The chapter five has

elaborately dwelt on the aspect of land usage as well as proper conservation and protection of ecologically riparian areas. The Constitution on Kenya, chapter 5 subsection 60(1) land shall be held, used and managed in a manner that is efficient, equitable, sustainable and productive.

It is mandatory to protect and soundly conserve the ecologically sensitive areas through Sustainable and productive management of land resources. Land use denotes any user that uses, benefits or conducts any activity on land. In section four of the constitution on distribution of functions, the national government is mandated to develop general principles of land planning and the co-ordination of planning by the counties whereas in part two of the schedule, the counties have been outlined including land survey and mapping; housing; boundaries and fencing; and electricity and gas reticulation and energy regulation.

Urban Areas and Cities Act, 2011

Part II of this Act provides for management of cities, municipalities, towns and other urban areas. It provides for the threshold to be met to be conferred to any of the status.

In accordance with this Act, every city, municipality and town is expected to operate within the framework of an integrated development planning and this shall be the basis for provision of physical social infrastructure and transportation, nurture and promote development of activities in an orderly manner and be the basis for development control.

Development corridor and industrial activities are development frameworks that form a subsystem to achieving this Act.

County Government Act 2012

The current governance system is at two levels: National and county.

This Act makes it mandatory for County Governments to plan their areas of jurisdiction if they are to be allocated any public funds. The plan is supposed to integrate economic, physical, social, environmental and spatial aspects of planning. It indicates that a County Planning unit shall prepare the plans and Section 107 has provided the plans that should be prepared include; county integrated development plan, county sectoral plans, county spatial plan and cities and urban areas plans as provided for under the Urban Areas and Cities Act.

Section 105 establishes that a county planning unit will be in charge of—organizing coordinated improvement arranging inside the region; guaranteeing incorporated arranging inside the area; guaranteeing linkages between region designs and the national planning structure; and guaranteeing significant commitment of residents in the planning procedure;

guaranteeing the gathering, examination, stockpiling and refreshing of information and data reasonable for the planning procedure; and guaranteeing the foundation of a GIS based database framework.

The Environmental Management and Coordination Act, 1999

The Environmental Management and Coordination Act (EMCA, 1999) accommodates the incorporation of natural worries in national approaches, plans, projects, and tasks. As per the EMCA 1999, Environment incorporates the physical components of the surroundings of individuals including land, water, air, atmosphere, sound, scent, taste, the organic variables of creatures and plants and the social factor of feel and incorporates both the characteristic and the constructed condition.

As per to this research touching on the potential of industries in the development corridor, it is always a concern to ensure harmony within the larger system of the environment. Thus, it will be crucial to investigate on environmental standards for this potential corridor development.

Physical Planning Act, CAP 286, 1996

The Physical Planning Act, 1996 is the main statute that provides legal basis for land use planning; development control; and for the preparation and enforcement of different Physical development plans in Kenya.

Physical planning is a design exercise that uses the land use plan as a framework to propose the optimal physical infrastructure for a settlement or area, including infrastructure for public services, transport, economic activities. A physical plan may be prepared for an urban area or a rural area. A physical plan for an urban region can have both rural and urban components, although the latter usually predominates. A physical plan at a regional scale can also deal with the provision of specific regional infrastructure, such as a regional road.

In the preparation of plans and requires that in preparation of plans, proper consideration be given to the potential for economic development, socio-economic development needs of the population, the existing planning and future transport needs, the physical factors which may influence orderly development in general and urbanization in particular, and the possible influence of future development upon natural environment.

Any change of use of the actual development without authority constitutes an offence. “Part V Control of Development” shows powers of local authorities in development permission

including application and approval of development. In addition, forms for development application and for approval have been provided to enable procedural approval of different projects.

Permission will be required for four cases of land development.

i) Change of use: change in the use of land

ii) Extension of use: adding other use to the land (20% of the total land)

iii) Amalgamation: combination of the plot or use of land

iv) Sub-division: separating the use of the land

However the Act is currently under review for purposes of harmonising it with the Constitution (2010) and other relevant planning statutes.

Land Act, 2012

This is an Act of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. The Act recognizes various types of land ownership including public, private, leasehold and freehold.

Institutional Framework

Corridor Development like any spatial planning is needed to respond to social economic realities. Juja a satellite town within Nairobi metropolitan and along recently expanded highway is equally expanding while transforming its landscape. It does not only engage local level institutions but also at regional level**.**

The Kiambu County Government

The Kiambu County Government has been given the mandate of planning for this local area. At this level the key institution involved directly in spatial planning is the County Planning office. Liaison committee, like the one at National level also do exist at the county level, and its role is the same as that of the national liaison committee.

Ministry of Lands and Physical Planning

The Ministry of Lands and Physical Planning has the responsibility of spatial planning in the country. It provide the overall guidelines to the National Land Commission, as well the planning guidelines for counties. The physical planning act, created national physical

planning liaison committee, composed of members from relevant key resource areas. Its major role is to arbitrate and resolve conflicts on issues related to development and planning.

Kenya National Highways Authority (KeNHA)

The Kenya highways authority is responsible for the management, development, rehabilitation and maintenance of national roads. The roles include controlling national roads and road reserves and access to road developments, monitoring and evaluating the use of the national roads, collecting and collating data related to use of national roads, liaising and coordinating with other roads authority. The Kenya roads act, 2007 created roads board, composed of appointees with experience and are knowledgeable to relevant key areas that include: industry, highway engineering, transport economics, surveying, accountancy and law. The KeNHA provides the information in relation to transport corridor planning and the existing or planned integrated plans.

Kenya Urban Roads Authority

Its mandate is the same as KeNHA's with limitation of roads which are not national and as well limited within the urban scope. Urban planning, industry; highway engineering; surveying; and urban public transport operation, knowledgeable persons are considered in the KURA board. KURA and Kiambu County government are in charge of road developments in the study area.

2.13 The Challenge of Planning in Kenya

Just like most African countries, Kenya has been **urbanizing rapidly**. While an estimated 20.4% of Kenya's population lived in urban areas by the year 2000, the proportion is estimated to reach 60% by the year 2030 (Kenya Vision 2030). This growth is largely due to a high level of rural-urban migration fueled by rural poverty and a dwindling per capita ownership of farming and grazing land, (Kimani M. and Musungu T. 2010).

The rapid urbanization has resulted in an increase in the demand for more urban land, shelter, infrastructure, social facilities and jobs. The growing urban population has put pressure on the existing infrastructure, housing and social amenities.

Hardly 30% of the urban centers are planned and even where plans are available they are rarely enforced (Kimani M. Musungu T. 2010). The growth in unplanned settlements in the urban areas, urban sprawl, congestion, and property development in excess of the carrying capacity of available infrastructure are the most obvious evidence of failure to plan urban

development and enforce the designated laws and standards. In-formalization sets to guide development.

Despite rapid urbanization **rural population is on the increase trend**. More people are making a living in the rural; the implication is more pressure on available resources, (mostly naturally). A solution may be, to provide nonagricultural employment, unfortunately in many cases local industry has been a failure. The **agriculture** which is the main contributor to Kenya's economy has not been given the attention, it deserves, and instead it has been hampered by poor planning and encroachment of urban characteristics.

Due to poor governance and weak political will and commitment, Kenya has failed to guide planning. There is lack of a mainstream mechanism for physical development planning thus creating a conflict between the national, regional and local levels of planning. Planning acts in the public interest, but an alternative is that government/ planning activities are undertaken for the best interest of those who govern.

Low level of community involvement and stakeholder participation: Community participation enhances the definition of the collective rationality. While inadequate community involvement acts as a hindrance to utilizing the opportunities that exist.

The case of site and service schemes instead of elimination more proliferation of slum development is witnessed adjacent to planned neighborhoods such as Dandora. Furthermore more decay of such estate late became a challenge due to consistent follow ups in planning.

Poor capacity in the planning profession: Experts are also unable to cover the vast and highly populated Kenya. Characterized by incapacity, in terms of human resource skills to eliminate unprofessionalism in planning. Professionalism has been understood to be one of the major instruments for changing the face of Kenya. Changing the face of Kenya's planning requires discipline and political will to do so (African Socialism sessional paper part 141, 1965).

Poor co-ordination. Planning is not one person venture. Line departments/ministries are poorly coordinate, a result is seen in wasting resources that otherwise are scarce through duplication of roles, little sharing of important information. Currently coordination between national and county governments has been a great issue that is delaying the products of devolution.

Additionally poor information strategies aren't enabling the communities to unlock the potential of their resources. This research is timely and aims at understanding the potential of

industrial activities along the corridor. The information will inform not the experts but also the relevant community.

2.14 Case Studies

2.14.1 Case Study 1. Etowah Town, Tennessee, USA

This study uses Etowah town as an example because just like Juja, the town is a gateway to other regions. The town built on industrial development in a bid to increase the town's economic growth and thus the same can be replicated for Juja town.

Overview of the town

Etowah is a small town in the eastern Tennessee foothills. It is the second largest town in McMinn County. Railroad infrastructure provides the town with a valuable heritage asset while a modern and thriving industrial park provides well-paid employment opportunities to its residents.

In 2002, Etowah faced a severe economic challenge characterized by declining employment levels and dilapidated infrastructure. Town leaders in Etowah focused on their communities existing assets and built a new, long-term and sustainable strategy for development. Today, Etowah has a thriving economy based on three pillars: *heritage tourism, downtown development and industrial recruitment and expansion.*

Etowah was the first planned community in the United States. The railroad was built by the Louisville and Nashville (L&N) Railroad Company in 1906, Etowah was to be a crucial location in the company's efforts to piece together a direct route from Chicago to Atlanta and open up the town to the wider region. In terms of natural and built assets, Etowah is a regional gateway into the Cherokee National Park.

Approach to development

Etowah's strategy for economic development was to build from its existing assets—to use its heritage assets to attract tourists; to create a dynamic and thriving downtown corridor with retail and service amenities that attract visitors as well as locals and to leverage the town's quality of life factors and its existing industries to further expand its industrial base.

The roots of Etowah's strategic approach can be traced back to a community planning exercise that took place in 1998, during which a coalition of government, businesses and

NGO leaders came together to develop a shared vision for Etowah and a long-range agenda for development.

The research thus builds on Etowah's two main pillars: **Downtown and Industrial Development** which are further discussed below:

Downtown development

It follows that the second pillar of Etowah's economic development strategy is to build a downtown corridor with services and amenities that attract tourists and locals. In the vacuum created by economic shocks of the late 1990s, a second-hand-item market developed in Etowah's downtown retail corridor. Shops selling antiques and sundries took root in previously unoccupied storefronts. According to a prominent town official, "Etowah's secondhand stores attract shoppers from further away."

Their main challenge, which was articulated during Etowah's strategic planning efforts of 1998, was their lack of capacity for marketing and advertising. In response, the chamber worked with downtown merchants to help them take advantage of traffic from the railroad excursions.

Industrial development

The final pillar in Etowah's economic development strategy is industrial development. The town manager coordinated recruitment and expansion activities. When Etowah was working on its community strategic plan, it became apparent that being proactive in the area of industrial development could complement. Town leaders recognized that the railroad infrastructure in Etowah was a valuable asset, not only for tourism, but for industrial distribution. The town made a strategic decision to purchase and develop an industrial park on the northern edge of town, the goal of which was to create sustainable, living-wage jobs for Etowah. The town extended infrastructure for water, sewer and utilities to the North Etowah Industrial Park.

Once the site preparations were complete, companies started calling. Etowah was never in the position of being able to offer cash incentives, but site development at the industrial park and the existing rail infrastructure, combined with the county's payment in lieu of taxes program were sufficient to attract tenant/investors interest. Today, Etowah is home to major industrial tenants, including Waupaca Foundry, Johns Manville and Consolidated Metco. Average wages in Etowah's industrial park range from USD 16 to 20 per hour plus benefits.

Key Themes or Lessons

Development strategy should be based on a broad definition of small town assets. In Etowah, the train depot, historic downtown architecture and rail infrastructure were obvious development assets. Some of the less obvious but equally important assets included the adaptability and grittiness of local residents, the town's interesting history, local NGOs, and the nearby protected parkland.

The process of identifying a small town's assets ought to take a broad view of what a town has to offer and employ creative ways to leverage those assets toward economic, civic, social and environmental gains. Proactive industrial development as part of a broad-based strategy can spur investment. Etowah demonstrates that proactive industrial development can be part of a broad-based and asset-driven economic development strategy.

According to Etowah's strategic plan, "recruiting technology-based industries that provide a clean industrial environment will avoid the brain-drain create higher paying opportunities, which will give our children a reason to remain in Etowah and recruit others to relocate in Etowah." Etowah initiated industrial development on its own terms, and only after embarking on a community-wide exercise to determine its assets and strengths for development. The results are impressive, including hundreds of living-wage jobs in expanding industries. (UN-Habitat, 2012)

2.14.2 Case Study 2: Douglas, Georgia

The study uses Douglas town in Georgia because just like Juja town, Douglas is of proximity to seaports while Juja town builds on its proximity to the Thika Superhighway which links regions. In the key lessons addressed for the growth of Douglas is partnership between the town's leadership and research and technical institutions, Juja is therefore advantaged to due to JKUAT thus the programs implemented for Douglas can be replicated for Juja town**.**

Douglas is a small community in Georgia, located between the Okefenokee Swamp to the south and open farm plains to the north. Douglas cultivates economic development from three angles -- by intensifying entrepreneurship and small business efforts, diversifying industrial recruitment and employers, and preparing a cadre of new leaders to move the community's vision forward.

In 2005, Douglas was the first rural community in Georgia to meet the state's rigorous standards as an 'Entrepreneur Friendly Community'. Through a balanced economic

development strategy -- which includes supporting entrepreneurs and small businesses, industrial development and leadership training, Douglas enjoys a 20 percent growth rate and has become a regional hub for jobs, retail, entertainment and medical services.

The industrial development strategy begins with the connections and networks that local leaders have been building for decades. Personal connections between leaders in Douglas and economic developers in Atlanta are a bridge to high-level business prospects. The chamber and EDA, along with the town administration, tap into these networks to bring business prospects into Douglas.

The town's goal is to attract a diverse range of companies that pay reasonable living wages. The town offers local incentives, with a heavy emphasis on noncash incentives. During a typical negotiation with a business prospect, the local technical schools are at the table to outline training opportunities, local business leaders make themselves available to sell the supportive business culture in Douglas.

The key lesson learnt in the case of Douglas town is:

Douglas is quick to respond when local businesses ask for assistance. Several years ago, the EDA started hearing complaints from local industry regarding the lack of trained commercial truck drivers. In response, EDA partnered with the local technical college to develop commercial drivers' license driving range and education facility to train new truck drivers.

This sector of workforce development responds to specific needs from local employers, and it fits well in terms of Douglas' growing importance in distribution and warehousing and proximity to regional seaports.

2.14.3 Case Study 3: Maputo development corridor (MDC)}

Rogerson and Crush (2001), observe, Maputo development corridor (MDC) in South Africa as a spatial engineering project that emerged out of the re-establishment of the transport axis between Maputo and Johannesburg. As Spatial Development Initiatives (SDIs) flagship project, MDC is now referenced to not only in South Africa but in similar discourses in Africa In the quest to resolve inherited constraints of the 50yrs apartheid state (1930-1994) the new dispensation sought to a new industrial geography thus the origin of SDIs .

The authors further, explain to indicate the design of SDIs;

> ‘As packages of strategic government initiatives aimed at unlocking inherent and under-utilized economic development potential of certain specific spatial locations in South Africa.’

In their contribution while evaluating this particular spatial initiatives the two write disseminating knowledge on development corridor particularly showing the widened, encompassing of spatial entities in transport corridors. In the process of unlocking economic potential and facilitating of new job creation bottlenecks of investments such as inadequate infrastructure are removed and strategic opportunities like private sector investment and capacity areas are identified .

In their report, their after they indicate this spatial planning as not one event to bring sustained development, instead they draw lessons while identifying core process essential for sustained SDI planning: Crowding and coordination of public private sectors; public-private partnership especially in building vital infrastructure; political goodwill; capacity building in identified extra investment opportunities and clustering of industries around anchor projects.

In another study in support of MDC, Mitchel 1998 attempted to assess progress against key objectives. In his exploration financial strategies and involved parties are identified in rehabilitating primary infrastructure; to maximize investment in corridor all sectors are involved and private sectors are attracted as government funds social infrastructure ; community participation is also captured among initiatives to maximize potential growth.

The drawn lessons from South Africa experience is that, with sustainable interventions, transport corridors can be sustainably be turned into development corridors. However for the corridors to respond to unrealized potential, broadly defined objectives are necessary. While the onset initiative of the two countries was to primarily service as Transport Corridor, the holistic view in planning by SDI initiative has successfully reflected establishment of industrial plants with myriad business opportunities while ensuring social enhancement and environmental sustainability along –thus, ‘ a Development Corridor’ To foster this growth integration of anchoring objectives were defined: improvement of basic infrastructure; promotion of private sector investment; environmental sustainability, inertia.

2.14.4 Case Study 2: Asia (Indonesia) and South America (Brazil)

In **Indonesia**, (in the 1980s), the construction of Toll-Ring roads around the city of Jakarta triggered the movement of firms out to the peripheral areas of the greater Jakarta metropolitan (Henderson et.al, 1996).

The author further observes that in the same market these firms witnessed reduced congestion costs (e.g. that of transport and land rents) consequently enabling them to benefit from this lower land rent and lower labour costs. He equally noted the benefit from agglomeration factor since they remained within the same region.

In another exploration the improved transport networks in **Brazil** are seen to have enabled the deco centration of industry from the Greater Sao Paulo to hinterland (Henderson et.al, 2001). The author noted, while confirming the significant growth of states and towns at the peripheral areas of traditional economic core. He however pinpoints that unlike the growth in metropolitan area the lagging areas, that were more remote did not receive the significant impact of the transport networks.

The lesson learnt from these two scenarios: The influence of improved transport network will continue to spur development along their surge. However metropolitan regions, in comparison to more remote, areas will continue to attract more investors due to their potential qualities.

2.15 Research Concepts

Development Corridors

A Development corridor is a spatial growth approach that occurs along a linearly spatial element. It is an emerging as development initiative that need to be nurtured to promote greater prosperity and quality of life to the current and future humanity. In Kenya the key strategic document, vision 2030, has considered development corridors as the desired approach of fostering development; such an example is the LAPSSET Corridor which was initiated and designed to pass through the former 'Northern Frontier District.'

It is an evolving concept with no clear demarcation between stages of evolution, as most researchers agree. As such corridors exhibit complexity and lack universal definitions. However the stages involved are differentiated by use of specific characteristics exhibited at different stages and times.

According to (Ng'ayu, 2015), 'there are three perspectives from which the development corridor concept can be applied; i) elongated zone of development influenced by major transport routes and other forms of infrastructure and also referred to as linear development ii) the extension of large cities; and iii) corridors are sometimes also economic development axis.

It is presumed that the development of various nodes along the corridor will radiate to the surrounding areas and to the areas around the main axis of the corridor.'

On the other hand history reveals existence of correlation between transport and development corridors. In relation to this research, Thomas and Thomas, (2009) have given the line of thinking that supports this author's ideological basis for the research by description; "development corridors are described as transport (or trade) corridors with under-utilized economic potential in their environs, the development of which would be explored through spatial planning and development projects (SDIs). They are therefore seen as a means of configuring, prioritizing and promoting inter-related infrastructure and large-scale economic sectoral investments in defined geographic areas so as to promote trade and investment led economic growth; optimize the use of infrastructure; encourage value-added processing; and enhance the competitiveness of African economies.'

Hope and Cox, (2015), notes that, the corridors should be viewed from the physical and functional dimension. The Asian Development Bank, asserts too that, 'development corridor is not simply a connector between A and B but rather with nodal points within, that serve as centers for enterprise development'. It concurs with Hope and Cox's explanations of expansion of key transport corridors to enhance economic activities over time; eventually the potential of a sub-region is reached. Despite the dynamics identified and character of the corridors the challenges in definition and perspectives on development have therefore resulted in disintegrated policy and decision making.

The Concept of Rural Urban Fringe

The Rural urban fringe is a transition area with both characteristics of urban and rural characteristic. Friedberger (2000), describes it as an area characterized by diversity in land uses with many areas in continuous transition. It is a rapidly changing zone without prerequisite infrastructure.

The peri-urban form of development is closely linked with Development corridors; Aguilar corridor and Ward (2003) as quoted by Ng'ayu 2015, explains: 'firstly, urban corridors which are lineal developments that may concentrate a predominance of different activities along the way, i.e., corporate developments, industrial parks, residential areas, and the density varies from very compact areas to *low*-urban density with rural landscape in the middle.

Second, urban sub-centers in the periphery that may be consolidating traditional towns once dominated by agricultural activities, or the result of new (low-income) residential

developments in metropolitan municipalities of rapid growth incorporated into the wider metropolitan complex for the first time.

According to Aguilar, the sub-centers play the role of small cities by providing cheap labour, concentrating a wide range of services, and serving as satellites or dormitory towns to the large city.' Birley & Lock, (1998) in their definition recognize mosaic characteristics of different land uses in the peri-urban zone, habitation by communities of different economic status, in a state of rapid change, but with lack of infrastructure. Kaiserer al at 1995 further elaborates that construction and expansion of highways cause market changes and land regulations thus expanding the city further to the peri-urban.

The study area possess both rural and urban characteristic; a town along the expanded transport corridor and rapid development radiating to the surrounding in Kenya, where the urban fringes have been recognized as planning areas to facilitate development (County Government Act 2012). However the challenge of unguided developments along the corridors may hinder the realization of the opportunities.

Planning concept

Planning is defined as a concept comprehensively designed to find the best use of scarce resources. (Sessional paper no 10, of 1965 page 49). It is also termed as a public undertaking that seeks to guide society in making choices directed to assist societies to get to where they desire to be. A process of anticipating the future we desire and putting measures in place to guide societal systems (Ndegwa, 2014). Faludi notes that communication between man and his fellow environment results into a stock of messages; as a store of knowledge (of the environment/world) which is used as a basis for man's actions. The image represents a man's knowledge of the world. It is in (general context) the making of orderly sequence of action that will lead achievement of stated goals. Therefore this research is out to comprehensive gather relevant information that can guide drawing of sustainable spatial entities in the named town.

2.16 Conceptual Framework

The conceptual framework defines how Juja, will be defined to enable in conceptualization of the study area for sufficient development of the main focus of the research. The town will be defined in terms of historical developments, factors behind growth, transformation trends and its growth direction. This area of study was defined: as a node in relation to the Nairobi – Thika development corridor; in terms of historical development in relation to industrial

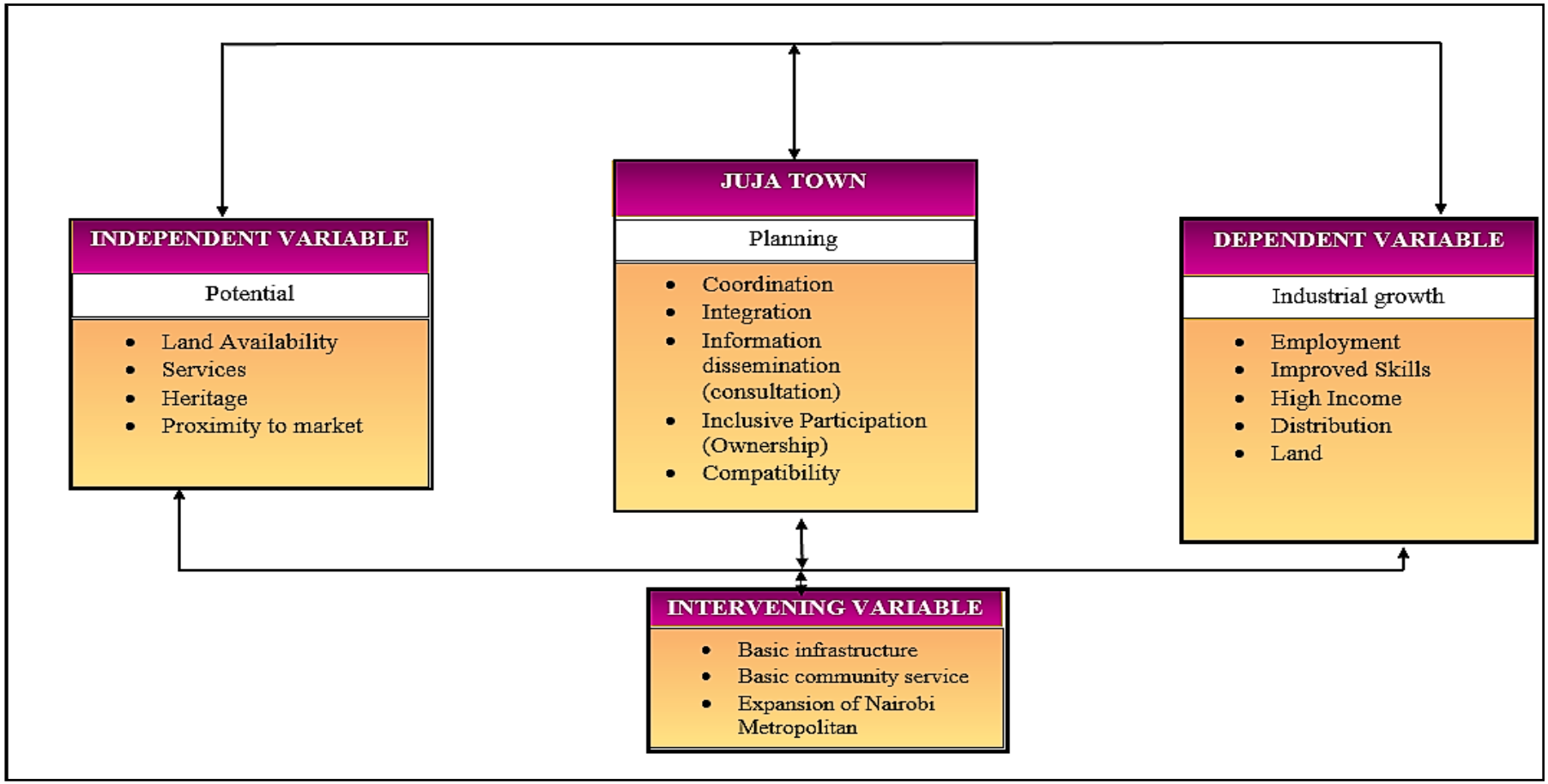
activities and supportive systems. A Peri-urban town that is within rapidly expanding metropolitan region, equally found along a major transport corridor. An exploration into the factors of potential growth of the industrial activities forms the main core.

Thus the main focus was to identify the existing industrial activities in this study area; their characteristics in terms of type, location and land characteristics. Social economic factors are mentioned in relation to potential factors of industrial growth.

The framework mentions the concept of development corridor to enable in conceptualization of the study scope for sufficient development of the main focus.

For sustainable development the activities cannot exist on an island thus the support system in an exploration on further potential for growth. This will be limited to basic infrastructure and basic social amenities. The framework further indicates the existence of a potential relationship of growth of Juja and industrial development. Guiding principles in sustainability will be defined in terms of interventions.

Figure 2.3: Conceptual Framework



Source: Author 2017

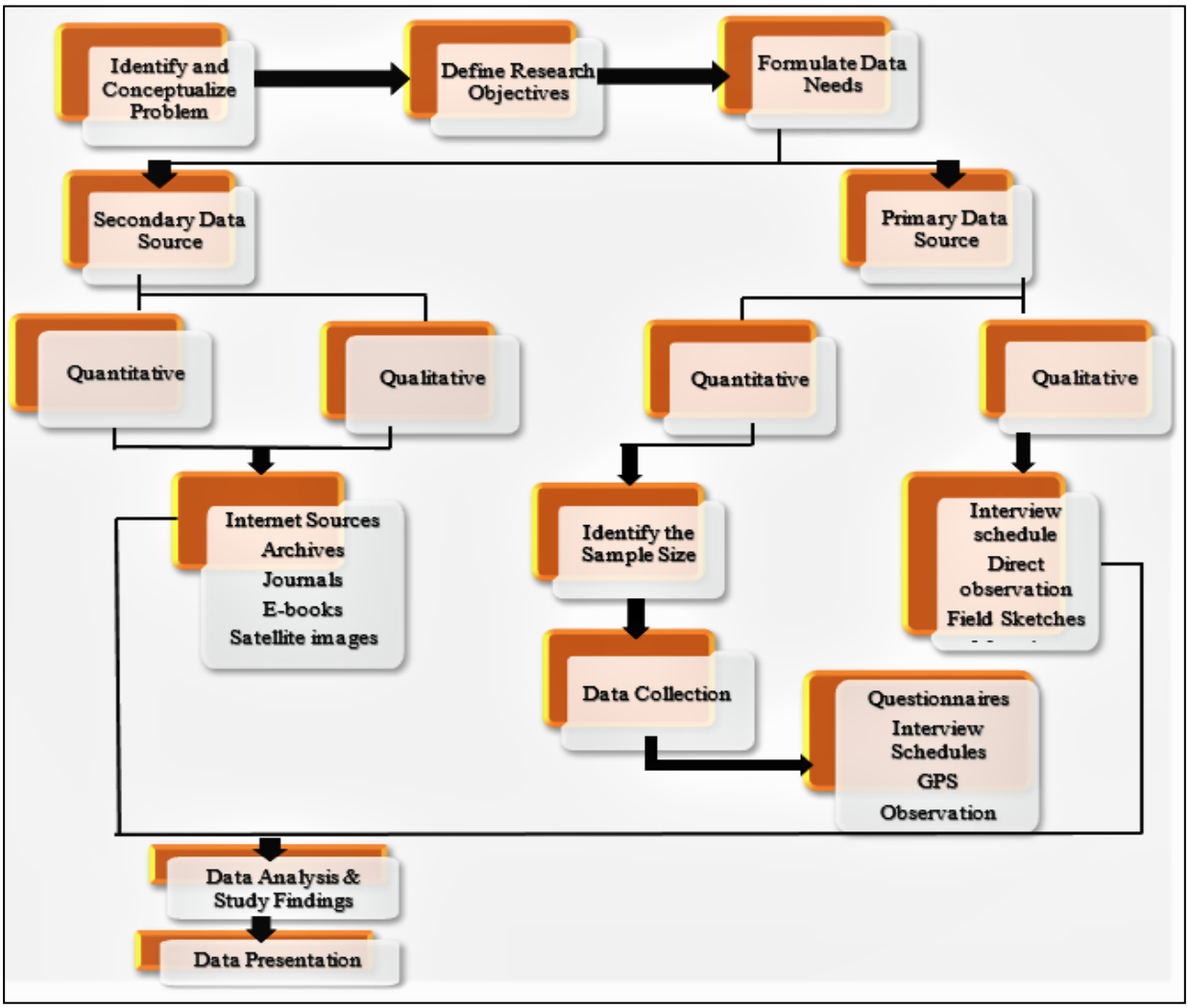
CHAPTER 3: RESEARCH METHODOLOGY

3.1 Research Design

This section outlines how the study was planned and conducted, the procedures and techniques employed to answer the research questions. It was an inquiry that involved multi research methods as it was informed by the review of literature, related cases and the reconnaissance survey. It was non- experimental as the variables were studied at their current occurrence and how they occurred before, without any manipulation of independent variable.

The strategies included both qualitative and quantitative research techniques. Qualitative technique was employed with an aim of providing an in-depth understanding of the phenomena, with strengths of getting more information, being flexible and innovative. However the findings could not be generalized to the population thus different/more approaches were explored to build on the findings. A case study approach was referred to, to draw experiences from different perspectives on the case while listing guidelines on industrialization processes in towns like Juja. Within the context of this nodal town along the Nairobi-Thika transport corridor various components were studied in order to understand the potentials of industrial activities and thereafter planning for sustainable industrial land use. Theoretical frameworks formed a supportive argument as well as field survey through focused group discussions, interviews, open ended questions and field observation and imagery as well as documentary analysis. Qualitative raw data was transcribed into usable data together with quantitative technique that entails collection of numerical data that is described to be having objective conception of social reality (Bryman and Bell, 2007). The findings were inferred to the population thus drawing conclusions about the same population.

The following logical sequence and stages were followed in order to obtain answers to



research questions.

Figure 3.1: Research design sequence

Source: Author 2017

3.2 The Target Population

The study chose households as the major unit of analysis since they are the ones within the area of development utilizing various resources therefore with first-hand information. The study also included the industrialists for their uniqueness in specific industry related information. The business owners also formed part of the sample frame to give relevant information in the topic. The relevant departments in the county government were also included (transport, physical planning, the trade and industry department). Service providers such as RUJWASCO a government body with mandates of managing water and sewer infrastructure, institutional representatives and relevant experts formed part of the sampling

frame. Local leaders (area chiefs, MCA, and opinion leaders) were also factored in this process. All the above were included to ensure inclusive of all stakeholders. Below is a table showing the details of the sampling frame:

Table 3.1: Showing Sampling Frame Details

S/no	Target Population	Category 1	Category 2
1.	All HHs within the study defined boundary (29,723)	All in the study defined boundary within Kiaora Sub location (16,849)	High density
			Medium Density
			Low Density
		All in the study defined boundary within Mirimaini Sub location (7,504)	High density
			Medium Density
			Low Density
		All in the study defined boundary within Kalimoni Sub location (5,370)	High density
			Medium Density
			Low Density
2.	All Industrialists	Big	
		Medium	
		Small	
3.	All Business Enterprises	Big	
		Small	
4.	All Service Providers	Transport	
		Water and Sanitation	
		Energy	
5.	County departmental representatives	Trade and industry	
		Lands officer	
		Physical planner	
		Transport	KeNHA
			KURA
			KERRA
6.	Institutions	Education	Tertially
			Secondary
			Primary
			Pre-school
		Health	3 Number
		Market	Available

Source: Author 2017

3.3 Sampling Design

Ngau and Khumsa (2004) states that, ‘’the objective for sampling is for estimation of population values, economic advantages, reduced time of study and for better and more accurate quality of results’’. In most researches it is not possible to undertake the enumeration of the whole population. Sampling remains the most accurate provider of results that can be inferred to the population. Kothari (2004) defines the sampling design as, ‘’the technique or procedure that the researcher would adopt in selecting some sampling units from which inferences about the population is drawn’’

3.3.1 Sampling size

This is the number of units, subjects, items in a sample drawn from and is a representation of a population (Mugenda & Mugenda 2012). Mugenda, (2008) states that, when the target population is known, statistical theory provides a recommendation on how to compute the most appropriate sample size. In the case where population is not known the researcher is required to conceptualize the phenomenon under study and set the most reasonable sample size to ensure that all sources of variations are captured. The minimum acceptable sample depends on the type of the research and ordinarily a researcher would require a minimum of 30 respondents in survey (Kombo&Tromp, 2006)

Household sampling

The desired sample size was determined using the formula of Fisher et al (1991), since the population is greater than10, 000:

$$\mathbf{n = \frac{z^2 pq}{d^2}}$$

Where-: n - The desired sample size (assuming the population is greater than 10,000); z - The standard normal deviation, set at 1.96, which corresponds to 95% confidence level; p - The proportion in the target population estimated to have a particular characteristic. If there is no reasonable estimate, then use 50 percent (the study applied 0.50); q = 1.0 – p; d = the degree of accuracy desired, here set at 0.05 corresponding to the 1.96. In substitution,

$$n = \frac{1.96^2 \times 0.5 \times (1-0.5)}{0.05^2.} = 384$$

A sample size of 100, was assumed to be reasonable to include all major variation in the variables of interest, instead of 384 in consideration to logistical limitations, time and resources, (Mugenda Gitau, 2013).

The 2009 population census and 2017 projected densities were used to define an approximate population in every sub-location within the area of study. The sample sizes representing various locations were further determined using quota sampling as elaborated in the table 6, below. Later independent samples from each strata were selected.

Table 3.2: Sample Size as Determined in Every Defined Division {sub location} (HH)

Sub location (Division)	Density (2009)	Area within the scope	Population {Within Scope} in	Projected Population(2017) {Within Scope}	Projected HH (using an average of 3 members/HH	Ratio	Sample size (n)
Kiaora	1412	9.42	13,301	(PN_1) 16849	(H_1)5,617	0.57	(n_1)57
Mirimaini	403	14.7	5,924	(PN_2) 7504	(H_2)2,502	0.25	(n_2)25
Kalimoni	164	25.85	4239	(PN_3) 5370	(H_3)1,790	0.18	(n_3)18
Total	**1979**	**49.97**	**23464**	**29723**	**(H_T)9,809**	**1**	**100**

Source: KNBS as modified by author

The formula used for the sample sizes was H_1/ H_T X n ;or H_2/ H_T X n; H_3/ H_T X n for n_1, n_2, n_3 respectively,

Where;

n_1; n_2; n_3 - Sample size in various divisions

H_1; H_2; H_3- Households within scope in various divisions (sub location)

H_T - Total households within scope in various divisions (sub location)

n – Total sample size (100)

Note that: (i) P_1; P_2; P_3 - Population within scope in various divisions (sub location) and

(ii) N_T- Total population within the study geographic scope

Social class and location criteria were used to select representative zones from every division (sub-location). This was based on baseline studies that were carried to validate the mapping exercise by satellite imagery. Unique characteristics like floor heights, physical distribution of settlements, physical access, and densities were used to determine the specific areas to ensure that certain attribute are included in the study. There after simple random sampling was used to choose the representative street in every zone. This was followed by stratified random sampling which arrived at the required sample. Sampling of Industrialists

A sample of 20 industries was selected. This selection was guided by the list of industries provided by the trade and industry department at the Sub county offices. The study focused to get representation from the three sub locations while involving categorization of activities into size and location. Categorization into the procedures that existed also enabled the research to include at representatives of each. These categorical procedures included: assembling and packaging; agro-based; printing and publishing; manufacturing; mining.

Table 3.3: Sample Size for Industrialist

S/no	**Size**	**Location**				**Total no.**	**Ratio**	**Sample size**
		Mirima-ini	Kiaora	Kalimoni				
1	Large	3	0	1		4	12	2
2	Medium	10	1	7		18	51	10
3	Small	0	1	2		3	9	2
4	Not defined	6	2	2		10	28	6
Total		**19**	**4**	**12**		**35**	**100%**	**20**

Source: Author 2017

Cluster sampling was used to select industries according to type and location. Purposively some industries were factored into the study given the limitations mentioned in section 3.7

Sampling of Business Enterprises.

The sample frame used to arrive at the exact sample for business enterprises is as shown in table 3.4 below. Again the selection was guided by the list of business enterprises provided by the trade and industry department at the sub county offices. The sample frame is as shown below. The ratios guided a deliberate sample size which totaled to 30 enterprises.

Table 3.4: Sampling of Commercial Enterprises

s/no	Business activity (Category I)	Category 2	Population	Ratio	Deliberate Sample Size
1	Stores	Hyper supermarket	2	0.2	1
		Mega Stores	1	0.1	1
		Medium Stores	2	0.2	1
2	Trader shop/retail	Large	10	1.0	1
		Medium	750	75	7
		Kiosks	13	1.3	2
3	Transport companies	Medium (6-30)	2	0.2	1
		Small Transport co.	Data not available	-	
		Independent	Data not available	-	1
4	Petrol filling stations	Large	1	0.1	1
		Medium	1	0.1	1
		small	3	0.3	1
5	Stores	Large	0	0	0
		medium	4	0.4	1
		small	0		0
6	Butchery		50	5	
7	Security Firms	Large	1	0.1	1
		Medium	0	0	0
		Small	0	0	0
8	Financial Services	Large (>25 Workers)	3	0.3	1
		Medium	2	0.2	1
9	Lodging Houses		15	1.5	2
10	Eating houses(restaurants/hotels		30	3	2
11	Small Informal		Not known	-	5
Total			**998**	**100**	**30**

Source: Author 2017

Open ended and structured questionnaires were organized to build on social economic factors while opening to the parts that considered the subject of discussion. For the purpose of collecting more data from the transport related business FGDs were used. Discussions were held to include the companies operating along the highway as well as those operating along Juja farm and Juja –Gatundu roads (Mure Sacco; Gathimani SACCO; JAT SACCO)

The key informants were purposively sampled to give in depth information at different levels:

Table 3.5: Sampling of Key Informants

s/no	Section	Department	Role
1	Transport	KURA	✓ Provided the transport related economies as well the integration guidelines that are required. ✓ Mandated to create efficient transport systems within urban regions in Kenya.
		KERRA	✓ Provides the transport related economies as well as the integration that existed. ✓ Mandated to create efficient transport systems within rural regions in Kenya.
		KeNHA	✓ Provided insights related to use of national highways while liaising with other key areas like industry, transport economies, physical planning.
2	Physical planning	At the sub county	✓ He provides the overall guidelines to the National Land Commission and the county, as well the planning guidelines for the sub county.
3	KPLC	At Thika station	✓ Distribution of electric power from the substation to the consumer. ✓ Maintenance of the Infrastructure
4.	Trade and industry	At the sub county	✓ Representing county enterprise directorate
5.	RUJWASCO		✓ Provided the insights on water and sanitation provision in the study area
6.	Lands officer		✓ Provided insights on sustainable administration and management of land and land resources while factoring in integration to enhance compatibility
7.	Spatial experts or professionals	Construction and spatial related field experts.(the ones who had worked within the study area	✓ They gave insights in planning of this area
8.	Land buying companies	2 Representatives from 2 companies	✓ To give information on behave of their company
9.	Elected officials (MCA and chief)	MCA	✓ To represent the local community. They provided insight on how the area is organized, proposed plans among others
		Chief	
		2 number Health institutions	
		Market representative	
		The Sub county Education officer	✓ Representing the education system at the sub county level

Source: Author 2017

3.4 Data Collection Methods and Tools.

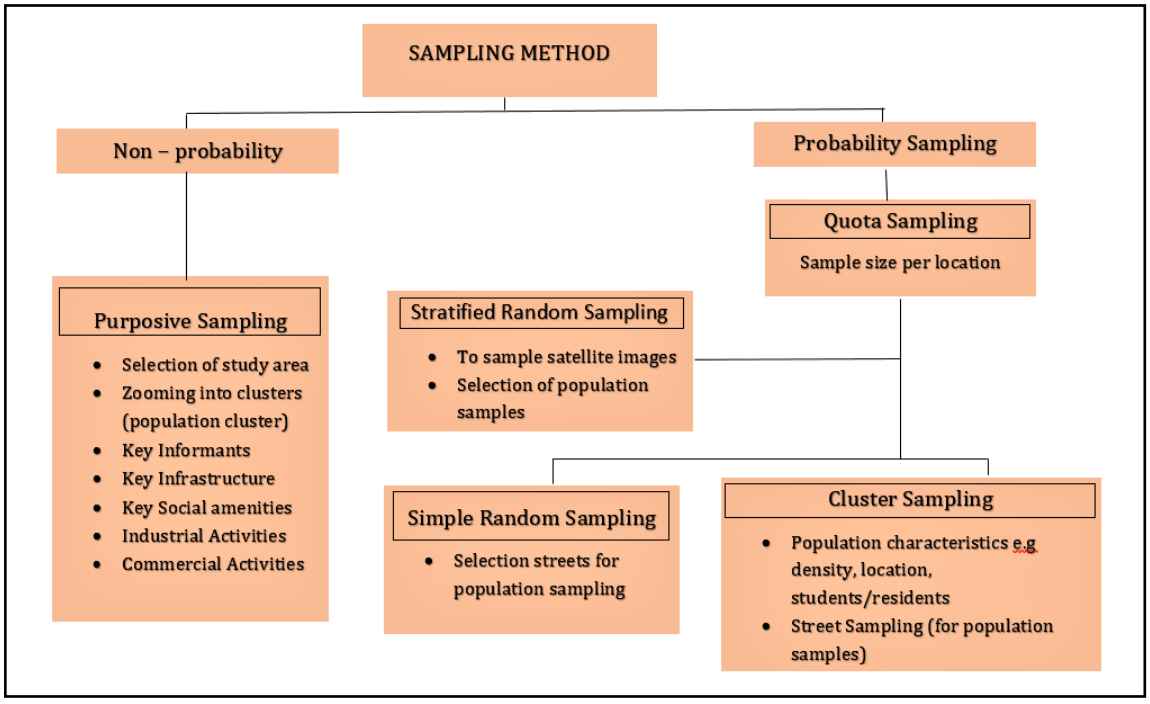


Figure 3.2: Summary of the Sampling Methods

Source: Author 2017

The proceeding sections clarify the requirement of both primary and secondary data in order to achieve the objectives. Various data collection methods were used depending on the data needs and their sources.

i) *Measurements*

The method was applied to acquire geometric information. Satellite images were used to identify the existing locations on industrial developments along this corridor. Physical characteristics in support of industrial development were also generated from satellite images to study land use attributes. The GPS supported, by recording relevant points and the required sizes while the calculation was on ArcGIS program. GIS data sets were generated to form shape files thus enabling overlay and analysis of different variables.

Physical measurement of land use, and, physical infrastructure by use of tools such as, measuring tapes. GPS supported the GIS results as well as the generation of smaller measurements.

ii) *Observation*:

Field observation supported imagery information.

The method was used to gather information on existing activities ongoing in the study area and the available infrastructure and community services. Photography was supportive while the observation guides and photographs were among the relevant tools.

Land use map that included County Spatial Plans and the Juja Urban Spatial Strategic Plan (USSP), which were generated were observed to form part of the primary data.

iii) *Interviews*

Information from key informants was acquired using open-ended interviews *guides*.

iv) Focused group discussion

Field discussion guide were used to gather information from focused groups. The method gave perceptions on industrial activities and policy directions. Guidance was given to key informants for discussions about the issues of interest. This assisted in gathering various community groups. Chronology of events/activities on industrial development as well support systems was also achieved.

Questionnaire Administration

Questionnaires were administered to get information from the existing residents (HHs), business population (business questionnaires) and industrialists (industrialist questionnaire). Some respondents filled the questionnaires alone, while other responses were assisted to write the responses.

Review of literature

Secondary data was obtained through literature reviewing which extracted information from archival sources previous researches, policy documents, books, print media, research journals, and publications among other relevant documents.

Case studies, contributed to guiding of the topic under discussion. A series of satellite images showed the chronological physical events thus informing the direction of development and the physical characteristics of the area.

3.4 Data Analysis and Presentation Techniques

The study used both qualitative and quantitative methods of analysis. Using GIS and GPS the physical location of the industrial activities were mapped by zooming into the exact locations. While the same tools were applied to analyze the existing land sizes, the narrative

analysis on qualitative data supported the findings. Symbolization using defined criteria analyzed the categories of land uses with the color code examining the densities of specific and general industrial activities. To explore into infrastructure and services the buffering tool showed their existence while the layering tool analyzed existing interactions with the industrial activities.

To outline on the relationship that exists between the highway and the activities, various GIS tools were used to provide spatial joints with the support of attribute table.

Key informants notes were reviewed to gather for relevant information while field questionnaires were checked for data cleaning, completeness and consistency. Qualitative field observations were transcribed into usable data and analyzed using SPSS and excel. Depending on the objective and data generated the findings were presented in map format, tables, GIS model, percentages, graphs and report writing

3.5 Selection and Training of the Research Assistants

Two research assistants (a male and a female) were recruited to assist in data collection and data entry. The minimum level of education for this research was bachelor's degree, with prior experience in conducting related data collection exercises. They were trained in order to: get the intension of the study; follow the defined procedures. They were involved in the pilot study exercise as part of training and orientation into the full exercise.

3.6 Testing Research Instruments

A pilot study was conducted in order to pre-test the research instruments, sampling procedures and data collection methods. Pre-testing of data collection instruments is important because a researcher is provided with an opportunity to correct any inconsistencies and errors before embarking to the main data collection exercise (Mugenda &Mugenda, 1999).The pilot study was conducted at Mung'etho area, which was within the study area and afterwards the necessary changes were made from the observations made.

3.7 Study Limitation.

1. It was not possible to select the industrialists as per the planned sample frame and procedures. Some industrialist did not allow access to their premises in an assumption of protecting their new business venture. Then it was necessary to use purposive/convenience sampling in order to include more industries that could guarantee permission for interview. The research tried to ensure at least a

representative of each category was included. A visit to all zones (sub locations) was factored in to ensure locational representation and avoid biasness. Those interviewed were neither ready to fully contribute in order to protect their business venture too.

2. The study's focus entailed the land issues and with sensitivity associated, most subjects responded with minimal cooperation. However measurement tools were used where necessary, to provide information that enabled the conclusion of the research.

3. A major limitation was also lack of getting full information due to un- updated records especially land related. The research relied on information by households, the land buying companies and direct ground measurement. The sub county offices were also in the process of updating their records thus modifications of procedures were found necessary towards answering the research question.

4. Inadequate time and resources for data collection was a limitation experienced while carrying out this study. First the bounding of the study within 5km on either side of the highway was preferred to limit the scope given that time and resource couldn't have favored the study beyond this scope. It is necessary to note that the town characteristics are spread beyond the definition of the study with settlements at 4.5 km, after which the land is continuously being subdivided. The research method comprised zooming into zones which were a representation of all variations.

CHAPTER 4: RESEARCH FINDINGS

4.1 Social Economic Characteristics

This section gives an overview of the age, gender, education, employment and income levels of the population, it also details out immigration into Juja town. This analysis is important as it informs the industrial growth potential in terms of skills, categorization of workforce in terms of gender and the catchment population to provide labor for the industries.

4.1.1 Age of respondents

The figure below illustrates the age distribution of the respondents within the study area. 44% of the population is between the ages of 25 and 34 years, 38% aged between 35 and 44 years, 13% are between the ages of 45 and 55 years while 3% of the respondents are 55years and above. This analysis is critical in determining the active working population for employment in industries. Thus majority of the workforce would be derived from the ages between 25 to 34 years.

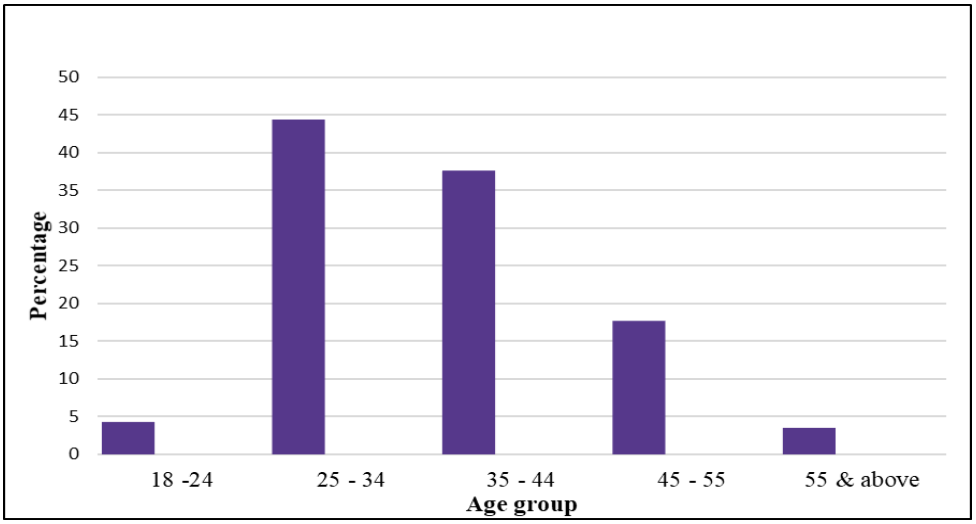


Figure 4.1: Respondents Age

Source: Author 2017

4.1.2 Gender

In regard to gender differentiation, the study found out that more than half the population was males, at 56%, and female 44%. Gender analysis is important in determining the potential for industrial growth in terms of workforce.

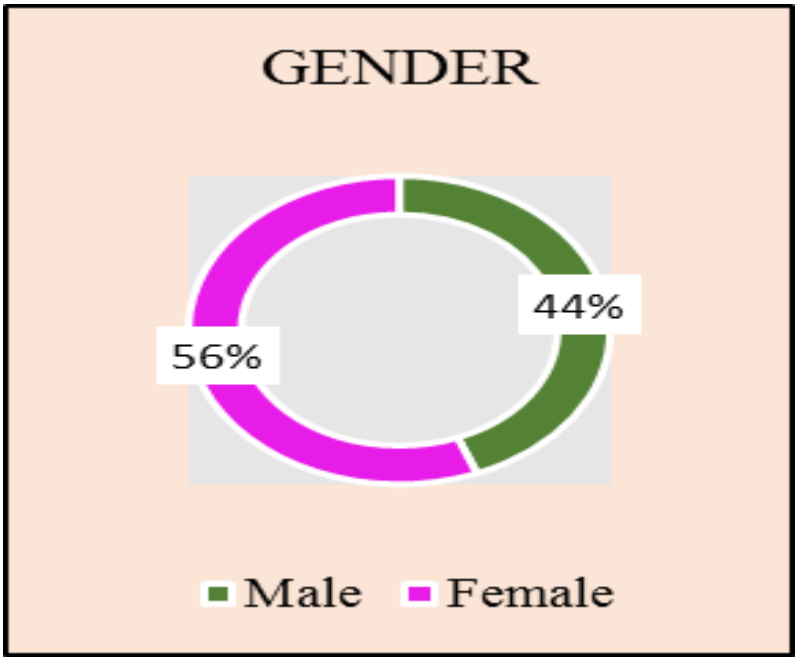


Figure 4.2: Gender

Source: Author 2017

4.1.3 Level of Education

The study intended to find out the level of education within the study area to determine the levels of skilled, semi-skilled and non-skilled workforce crucial in providing labor for the industries. The findings show that, 40% of the population had attained secondary education, 44% had tertiary qualification, and 13% had primary school education while 3% of the population had no formal education. Therefore, majority of the respondents within the study area have formal education.

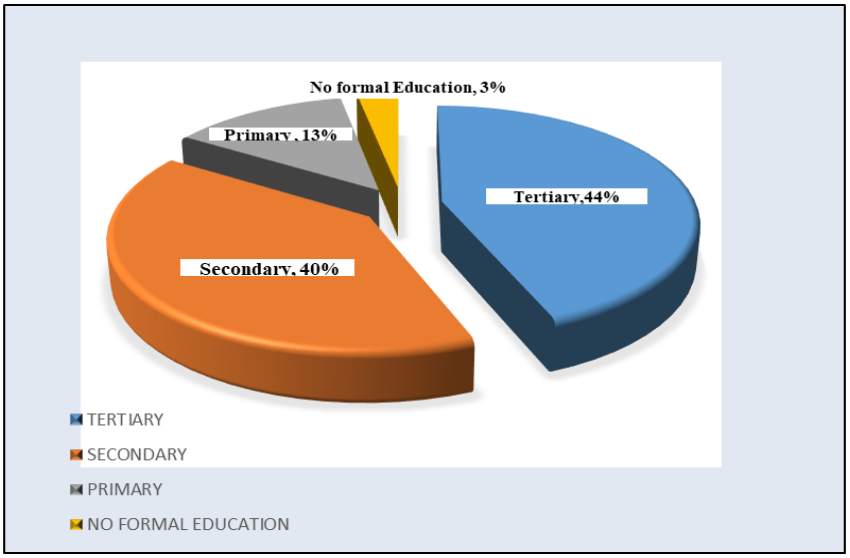


Figure 4.3: Level of Education Source: Author 2017

4.1.4 Income levels

Majority of the population in Juja earn between Ksh 10,000 – Ksh 24,000 making the majority of the population to be low income earners as shown in figure 4.4 below. The field study revealed that a section of the population was involved in commercial activities and majority was earning an average of between Ksh 24,000 to Ksh 60,000. Problems encountered within the town, specific to this portion of the population included inadequate infrastructure facilitation, fluctuating market, among others.

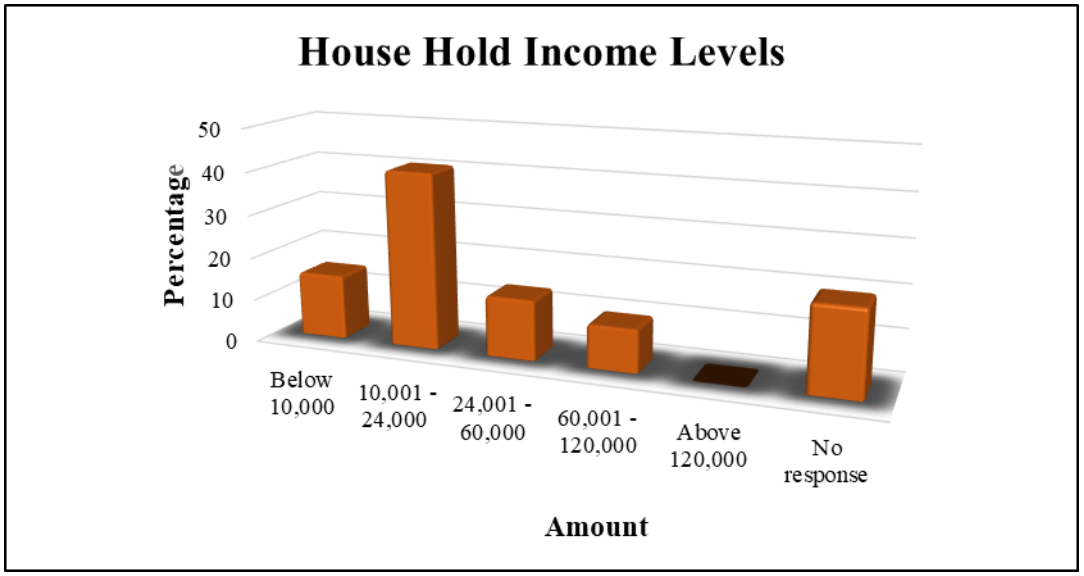


Figure 4.4: Income Levels

Source: Author 2017

In a FGD meeting, the fluctuating market was linked to seasonal changes for example, during university break and hard economic times. Diversification therefore is an option that can solve this market problem. Concerning their views on how business could be improved, 38% suggested the improvement on credit facilitation, 32% improvement of infrastructure while 30% were for establishment of industrial related enterprises for value addition. Section 4.2 explains on approaches and plans that are underway on this infrastructure development. On forms of saving, 63% preferred formal banking while 18% were involved in table banking and 15% did not save at all. This to some extent explained the potential of the town as it avails an opportunity to saving.

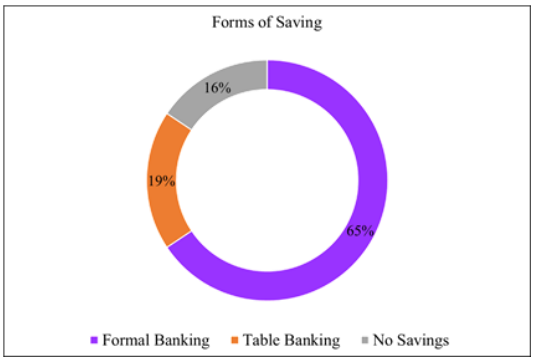


Figure 4.5 : Forms of saving

Source: Author 2017

4.1.5 Employment Status.

From the field study, it was established that 60% of population are self-employed, and 16% are working in private organization while a total of 19% are in parastatals and working for the government. However, 5% of the respondents are unemployed. It is thus evident that formal employment cannot be fully relied on and thus the need for industrialization in the town to create employment opportunities. Self-employment is also an indication of innovative skills that can be explored for industrialization.

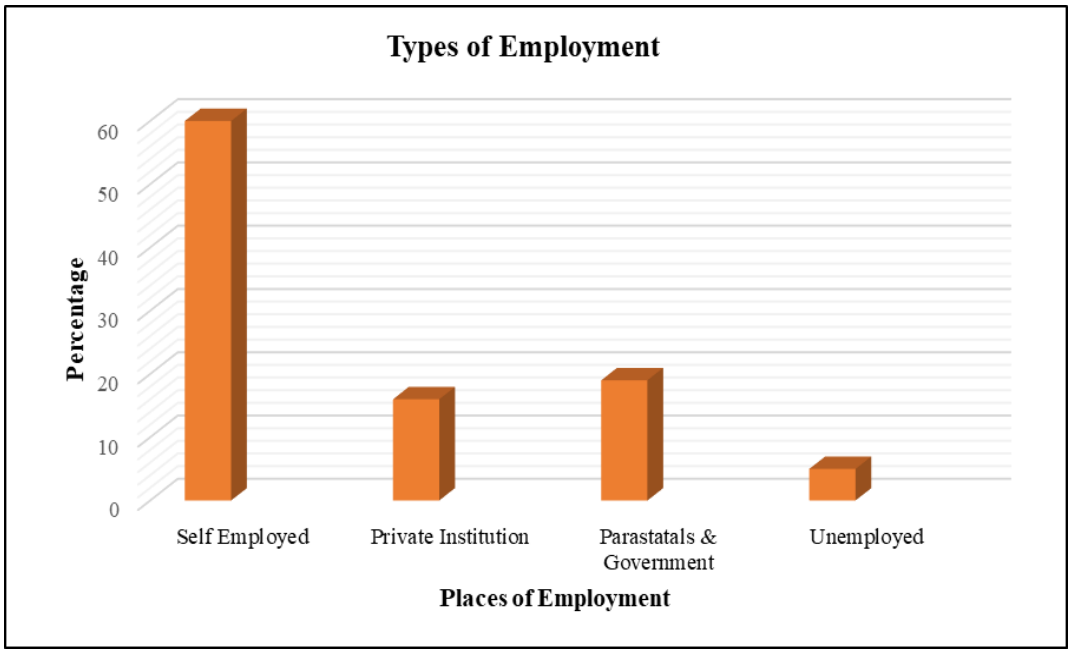


Figure 4.6 : Employment Status

Source: Author 2017

4.1.6 Migration Patterns

From the field study, immigration to Juja comes from the neighbouboring areas i.e Nairobi that comprised 8%, Muranga, 8.5%, Nyeri, 8% and the larger Kiambu, 8%. However migration from Kisii, Uasin Gishu registerered an equivalent number of 8%. The pattern is also showing migration from other counties (figure 4.6). Inconjuction to that, reasons for migaration include: search for employment opportunities and accomodation causing population increase thus the need for supportive components such as employment areas and improved social services (FGD, 2017), this analysis is thus important in the research indicating the existing social interlikages to other regions in Kenya that can be explored for economic gain.

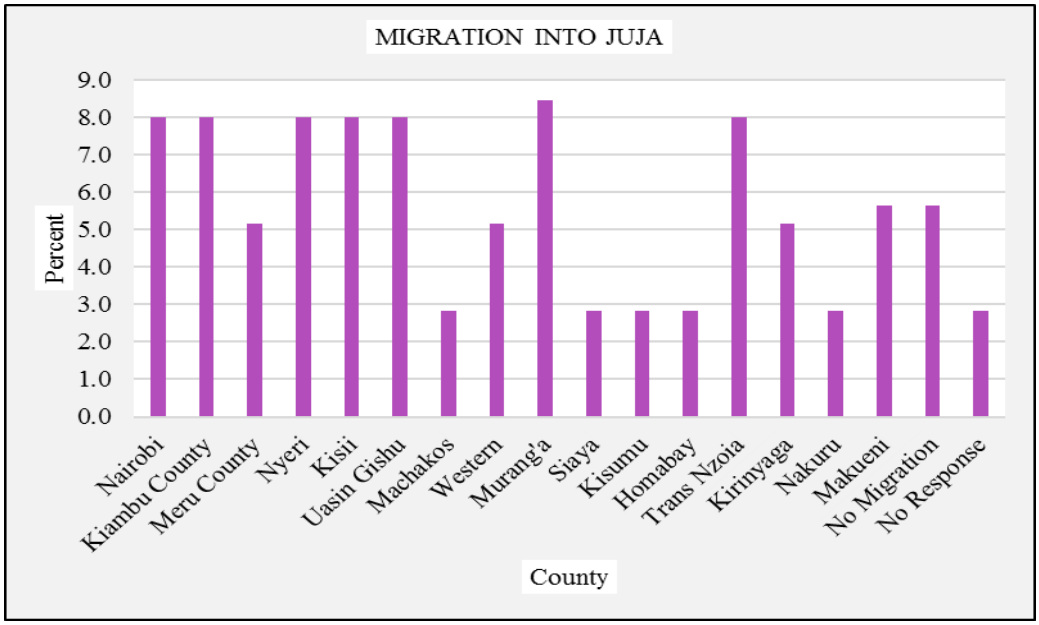


Figure 4.6: Migration Indication

Source: Author 2017

Sources of Energy

The figure below illustrates the sources of energy for domestic use. 60% of the populations in Juja still use charcoal as a source of energy for their households especially for cooking as shown in figure 4.7 below. 25% use KPMG (Gas), 10% electricity, 4% firewood while 6% rely on kerosene.

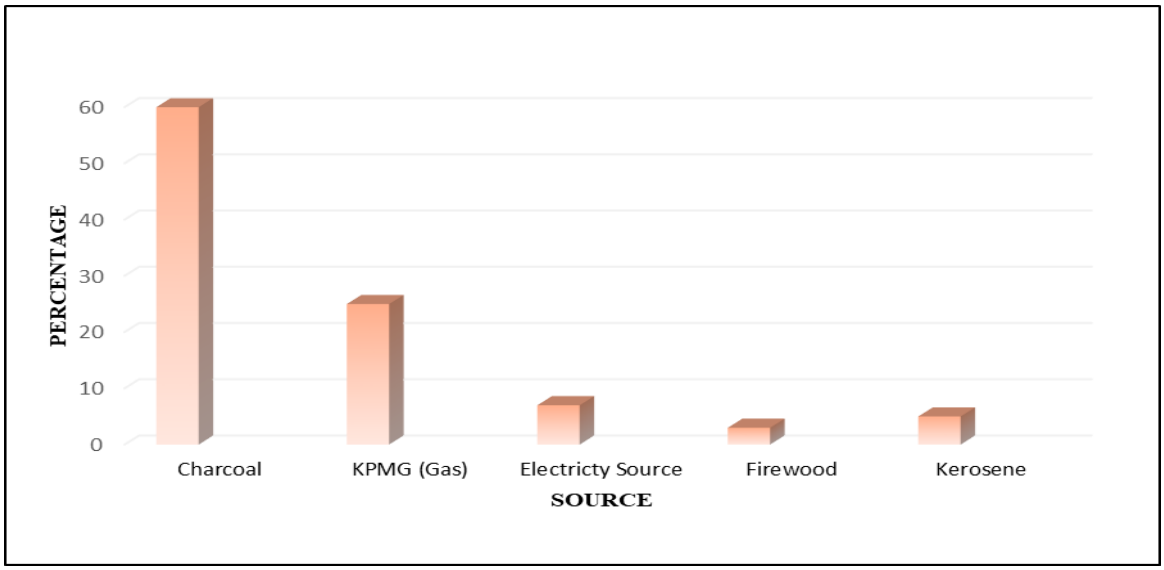


Figure 4.7: Energy Sources for Cooking

Source: Author 2017

The study showed that 95% of the population, use electricity source for lighting. Moreover, 90% of the industries within the study area rely on electricity as their main supply for energy. However, 20% of these industries have diesel powered generators for main power supply as well as for backup in case of power outage. In addition the study indicated use firewood as a source of energy in one of the industries.

4.1.7 Access to Land and Housing

This section details out the housing services and institutional housing. It reviews the different housing typologies and their level of service provision. This analysis is important in determining availability for housing of the industrial workers and their access and safety to the industries.

4.1.8 Housing Typology

Institutions including EABAG Limited started providing housing for its workers, being the pioneers of industrial workers' housing within the study area. As immigration increased into Juja, the demand for housing exceeded its supply and thus the low income earners resorted to construction on informal structures made from affordable building materials such as timber, old iron sheet for walls or polythene bags (Key informant, 2017).

Historically (from the late 1960s-1970s) the identity of Mucatha area which currently proposed as CBD, the monthly rent for one room was at Ksh 20. In Gachororo estate, the rental charge for row housing was at Ksh 300 per month. Recently, the typology has evolved to include bungalows, mansionette, and high-rise apartments for residential buildings as well as hostel development mostly dominated by the private sector.

Plate 4.1: Informal Settlements within the study area.

Source: Author

Plate 4.2: Bungalow and High rise apartments

Source: Author

The picture above in Plate 4. depicts a self-contained two story bungalow and high rise apartments as modern housing within the study area.

Plate 4.3: Depiction of residential neighbourhood in Juja

Source: Author

This picture depicts a gated residential neighborhood, mixed use apartments and a maisonette for the high-end population.

Housing Density.

This section analyzes the different densities of residential developments in order to determine the feasibility of more housing units to respond to the increasing housing demand within the study area and also in determining the type of housing suitable for various zones for housing the industrial workers.

Table 4.1: Main Occupancy on Classified Zones

Zone	Residential Land Use classification	**Main Occupancy**
1	Medium Density Residential	Individual houses bungalow mixed with mansionettes
2	Medium Density Residential	Individual houses bungalow mixed with mansionettes
3	High Density Residential	Rental Residential flats
4	Mixed Development	Rental Residential flats
5	Mixed Development	Rental Residential flats
6	Medium Density Residential	Individual houses bungalow mixed with mansionettes
7	Medium Density Residential	Individual houses bungalow mixed with mansionettes
8	Low Density Residential	Home ownership developments
10	High Density Residential	Mainly hostels with residential flats
12	Medium Density Residential	Individual houses bungalow mixed with mansionettes
13	Low Density Residential	Home developments
14	Low Density Residential	Home developments
15	Medium Density Residential	Individual houses bungalow mixed with mansionettes
16	High Density Residential	Mainly hostels with residential flats
17	Medium Density Residential	Individual houses bungalow mixed with mansionettes
18	High Density Residential	Mainly hostels with rental residential flats
11	High Density Residential	Mainly hostels with rental residential flats
9	Mixed Development	Flats

Source: Author 2017

From the above table, it was established that the high density areas are coupled with temporary accommodation (hostels and rental apartments). Rental units are also mixed-use developments which are not properly planned thus the need for planning in order to conform to the adjacent land uses to open up Juja town for industrial development.

Building Materials

The main materials used for walls, roofs and floors are: stones; iron sheets and roofing tiles; cement screed as well as tiles respectively. Stones for wall construction are readily available within the study area due to quarrying activities. Quarrying as an extraction activity forms the backbone of the construction industry in Juja town as noted earlier in this research (Field Survey, 2017)

Housing Conditions

From the analysis on housing typologies, it was established that most housing units are in good condition, however, houses belonging to sisal and coffee estates for instance the PBCC, are generally old and dilapidated. This is because most of them are over 5 decades old established during the pre-colonial time.

Rental Charges

This analysis establishes the rental distribution among different housing sizes. This forms a basis in determining the affordability of housing unit among different income levels of the population. Table 4.2 illustrates the comparison of household income and rental charges within the study area.

Table 4.2: Housing Rent Analysis

s/no	Dwelling unit	Minimum cost (Kshs)	Maximum cost (Kshs)
1	Single room	2,000/=	3,500/=
2	Double room	4,500/=	5,500/=
3	Bedsitter	5,000/=	10,000/=
4	One bedroom	8,000/=	13,000/=
5	Two bedroom	12,000/=	20,000/=
6	3 Bedroom	15,000/=	25,000/=

Source: Author 2017

Housing Providers

Institutional housing forms the basis of worker's housing programs and initiatives in the study area with JKUAT and PBCC being the major players in this sector. The private sector plays a key role in provision of housing within the study area with real estate agencies being the active key players in the development market. The new and most current development is by real estate companies that comprise of Urithi housing, Juja South, Gakuyo, Karen Court developers among other private agencies. Cooperative societies and Saccos provide loan money to their members for land acquisition and building of homes. On the other hand parastatals play a role in home ownership/renting investment programs through SCR and staff

welfare improvement factors. Therefore, this implies that the town has potential in terms of housing provision for industrial population due to the adequate sources of funding.

Furthermore, the increased demand for housing illustrates the growing population thus justifying the demand for industrial housing. Mixed use development also indicate multiuse of spaces however deliberate planning interventions are required to ensure harmony as well as compatibility (Like separating noisy activities e.g. garages).

Land Ownership

The survey showed that 35% population in the study area own land in Juja town, while 57% of the remainining population aspire to own land in the future (Figure 17). Furthermore, some respondents suggested their preffered land uses activity where, 45.9% preferred land for residential purposes(renting out), 13.5% for commercial, 2.7% for agriculture, 8.1% for home ownership development while 16.2% for commercial and residential (mixed use) purposes. The figure 4.8, below elaborates on the responses.

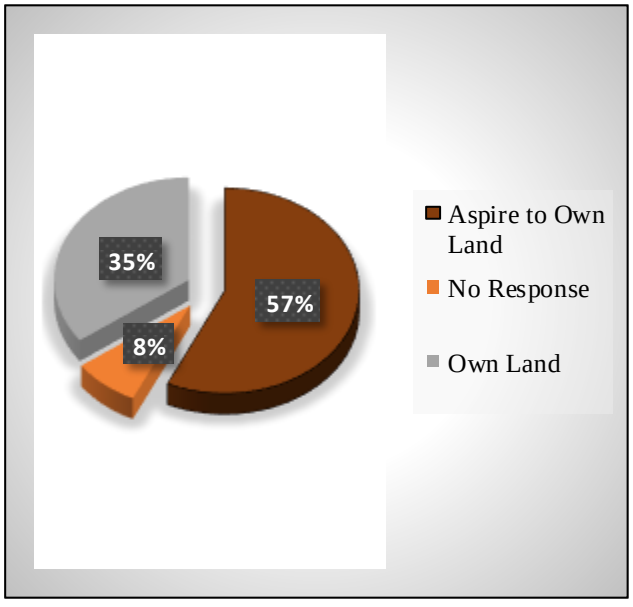


Figure 4.8: Land Ownership

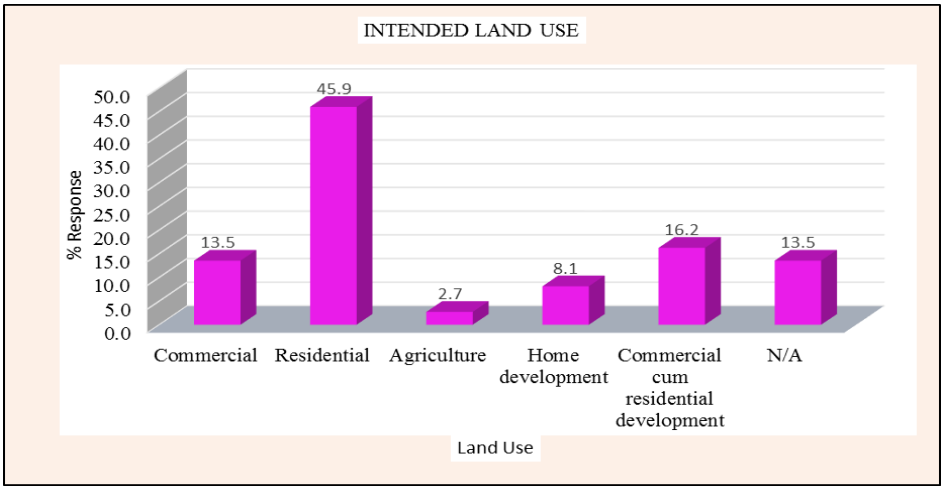


Figure 4.9: Intended Land Uses Source: Author 2017

A section of the population (business owners) had a slightly different approach to the intended use of land they had already acquired or planning to buy: majority (35%) confirmed that they would use them for mixed development whereas a few (5%) had plans for residential flats development as shown figure 4.10 below. Further, understanding about commercial and residential mixed uses, revealed on plans to incorporating income generating units (IGUs) which may reflect to industrial activities or SMEs.

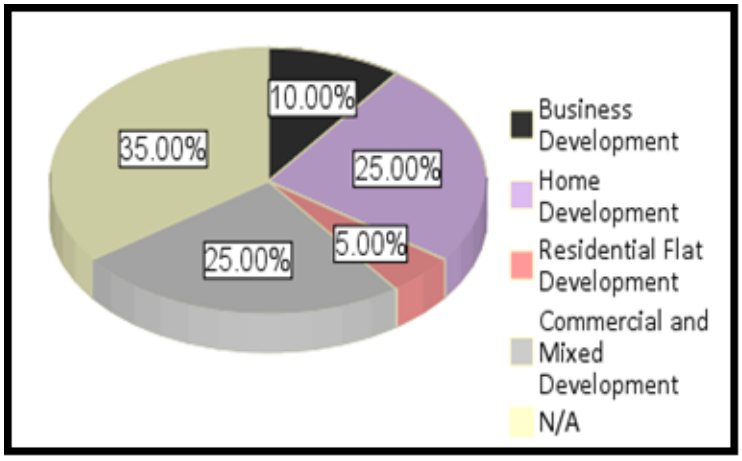


Figure 4.10: Intended Land Use (Business Respondents)

Source: Author 2017

Comments about Nairobi- Thika highway in relation to their business activities, pin pointed to an increased mobility and accessibility coining Juja as a good business place. They further explained how the highway and the town's centrality have enabled them to distribute their innovations consequently promoting trade.

The study revealed that households in most estates do not posses title deeds except in estates like Nkanini, Sawa Sawa.Thus, share certificates are the documents which are dominantly used to allocate the acquired land. Further dicussion at FGDs indicated that land tittles are in big blocks of divisions and processes of titling was underway. The survey did not confirm from the holders of this blocks on the status of land ownership. However, most of the land within the study area are either leasehold or freehold.

The study found out that the private sector own large portions of land in Juja purchased through Sacco societies and through real estate companies. Land is later subdivided by their owner in readiness for selling.

Security

Security is an advantageous quality within Juja's political stability. Within its social setting an opportunity has been created, accommodating almost all tribes in Kenya while defining it as a cosmopolitan town, peaceful with moderate security as shown in figure 4.11, below.

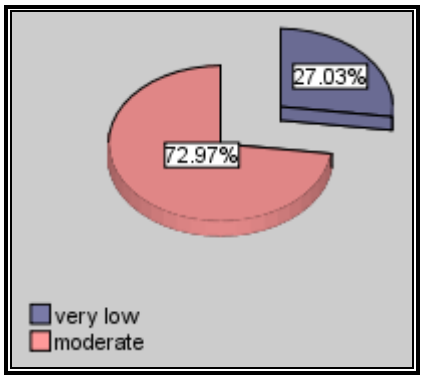


Figure 4.11 : Level of Insecurity

Source: Author 2017

The heterogeneity aspect brought in by the aspect of security may favor industrial activities whereby raw materials can be sourced from other areas in Kenya. The expression of security coupled with migration patterns signifies labor provision and sustainable establishment of the industrial activities.

80% of industries visited use private security to protect their enterprises while 20% rely on public security. Among the main challenges for industrialist was potential insecurity of bushy areas along the main roads especially at lands that are unattended.

4.2 Access to Services

Infrastructure is an important sector considered as an essential lubricant in the development process. Access to infrastructure is an element in planning; coupled with community facilities they form powerful tools in influencing the rate, direction, and type of development.

4.2.1 Roads.

Thika highway is the major road exists in this study area; its influence on the development of the area and change of landscape was visible. This highway covers a total area of 0.526km^2 (52.63 Hectares) within the study area and it extends to link the area with the existing bypasses thus opening up the area to central Kenya and further regions such as Uganda, Tanzania and Ethiopia. Along runs Nairobi-Thika railway line which was dormant when this study was taking place

Other major roads included the Juja-farm road, Juja-Gatundu road and Kenyatta Road. Kenyatta road is tarmacked while Juja-Gatundu road and Juja-farm road were proposed to be tarmacked. The Juja-farm road was proposed to be dual carriage way and projected to link the greater Eastern by-pass thus directly linking the town to Machakos County and the Thika-Garissa highway without passing through the major towns of Nairobi and Thika. A proposal to the upper Gatundu and Ruiru exists and was underway thus more opening of this town. (Juja Sub County physical planner and Transport officer, 2017). The implication is that the town is highly connected.

Other minor access road networks transverse the study area serving the residential zones. Two circuit roads that were under construction during the field study were expected to reduce congestions along the highway and enhance circulation within. This implies that more time will be saved in terms of travel time and traffic thus making Juja town an attractive zone for potential industrial investment.

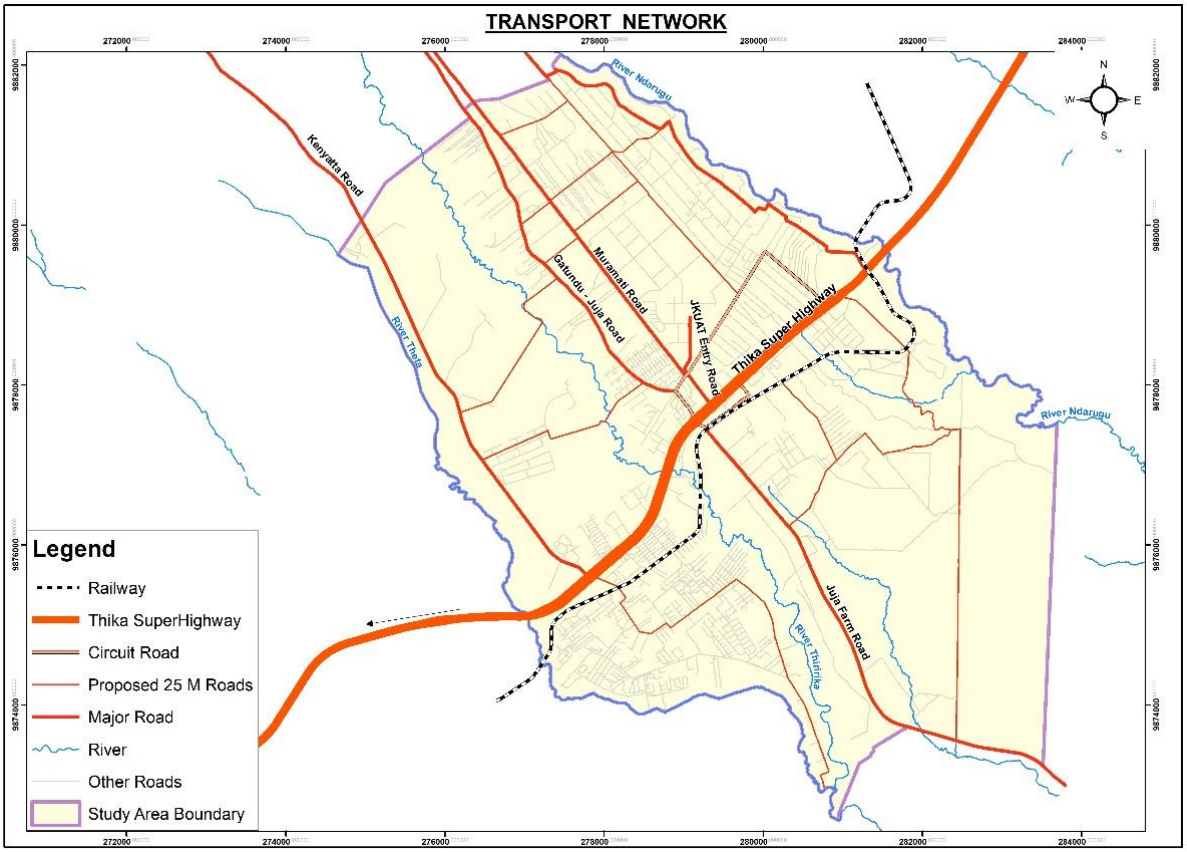


Figure 4.12: Road Map Showing Connectivity

Source: Author 2017

Parking

During the study, minimal space was allocated for PSV thus translating negative impact along the service lanes and causing more congestions and jam throughout the town. Off street parking was provided by a few private entities including Barclays bank, Juja city mall and existing petrol stations, implying public- private partnership (PPP) which can be explored for further support. The on street parking along the major arterials roads was not well designed/specified, but there are plans underway for additional parking spaces.

Perceptions, about Road Network.

The perceptions of the population with regards to road networks indicated high connectivity and accessibility within the residential estates (FGD, 2017). Figure 4.12 indicates the road connectivity levels in the study area are high, evidently with no missing links nor dead ends thus implying that the area is accessible. Accessibility is a key component in industrial development, translating to the potential the study area has for industrialization. The

discussion with the motorbikes association also identified with the high accessibility that has enabled their business to thrive. Figure 4.13, below, show it as a major form of transport within the town.

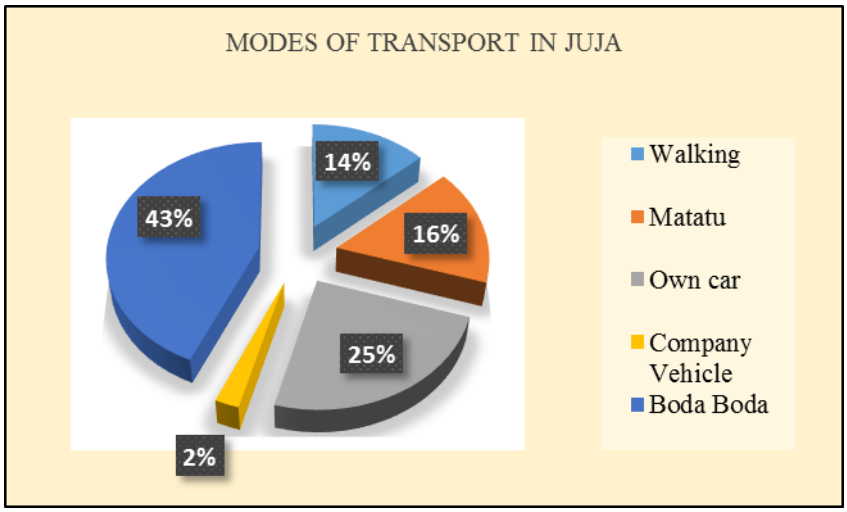


Figure 4.13: Modes of Transport

Source: Author 2017

Challenges Faced within the Road network.

This section explores the challenges faced by the population with regards to the road networks.

Lack of basic utilities like the public sewer networks, poor storm water drainage systems resulted into blockage of natural watercourses; exiting all water into the road especially during rainy season . Discharge of raw sewer into open was also a common trend in the town. The flat terrain topography and the nature of soils contributed to more flooding and consequently high maintenance costs. The population sited flooding as major among other challenges experienced on Juja roads.

Response indicated some roads which were impassable during rainy season to have been improved by the collaboration of the county government and some industrialists as explained earlier in this study. However, heavy trucks on murram roads easily expose them to pot holes. The population also identified conflict on road usage between the motorized and non-motorized transport (FGD, 2017).

The population also identified conflict on road usage between the motorized and non-motorized transport (FGD, 2017).

Furthermore, encroachment on to road reserves within the residential estates have been rampant owing to the fact that most subdivision schemes had not considered the development trends within the study area. In some residential estate provision was 6m wide instead of 9m, with 3.5m and 4m wide access roads. The encroachment of kiosks with on- street parking along the road makes congested increasing road user conflict (Sub County Physical Planner, 2017). The officials of KeNHA indicated that there were concerns of excluding car washes, stores adjacent to the highway and roadside markets as they were associated with increasing congestion along these roads. The KURA informant mentioned the interference on the way-leave, the encroachment of activities such as on storm water channels. Together with minimal consultations by departments mandated in laying infrastructure, conflicting space use is abounding.

The observation made by the researcher confirmed heavy trucks plying along the major roads, the number of private and the on street informal activities, cause congestion more especially when they are approaching the flyover. The informal activities commonly found along these roads include: hawking, selling of groceries, pulling of hand carts as well as public gathering among others.

Plate 4. 4: Trucks along the Juja- Gatundu road

Source: Field Survey 2017

The sub county physical planner provided insights of hope in planning. This is through involvement of developers, the community, various experts and the two levels of government. On the other hand the coordination between KURA, KeNHA and police department is on the positive trend of controlling the traffic jam experienced in the town.

The study's key informants identified with a strategy to utilize the growth and centrality of the town as well as by-passes along the highway for direct transport to other counties. While, focused group discussions (FGDs) also emphasized more on coordination in planning and appreciated the growth of industrial activities relating it to opening up of employment opportunities. This implies that with a proper governance and management structure, Juja town will thrive to achieve potential in industrialization and also create employment opportunities for the area and the region.

Plate 4.5: Focused Group Discussion with Matatu Operators

Source: Field Survey 2017

Table 4 2: Other challenges Experienced on Juja Roads.

Challenges faced on the roads		Responses	
		No	Percent
	Narrow roads	20	14.5%
	Poor connection to highway	15	9.4%
	Traffic congestion	29	13.8%
	Lack of street lights	10	7.2%
	Flooding	44	18.8%
	Dumping of raw sewerage	20	12.3%
Total		138	100.0%

Source: Author 2017

4.2.2 Water Supply and Sewerage

This section analyzes the major sources of water within the town, the sewer infrastructural provisions and how this affects the development of the town. This analysis is deemed crucial as it aims to find out the sufficiency/insufficiency of water supply and sewerage as major contributors to industrial development.

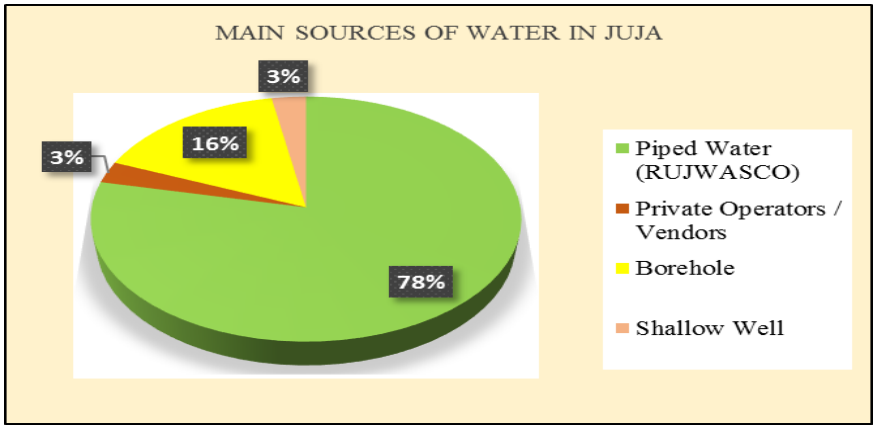


Figure 4.14: The main Source of water.

Source: Author 2017

From the field survey, it was established that 78% of the population is connected to piped water supply system provided by Ruiru-Juja water and Sewerage Company. The nearby Ndarugu River is the source of domestic water supply in Juja town, however with supplements from other sources. The Ruiru and Juja water and sewerage company (RUJWASCO) is responsible for the management of the infrastructure. Other sources of water within the town include: boreholes (16%) and shallow wells (3%). Ownership of these boreholes is majorly by the institutions around the town including JKUAT but recently the private sectors have started engaging in drilling more boreholes. (Field Survey, 2017)


A


B


C

This picture (A) illustrates the drilling of bore-hole by an individual developer, confirming the source as an alternative to the RUJWASCO source. While B, C and D are free water points provided as CSR by some developers


D

Plate 4.6: Drilling of boreholes in the study area

Source: Field Survey 2017

This picture illustrates water vending within Juja town as another source of water. This sector has been commercialized by private individuals who mainly source piped water and sell it to commercial enterprises. Mode of transport for sale of this water is by motorbikes. (Observation guide, 2017)

Plate 4.7: Water Vending

Source: Author 2017

4.2.3 Sewerage

With non-existence of the public sewer the mode of wastewater/sewage disposal in the town has remained as pit latrines, septic tanks and compost pits among others. (CIDP, 2013).The

management identified with challenges pertaining this method of sewerage disposal, with overflow from septic tanks, pit latrines and compost pits being key and is a threat to all modes of water supply and health generally, this is due to lack of drainage channels, flat terrain, poor draining soils, high water table. The high- rise residential development which influences the drilling of soak pits and septic tanks due to population demand for sewer infrastructure increases penetration of water into shallow wells as well as threat to the aquifers. (RUJWASCO, 2017)

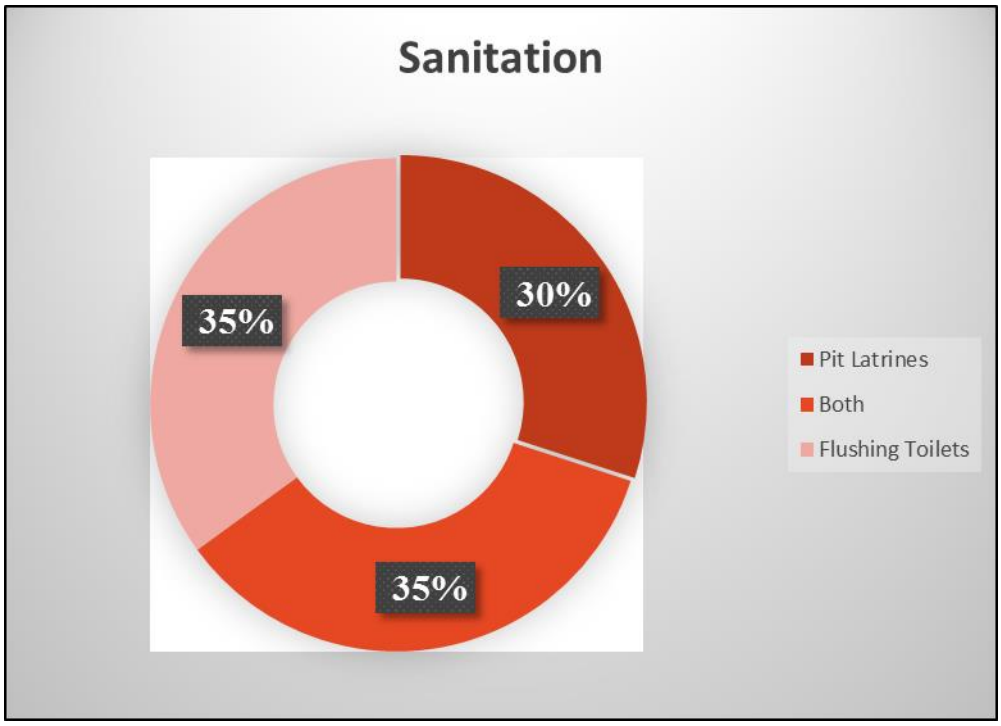


Figure 4.15: Sewer facility used by the population

Source: Author 2017

From the graph above, 35% of the population use flushing toilet system as a method of wastewater disposal while 30% of the population use pit latrines. Part of the population (35%) rely on both systems. As indicated above, 78% of the residents have access to piped water system and thus the preffered mode of waste disposal is the flush toilet systems but it is not accompanied with reliable sewer system. (Field Survey, 2018)

Plate 4.8: Latrines as a Method of Sewer Provision

Source: Author 2017

The picture above illustrates pit latrine as a method of wastewater disposal for 30% of the population within Juja town.

The sketch, on figure 4.16 (A&B) below, shows, common housing floor plan. The ground plan is an example of arrangements of excavations like septic tanks, building wall positions. While the section indicates critical points that may allow the mixing of ground water and sewer. However, there are plans formulated to update the water piping systems as was confirmed by the RUJWASCO officials and therefore a water adequate town for industrial growth.

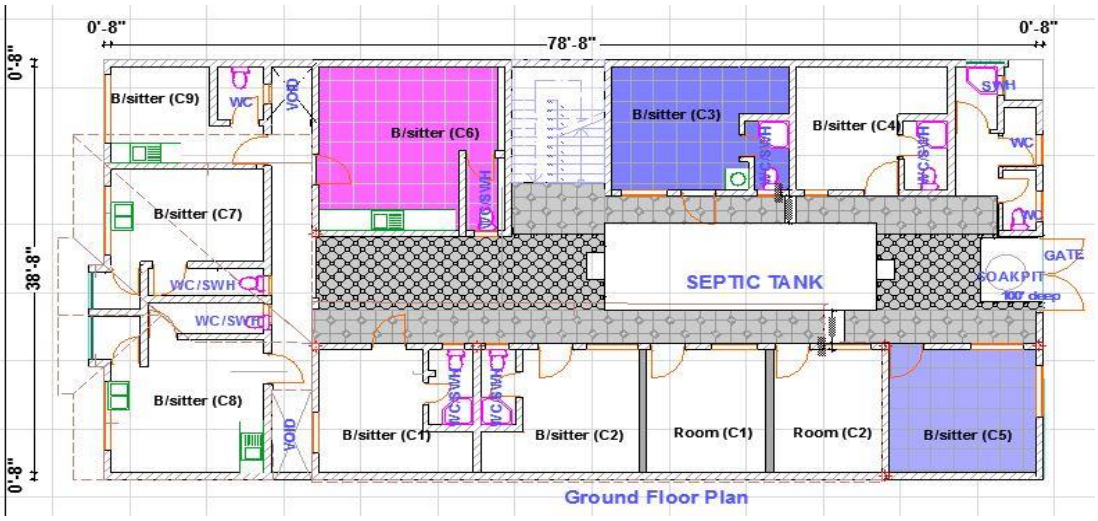


Figure 4.16A: Floor Plan Sketch to Show Septic Points and Walling

Source: Author 2017

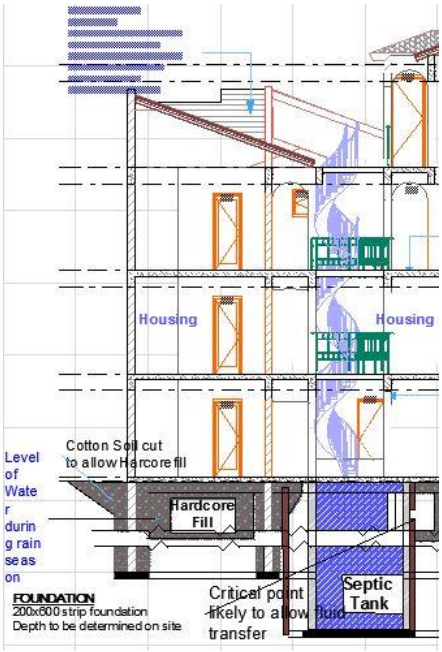


Figure 4.16B: Sketch on Critical Indications of House Foundations and Septic Tanks in the Study Area

Source: Author 2017

On the other hand action by relevant authorities, with support of World Bank has generated positive response the systems of sewerage provision is underway with the main trunk in place. This is in support to high population growth and migration that has caused expansion of the town thus a demand for provision of adequate sewerage service.

4.2.4 Community Services.

This section details out the support components of industrialization in terms of social infrastructure – schools, health centers, recreational, community halls and housing. These facilities help in fulfilling the work-play-live concept for successful industrial towns.

4.2.5 Health Services

The study aimed to establish the health aspect of town in terms of existing health facilities, their accessibility, their adequacy and the affordability of the health services. A healthy community means a working community which is important in examining the potential of industrial growth of the town.

Health Facilities.

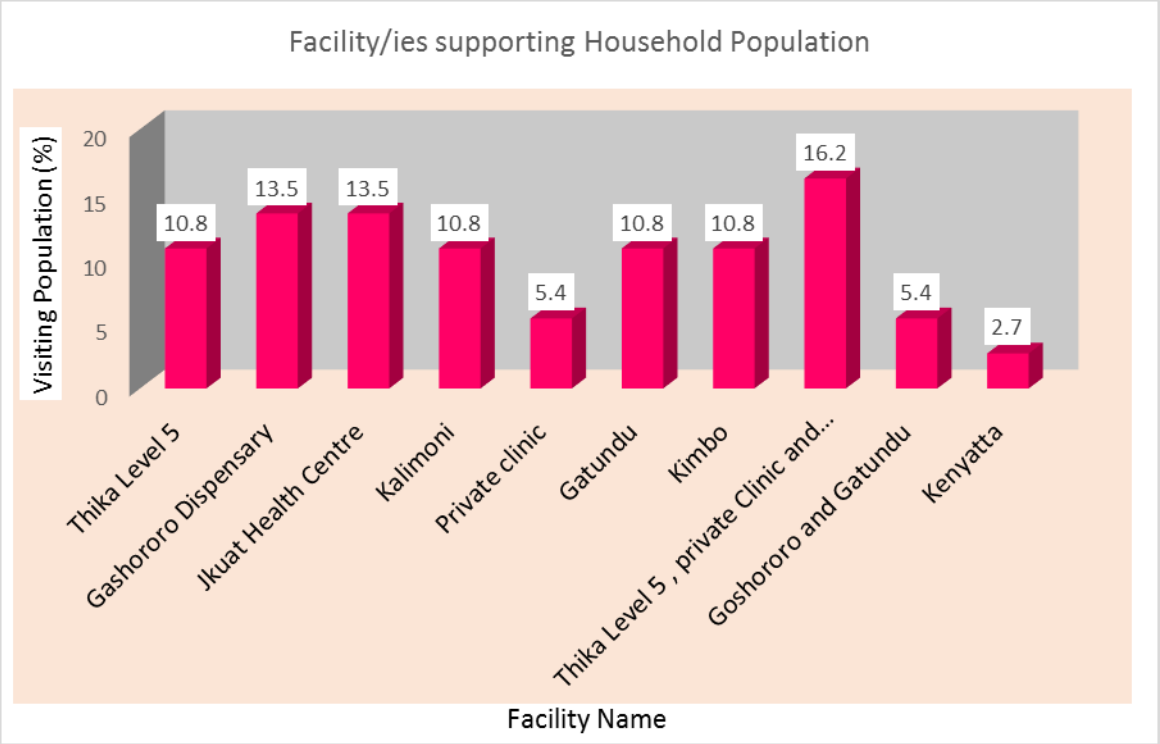


Figure 4.17: The Health Facilities Accessed by the Population

Source: Author 2017

There are three main health facilities within the study area: JKUAT hospital (13.5%), a private hospital with limited public access, Gachororo dispensary a public hospital (13.5%) and Kalimoni missionary dispensary (10.8%) providing healthcare services within Juja town.

There are several private clinics and one health laboratory (Agha Khan Lab). These health facilities are to serve 78.01% of the study area based on the maximum distance a person has to travel to access health services (as shown in figure 4.4,below) and 21.99% of the study area to remain underserved. However this is not the case: (i) In specific the JKUAT possess limited accessibility due to issues related to cost as well as, it is a department within the university while its primary purpose is to provide medical services for students and staff members, but it extends services to the community with growing population which demand for more services that have not been achieved. (Chief Medical Officer, 2017)

Table 4.3: JKUAT Private Patients Recorded in the Years: 2009- 2013

	2009	**2010**	**2011**	**2012**	**2013**	**Totals**	**Perc.**
New Attendance	1931	1972	2227	2542	2679	11351	**63%**
Revisits	848	1127	1403	1710	2004	7092	**37%**
Totals	**2779**	**3099**	**3630**	**4252**	**4683**	**18443**	**100%**
Percentages	**15%**	**17%**	**20%**	**23%**	**26%**	**100%**	

Source: JKUAT Hospital 2017

According to recommendations made by WHO on doctor to population of 1:1000, the JKUAT facility services are overstretched with only 4 doctors serving the university population and the local community. The Chief Medical Officer clarified that the situation sometimes becomes worse especially during high seasons when students are on session or in case of nearby accident occurrence (The accidents originate from the road as well as the building sites and with more commercial and industrial activities it is projected to handle more emergencies).

Furthermore, essential services like the theatre and maternity are not provided for and therefore patients are referred to Thika level five and Kenyatta national hospital in most times and recently *Kalimoni hospital.*

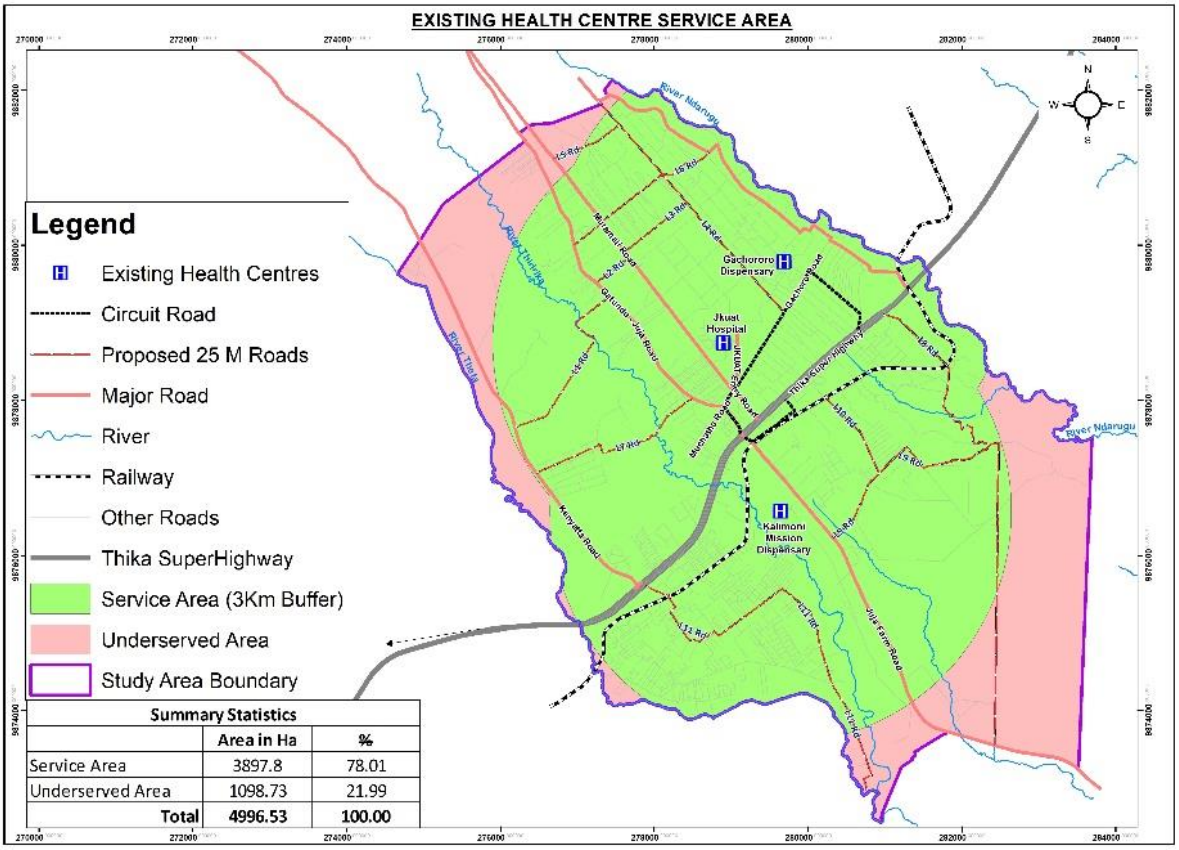


Figure 4.18 The area Coverage for the 3 Health Facilities.Source: Author 2017.

From the map above the 3 hospitals services approximately 78% of the study area. Approximately 22% is undeserved. More health facility proposals should fill the gap. Furthermore, (figure 4.18) clearly analyses to show the limitation of this public good, the North-West part is well served with Gachororo dispensary, whereas the Eastern and Southern parts remain underserved.

Other challenges as sited by the population include inadequacies and expensive provision of health services. Table 4.4 summarizes the responses on the challenges the population goes through whenever they access health services in the study area.

Table 4.4 : Challenges Facing the Provision of Healthcare Services

Health Provision Challenges	Responses	
	No	Percent
Expensive services	20	16.3%
In adequate services	23	18.7%
Inadequate drugs	20	16.3%
Poor services	13	10.6%
Transport	20	16.3%
Inadequate specialized services	27	22.0%
Total	123	100.0%

Source: Field Work 2017

In summary there is low quality of health services. However, the physical handbook provides alternative ways to render economical, geographical and social accessibility. Church missions, industrial units and private institutions may improve the services but it may benefit a portion of population (rich). Therefore, public facilities are required for the entire population. Hence, government collaborations with the above named units can provide an immediate solution.

Along term solution should be a public facility conveniently located, compatible with adjacent uses. Aspects of connectivity, land availability, central location (instead of placing it to the peripheries) should be considered. Therefore the research recommends level 4 hospital for highly specialized treatment {at Zone 2_8} to serve the region.

This is supported by threshold levels created by high population levels in the study area and the attraction (from outside the study area) that may be created by the advanced services. Minimum land requirements for different levels are made as:

Table 4.5: Minimum Land Requirements for Different Levels of Hospitals

National Referral hospital	**20ha**
Provincial hospital	8ha
District hospital	8ha
Sub- District hospital	4 ha
Health centre	3ha
Sub Health centre	2ha
Nursing Home	0.4ha
Veterinary Clinic	0.1ha

Source: Physical Planning Handbook.

The Market.

According to the research there was only one market located along Gachororo road opposite Kenya commercial bank (KCB). The market contained no permanent stalls and selling was conducted in open air, however, market leaders confirmed the county's plans of putting up sheds. A total of 500 traders visited the market daily, and engaged in selling only household consumable goods. Tax rates ranged from twenty shilling to one hundred shillings per trader, raising a revenue of 10,000/= as minimum to an average of 15,000/=per day. Some selling pockets exist within high density residential zones (map in figure 4.20) with make shift shades. Based on the location they cannot offer high end goods. Buyers and sellers come from within and without the study area. The access roads are narrow ranging between 4.5 to 5m wide. The table 4.7 below shows the supply chain of some consumable goods sold within these markets.

Table 4.6: Supply Chain of Consumable Goods in the Market

Item	Main location(s) of origin (within Kenya)	Other sources (within Kenya)	Sources from outside Kenya
Avocado	Kisii, Meru, Nyeri	Kiambu	
Bananas (for cooking)	Kisii, Muranga	Meru	
Banana(for Ripening)	Muranga, Kirinyaga, Meru		
Pumpkins	Kangundo	Kiambu,Kirinyaga, Embu	
Cereals	Stores in Juja town		Uganda,Tanzania
Water melon	Kangundo, Kirinyaga,	Meru, Muranga	
Vegetables	Juja Farm, Kinale, Magumu (Kiambu &Nyandarua)		
Sweet Potatoes	Kisii, Kirinyaga	Gatundu	
Onions	Central, and eastern Kenya		

Source: Author 2017

Major suppliers to the market were mainly from outside the town while suppliers from within the town outsourced their goods from all over Kenya. According to the respondents the market suffer from a number of challenge which include: narrow roads serving the market, lack of packing space, poor facilities such as storm water drainage, sanitary conditions and shades.

Plate 4. 9: Some Activities in the Market

Source: Author 2017

Religious Services.

A range of churches are found within the study area. They included St Augustine Catholic Church, St Mathews ACK, SDA Juja, the SDA Kenyatta road, AIC Kenyatta road, Kalimoni parish. Most facilities were on land sizes of hardly one acre but within reach of sampled population. Expansion of church grounds through amalgamation was witnessed. Consultative and integrated planning may enrich the spaces to include industrial activities.

Education Service.

This section reviews the existing education facilities within the study area. It details out the ECD centers, Primary Schools, Secondary Schools and Tertiary Institutions. This analysis is important in determining the adequacy/inadequacy of these facilities thus important in planning of industrial towns.

I) Earlier Childhood Education (ECDs).

ECD centers within the study area can be categorized as either public or private. Even though non- governmental organizations such as religious institutions have come in to provide ECD programmes in schools, the service provision level remains law. An interview with the sub County ECD coordinator noted over enrolment of public ECD schools especially those within the high density areas. This indicates that high-dependency ratio within the study area is high thus the need to create more employment opportunities and level up the provision level of ECD centers to match the population demand.

II) Primary Education

In the study area there, were 8 public primary schools namely: Jomo Kenyatta academy, Gashororo, Thiririka, Kigwe, and St Pauls, Kibii, Kalimoni and Muiga-Inn. Due to high

enrolments (table 4.8) especially in also in high density areas, the physical and social infrastructure of these schools remain poor, this indicates poor governance and lack of political goodwill to support educational infrastructure.

Table 4.7 : Enrolment Levels in Public Primary in Juja Town

s/no	Pr.School	Enrolment	Location	Remarks
1	Thiririka	Over1000	South-East part of the highway(Within PBCC) {Kalimoni sub location}	
2	Gachororo	1700	North-East part (in Gachororo estate)	
3	St. Pauls	900	Northern part (Kiaora)	
4	Kibii	400	Northwest (Mirimaini)	
5	Kalimoni	-	South (Kalimoni mission)	
6	Muiga-Inn	250	Southwest(Kalimoni)	A new school (up to class 4)
7	Kigwe	400	To the south(Kalimoni)	
8	Jomo Kenyatta Academy,			

Source: Sub-County Education Office, 2017

During the field study visit it was evident that the playground Gachororo primary is utilized by a multiplicity of user, such as to Gachororo secondary school, Private schools, and as a public playground. This is positive as it meets the principal of dual access.

Table 4.9 below shows the enrolment trend in the same school since 2004.

Table 4.8: Enrolment Trend at Gachororo Primary from 2004.

S/no	Year	Enrolment	% increase
1	2004	650	0
2	2007	780	20%
3	2010	1206	41%
4	2013	1408	17%
5	2016	1512	7%
6	2017	1700	14%

Source: Gachororo Primary 2017

The highway expansion raised the demand for education, an implication of the same was seen in the high establishment of private schools as confirmed by the Sub-County education director. This in turn increases accessibility to education at this level.

The study looked at various classes of private schools to further reveal accessibility in terms of affordability and availability of choices. Table 4.10 below confirms the approximate figure at defined class.

Table 4.9: Fee Variations for Various Class of Schools.

S/no	Class	Appx. cost/term (Kshs)	Appx.Total/Yr. (Kshs)
1	High cost	50,000	150,000
2	Medium cost	15,000-20,000	45,000-60,000
3	Low cost	5,000	15,000

Source: Author 2017

Private schools mostly operated on small size of land but they are advised to use high level building in order to create open spaces for both air circulation and play grounds. On the other hand, high-end private schools including the preparatory schools were in possession of expansive open grounds and facilities like swimming pools that are open to other schools at a subsidized fee. Support to facilitation of transport services to other schools was readily available in provision of prior agreements (Sub County Planner, 2017). This too implies the principle of dual access working in this town as well as private public partnership.

III) Secondary Education Facilities

Three public secondary schools exist in the study area (Gachororo, Thiririka and Theta). Gachororo secondary located in Kiaora sub location within Gachororo, a high density estate. While Gachororo is towards the North of the highway, Thiririka is directly located in the opposite side of the same highway. Theta Secondary school is to the south west about 3km from the highway. As noted in terms of infrastructure in public schools, the Sub County Education Coordinator noted the existence of public schools as an assurance of large number attaining tis level of education. There is thus need for continued improvement of the institutions in order to provide quality education for vocational training in industrialization.

IV) Tertiary Services

The local community is serviced by universities in different parts of the country. However JKUAT, located within the study area offers not only research and learning services but extra curriculum services such as parks. (Field Survey, 2017). This analysis is important as it translates to the availability of a research institute to carry out the potential industrialization of the study area.

4.3 Land Use/Settlement Patterns in Juja

4.3.1 Historical development of Juja Town

Juja area originated as an agricultural zone found in the colonial Kiambu district. The main agricultural activities were coffee and sisal growing; whereby sisal supported the, Kalimoni sisal Factory (topo map, on figure 4.19) later on Ea.-bag sisal company now premier bag and cordage.

Plate 4. 10: The Settlements at Sisal Factory (Premier Bag and Cordage Company)

Source: Author 2017

Agriculture and manufacturing necessitated settlement activities, evidently by the workers within the sisal factory. Over the years other important economic activities evolved, they include horticulture and stone quarrying (that started in earlier 1990s) that have contributed to further attraction of population in support of the activities. In earlier 1980s, JKCAT an agricultural constituent college to Kenyatta University was started. The college transformed to a full-fledged university in earlier 1990s. This development significantly transformed the social economic spatial land use in Juja in a number of ways: residential and commercial developments; new developments such as hostel housing, inertia.

The Nairobi metropolitan expansion created more opportunities (especially residential), and disintegrated the existing physical landscapes, with subdivision of vast lands as population increased as well as by the successful completion of the Thika Super Highway.

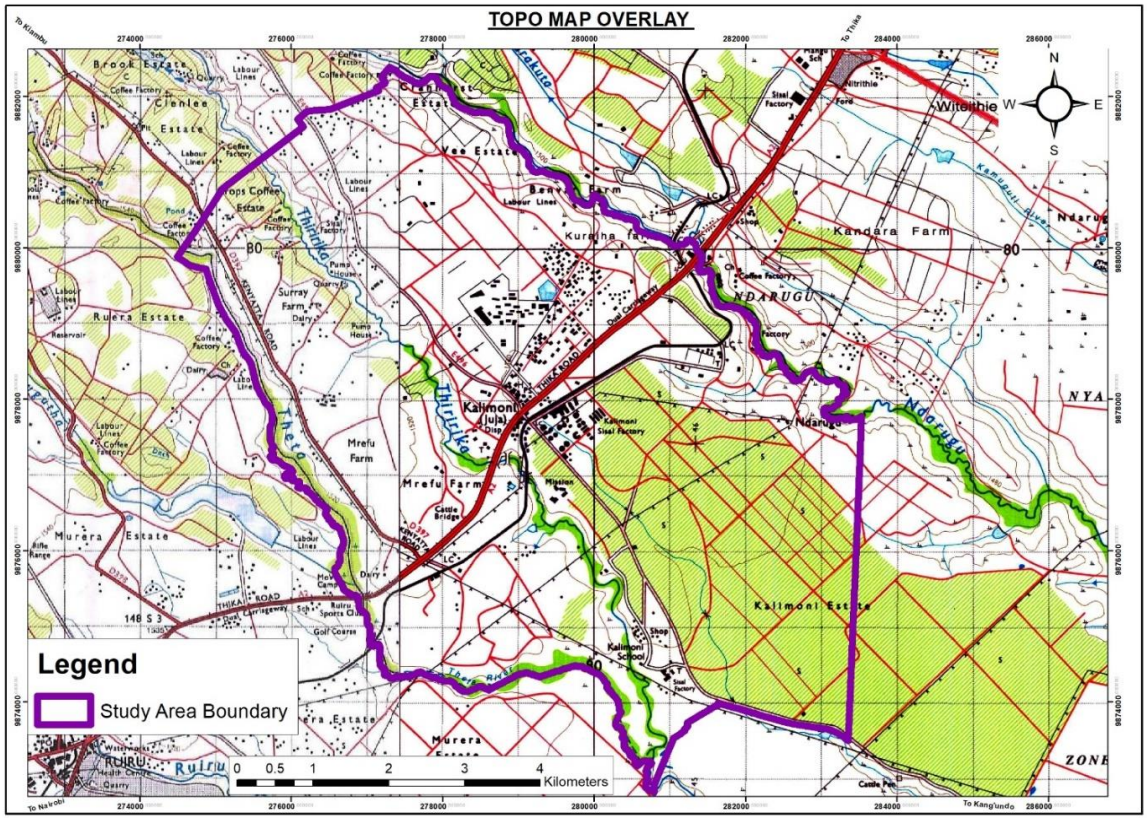


Figure 4.19 Topo Sheet Map at a Period the Study Area was Under Agriculture
Source: Survey of Kenya as Modified by Author 2017

Land uses existing within this study area include: residential, commercial, educational, recreational, public purpose, public utilities and transportation.

i.) **Commercial Use**

Apart from the industrial activities Juja town supports the significant commercial activities. It serves as a financial centre for residents and it is a home to Cooperative, Equity and Unaitas banks categorized as large financial institutions, as well as Barclays and KCB which are at medium level (Key informants). Hyper to medium supermarkets are within these town, where, Tusker mattresses serves as the hyper and Patrick Ndichu & Sons –Mega; Eco Matt and Prize worthy as medium. Petrol stations as well various categories of stores are also supporting the services.

Hotels as lodging and eating places as well as security companies build up the service provision. There are significant number of medium to small retail traders offering a variety of goods and services notably East Africa and cereals. In the recent times IT related business has

become part of trade in the town. This implies the town is meeting its basic requirements in terms of goods and services. It is also an indication of technology advancing aspects.The proposed CBD comprise mixed developments, while other developments are along both sides of the major transport corridor (the highway) with more activities and expansion towards the northern side. Strong commercial hubs are emerging in most of the high density residential areas and along arterial roads as well the highway: Gachororo; Mung'etho; Kenyatta road; High point.

Informal business was taking place along: Juja-Gatundu road; the highway (mostly at specific points like the flyover, underpass at Kenyatta road and High point). This form of activities engaged a substantial proportion of business ranging from second hand clothes (mitumba) dealers, vegetable and fruit hawkers, drinking water hawkers, shoe shiners, steel and carpentry related producers among others. The sector has played a role in providing employment contributing to self-employment in Juja. Part of which are directly industrial activity (examples are, carpentry, metal fabrication). This is an important trend that may support industrial growth, if their dynamics are understood and they are encouraged to formalize.

Plate 4. 11 (A & B): Informal Business at the Flyover and Underpass at Kenyatta road

Source: Author 2017

ii). **Residential Use**

Residential activities form the most dominant land use, at approximately 70% of total land in the study area (table 4.11). The study area depicts linear and ribbon as well as nucleated development patterns for settlements. Linear pattern originates along, Thika highway, Gatundu road, the Railway line and Juja farm road as it grows outwards. Some clustering also occur next to JKUAT university particularly where hostel development occur, however they are also spreading along the available road networks. Lack of physical development plan to guide development has led to haphazard development in the area. Some of the flats are used for mixed uses with commercial units on the ground floor and residential on the other floor.

Land for residential exists in subdivisions of sizes ranging from less than an $1/8^{th}$ acre plot (40x60 and 40x80);1/4 an acre,1/2 acre to more than 50acre land. Some portions of the subdivided land are undeveloped and form part of the speculation development in the study area (Field study 2017)

iii.) Educational facilities

This is the third major land use with large tracts of land such as the university of JKUAT, the preparatory group of schools the agri-technical training school, Gachororo and Juja schools. Within the residential neighbourhoods a number of private pre-primary and primary schools exist. This implies ready supply of this basic service to support the population who will eventually contribute to industrial growth through labour and technology supply

IV.) Recreational facilities

There exists a number of recreational facilities. They are found within institutions like JKUAT the Juja preparatory school. Gardens provided by private entities, however business oriented, they contribute to some percentage of recreational/open space land use. There are also various social and entertainment spaces located in various buildings. They are part fulfilling the work-play-live concept for successful industrial towns. Additionally open spaces play a role of enhancing the environmental healthy as they are termed as breathing portion of an urban area. Generally the aspects are a response to new paradigms in planning that are responding to concepts like workable cities and green areas.

V.)Transportation land use

The transportation land use is represented by the road networks and railway line. Further discussion is as in part 4.2.1.

During the research, the land uses identified were mapped and classified into zones which were coded as per land use as detailed a map in figure 4.20 below. A summary of the land uses and their sizes are shown in the table 4.11 below.

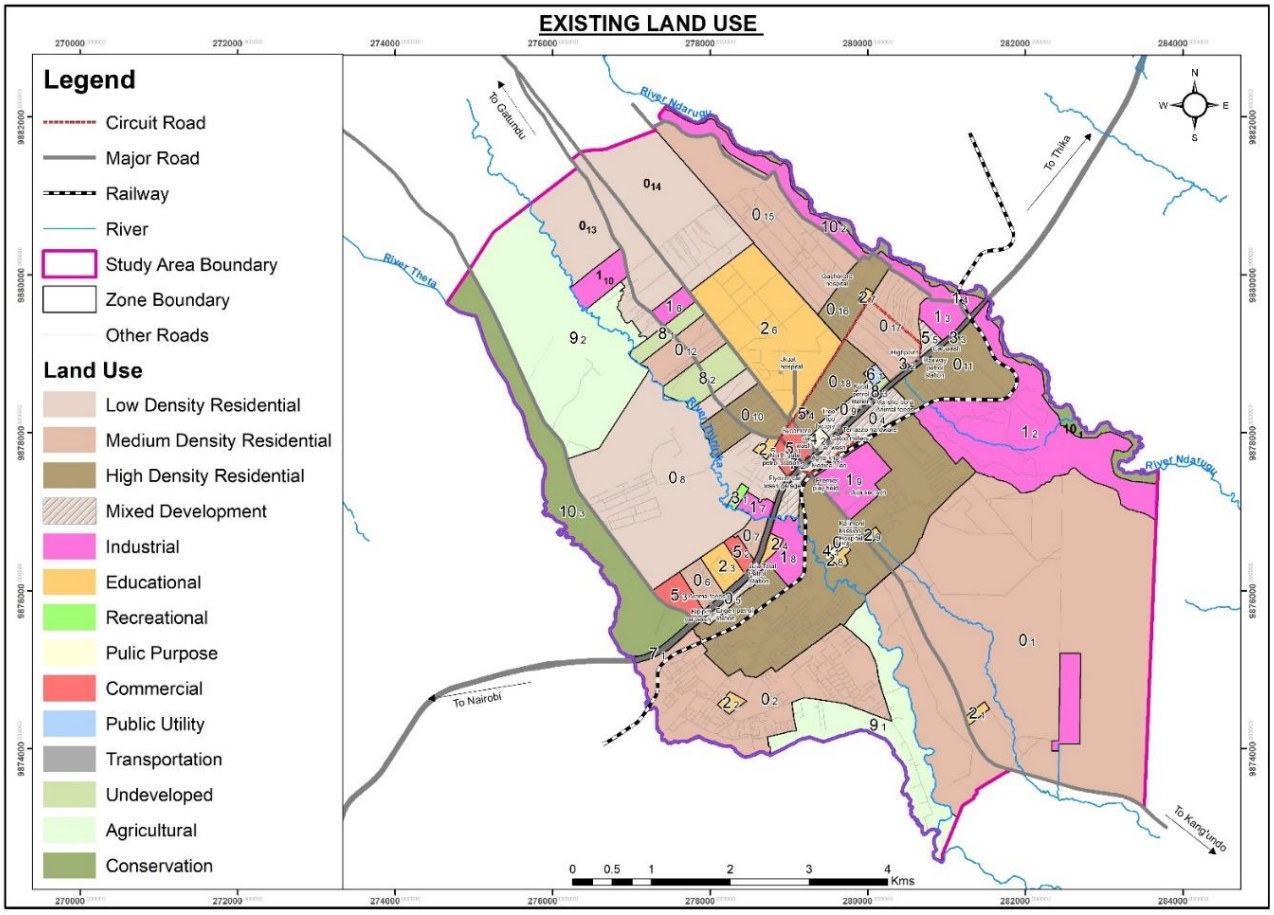


Figure 4.20: Existing Land Use Map (Also on Appendix-VII)

Source: Author 2017

The map above illustrates various existing land uses within the study area.

Table 4.11: Existing Land Use Summary

Land Use Summary			
Land Use	**Type**	**Area in Acres**	**%**
Residential	**Low Density Residential (2752.47 Acres)**	**8976.18**	**72.6**
	Medium Density Residential (4518.02 Acres))		
	High Density Residential (1500.89 Acres)		
	Mixed Development (204.8 Acres)		
Industrial		**1238.12**	**10.0**
Educational		**621.78**	**5.0**
Recreational		**10.77**	**0.1**
Public Purpose		**15.32**	**0.1**
Commercial		**117.98**	**1.0**
Public Utility		**14.32**	**0.1**
Transportation		**113.71**	**0.9**
Agricultural		**593.66**	**4.8**
Conservation		**662.57**	**5.4**
Total		**12364.41**	**100.0**

Source: Field Survey 2017

As noted earlier in this research residential land use has the largest share among the land uses with a significant total of 70% of the total land use. Industrial land use comes in second with 10%, showing potential growth. Therefore this means for industrial growth to take place, planning guidelines for development control should play its role to safeguard the existing industrial land; to encourage densification and provide more land to industry development**.**

In addition to that, according to the key informant, there exists cartographic maps that depict mainly huge parcels without details of subdivision as it was not possible to have detailed

subdivisions. However, based on the field survey the research made the following assumptions:

That the land buying companies continue buying chunks of land, thus an evidence of expansive land in Juja; that the same companies own land that is not yet developed. Advertisement posters (Plots on sale) and interviews (Key informants) confirmed the facts: that like the wider Kiambu County, Juja is threatened by suburbanization and land is highly subdivided. Most of the land in Juja is not agriculturally productive therefore industrial activities can be encouraged (Key informants, 2017). Earlier in this research study, the HHs confirmed ownership of plots of land whose sizes range from a $1/8^{th}$, 1(one) acre and 5 acre plots and citing that not all have been developed. Therefore, this creates an opportunity for amalgamation for planning for industrial activities.

4.4 Existing Industrial Trends in Juja town,

As indicated earlier in this research work, Juja town evolved from a center known for the growing of sisal and the development of East Africa Bag and Cordage Company (EABC). However, over the years the company holds the second major share of but industrial land in Juja as shown in map of figure 4.20; appendix VII. In addition, Close to thirty five (35) other large and medium size industries are found in Juja as table 4.12 shows below.

Table 4.12: Existing Industrial Activities in the Study Area

Size	Name	Location
Large	1. Premier bags & cordage LTD	Kalimoni
	2. Stone Mining (Quarrying)	
	3. KPP	
	4. Safari Stationary (K)	Mirima-ini
	5. Shengli Engineering & Construction	
	6. Star Plastic LTD	
	7. Penta Tancom LTD	Kiaora
	8. Stone Mining (Quarrying)	
Medium	1. Classic Food LTD	Kalimoni
	2. Mona Plastics	
	3. Gatico Millers	
	4. Space and Style LTD (proposed)	
	5. Ava. Chem LTD	
	6. Aroma Feed Suppliers	
	7. Basil Drilling Company	
	8. Rock World Engineering & Construction	Mirima-ini
	9. Finshaw Motor Cycle	
	10. Supreme Poly Pack (K) LTD	
	11. Wax Bury LTD	
	12. Mololine Furniture	
	13. K – West Milles	
	14. JKUAT Industrial Park	
	15. Juja Pulp & Paper LTD	
	16. First Class Bags	
	17. Penta Flower Farm	
	18. JKUAT Nissin Food LTD	Kiaora
	19. Hermon Enterprise	Not Defined
Small	1. Terrazzo Dealers	Kiaora
	2. Concrete Art Solutions	Kalimoni
	3. Parkhouse Springs	
Not Defined	1. Wazito Company LTD	Mirima-ini
	2. Casa Umoja ELECTRO Enterprise	
	3. Samkambu Electricals Services	
	4. Giant Handcraft	Kiaora
	5. Juja (proposed) Industrial Parks	
	6. Joywatt Trader	Not Defined
	7. Tertally Limited	
	8. Home Light Electricals	
	9. Lima Quality Meals	Kalimoni
	10. Malisho Imara	
Proposed	1. Silver Coin Go-downs (6 companies had rented 6 out of 62 total number go downs	Mirima-ini
	2. Cura Complex	

Source: Kiambu County Trade Office as Modified by Author 2017

The study shows horticultural as a major economic activity represented by companies such as KPP, JKUATESS and Penta Tancom.

I. Light industries as well jua kali (though informal) are also forming part of new developments. The proposals on spatial areas indicated by construction of Go-downs and sign posts indicate a potential attraction.

Plate 4.12: Proposed Go Downs Source: Field Survey 2017

Jua kali enterprises exist within the estate and, along specific major roads and the highway. They include welding, metal fabrication, motor vehicle repairs, timber yards and workshops. Accessing to these activities increases the challenges of road flow because of abrupt and several junctions with large vehicles plus minimal packing space. Metal fabrication is intensely undertaken within the estates leading to the production of steel doors and windows. It is worthy to note that it is a source of livelihood thus careful allocation is a requirement that can sustainably enable flowing of the town.

Plate 4 13: Metal fabrication at Sawasawa Estate Source: Field Survey 2017

Plans to contain the enterprises within a block of land are underway as the county government had started to negotiate with developers in order to acquire common spaces. The plans will increase competitiveness and decrease congestions due to unordered stop points.

II. Quarrying that takes the largest proportion of land (figure 4.20) supports the economy of this area of study. Quarrying products support construction industry within and without the study area, they comprise of machine cut and manually prepared stones.

Plate 4.14: Quarrying at Ndarugu

Source: Author 2017

Companies such as Silverstone, Kingstone, and Super stone, among others are involved in the quarrying.

In an attempt to understand this industrial growth within the study area, an FGD with stone transporters revealed depleting trend of quarries. Through observation however, the reclaiming of the depleted quarries into other industrial activities significantly indicate emerging opportunities towards other industrial development. At, zone 1_{10} and zone1_0 on map of figure 4.20, construction of go downs and factory enterprise form good examples. More technologies are emerging in production of building products a good example is as shown in plate 4.15 below.

Plate 4.15: Concrete Art Solutions as part of manufacturing of building materials

Source: Author 2017

III. The PBCC: A visit to the factory confirms continued manufacturing of bags and other innovative products (but at a small scale) that are supplied within and outside Kenya.

Plate 4.16: Some products at Premier Bag and Cordage Company

Source: Author 2017

At the PBCC Limited, signs of hope on this private company land which is near the proposed CBD were cited. Some facilities have been sublet to a plastic manufacturing entity while

proposals of industrial park are evidenced by a billboard at the entry point with an indication of support by Kiambu county government.

Plate 4.17: Premier Bag and Cordage Company

Source: Author 2017.

IV. The proposed JKUAT industrial park is a zone proposed to host IT & computer related activities as the major industries, however the proposed collaboration with the public will attract more activities. It is currently under construction, on an area of 21 Acres within the study area. The computer assemblage is temporarily accommodated in JKUAT.

V. Garages that were multifunctioning as carwashes existed as shown on map in figure 14 and Appendix VII. They contribute to employment creation, however they are at small scale and not well designed to incorporate other activities.

VI. Value addition in food production is also an embraced activity by such companies like, K-west and Gatico maize millers, VEGBROK, Sky foods, Classic foods among others.

Plate 4.18: Production at Sky Foods Company Source: Author 2017

Field observation indicated accessibility to market as their main advantage and an indication of prospective expansion within the same town in the near future. Agro-based production serves the urban agriculture as well as the hinterland areas in agriculture. Ava Chem LTD (Plate 4.19) is one of the producers.

Plate 4.19: Ava Chem. LTD producing Animal Products (Source: Author 2017)

VII. Petrol stations (5 in number) are spread along the highway they provide spaces and facilities for service bay, parking, car wash commercial refreshment cafeteria, and other public utilities such as public toilets. Proposed enhancement of designs for existing activities is recommended for continued support of this town in general (Key informants 2017)

4.4.1 The Influence of Nairobi- Thika Highway on Industrial Activities in Juja

In an attempt to know why the industrialist are attracted to the town, easy accessibility, with availability of affordable expansive land were listed as major factors. Accessibility as enhanced by, Thika road expansion is further explained by an extension of adjoined by-passes, which connect Juja to other parts of Kenya and Africa without necessarily passing through the immediately congested Nairobi and Thika town. Some firms acquired raw materials from the larger East Africa while some vend from global markets (table 4.13) thus connection at Ruiru through the Eastern by-pass; easily connect these activities to the JKIA. The relationship is further explained by the number of light industrial activities that established after the expansion of the Nairobi –Thika highway (Figure 4.23). The accessibility function of Thika road is also among the major factors that were considered during the conceptualization of the Nairobi (later JKUAT) industrial park. Being adjacent to the highway the land was identified as an added advantage to enable the commercialization of research opportunities (officer at JKUAT Industrial park). On the other hand the successful expansion of Thika highway contributes to decentralization of the urban economy and in stimulating suburbanization. In the study area large population is a manifestation of not only the suburbanization but with rural- urban migration) therefore the newly established firms

enjoy readily available labour. The trend of development in industrial activities is explained by the maps in figures 4.21, 4.22, 4.23 and 4.24 below.

As of 2003, before expansion of Thika Highway, the industrial land accounted for only 2.56% of the total area within the study area with the then existing industries including: Penta flower farms, Premier Bag Cordage, Moshi flower farm and some quarrying activities .

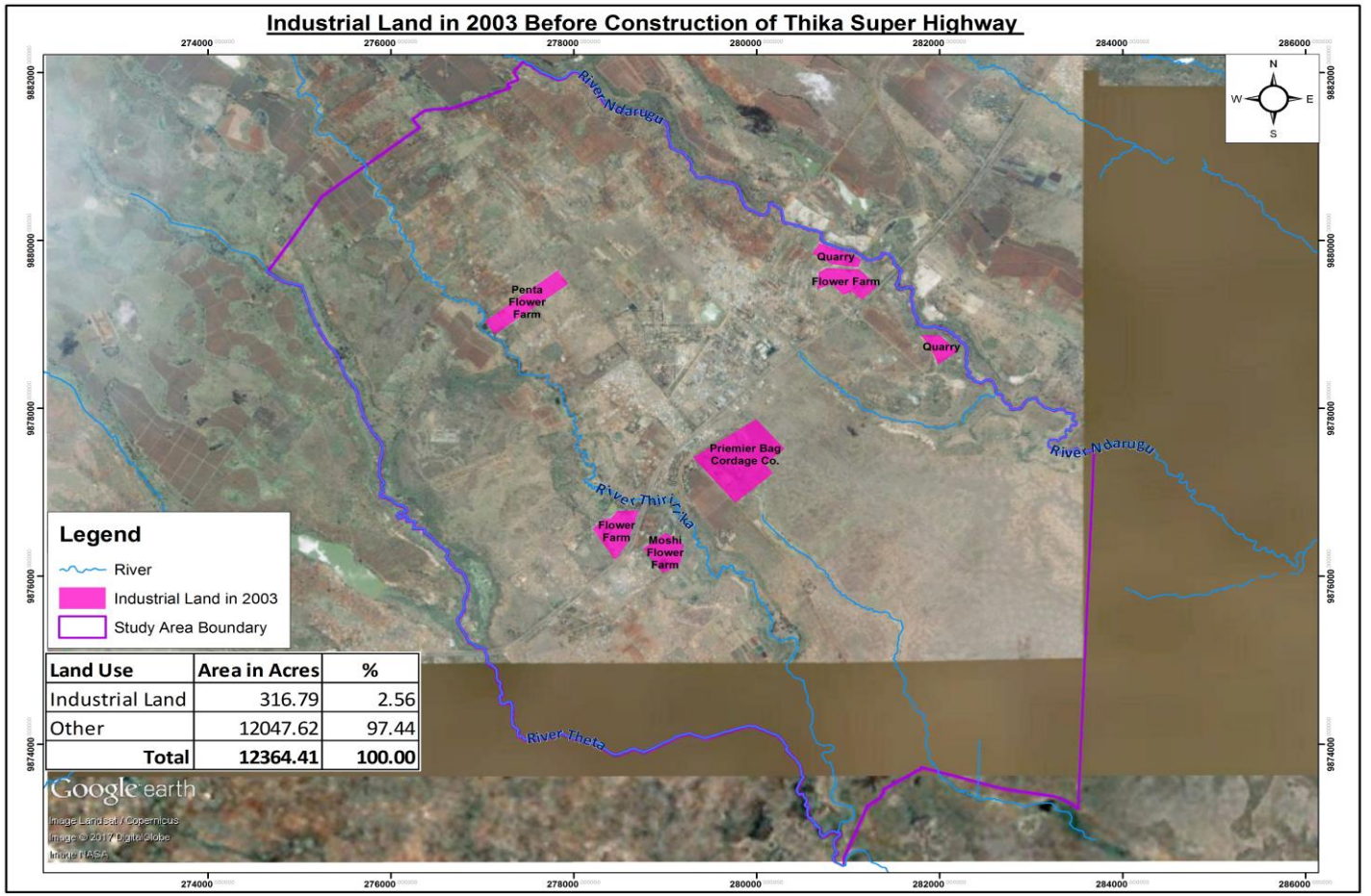


Figure 4.21: Showing industrial Activities in 2003

Source: Google Earth as Modified by Author 2017

As of 2010 before the completion construction of Nairobi- Thika Highway, the industrial land accounted for only 4.46% (as shown in figure 31), of the total area within the study area. An addition of KPP plant, Penta Tancom plant and an expansion of quarrying too were registered in 2003.

In relation to earlier discussion in this study the speculations related to construction of the highway in 2010 and expansion of Nairobi metropolitan, the area saw increased residential and emergence of new industrial activities. Residential activities saw an increase in the need for building materials within the study area. Quarrying activities became more pronounced to provide building blocks hence an extension of land under quarrying. The KPP flower and Penta Tancom farms also emerged leading to an increase of 1.90% in the total land percentage under industrial activities. See figure 4.22.

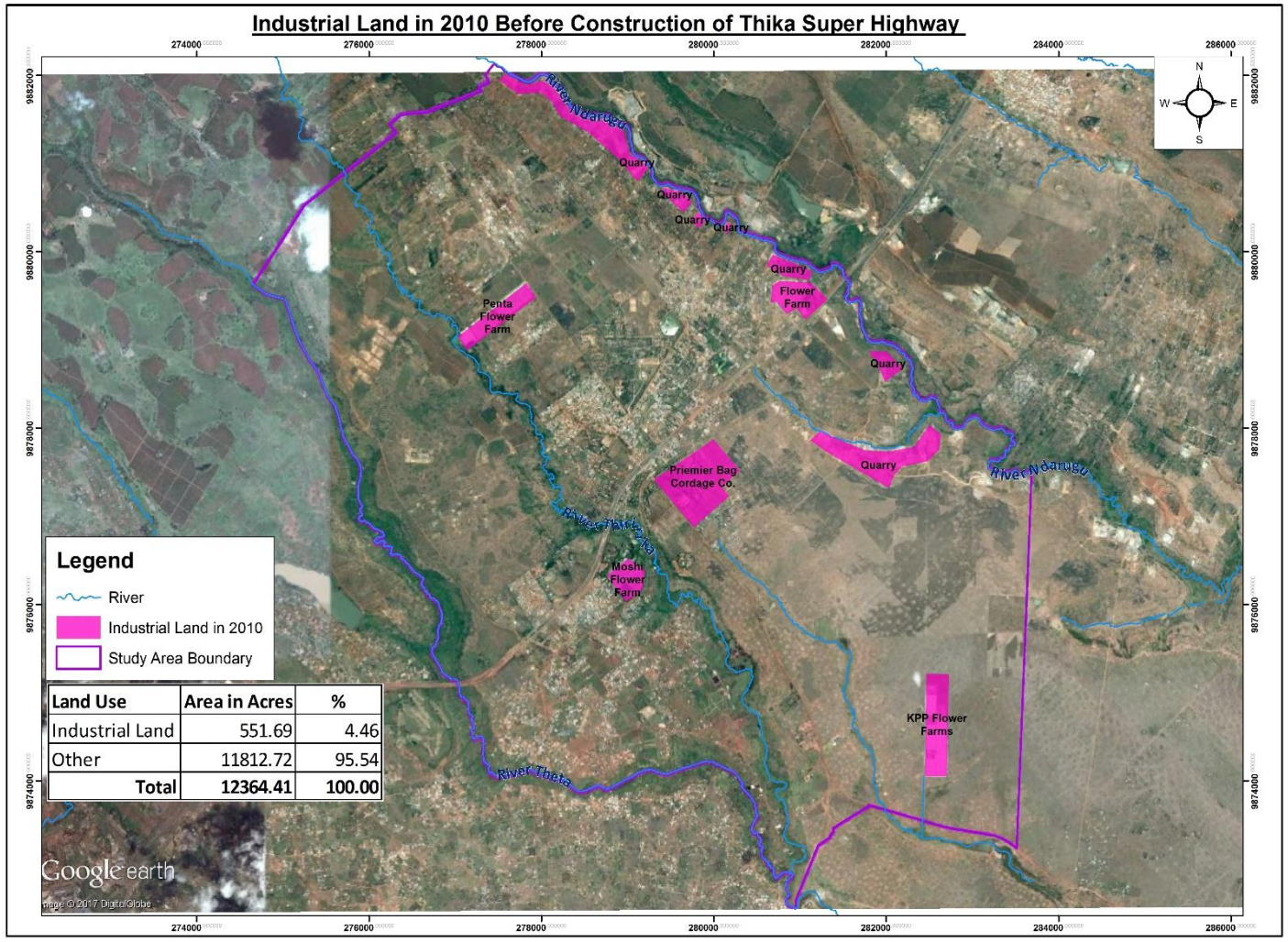


Figure 4.22: Showing industrial Activities Before 2010

Source: Google Earth as Modified by Author 2017

After construction of Thika Superhighway in 2012, more industries emerged within the study area and currently in 2017; the land under industrial activities is at 10.01% as shown in figure 4.23 below. There has been establishments of light industrial activities, (table, 4.13) and continued expansion of quarrying. The field survey observed the exhausted quarrying fields being transforming into other industrial activities. They are also not without the encroachment of residential activities.

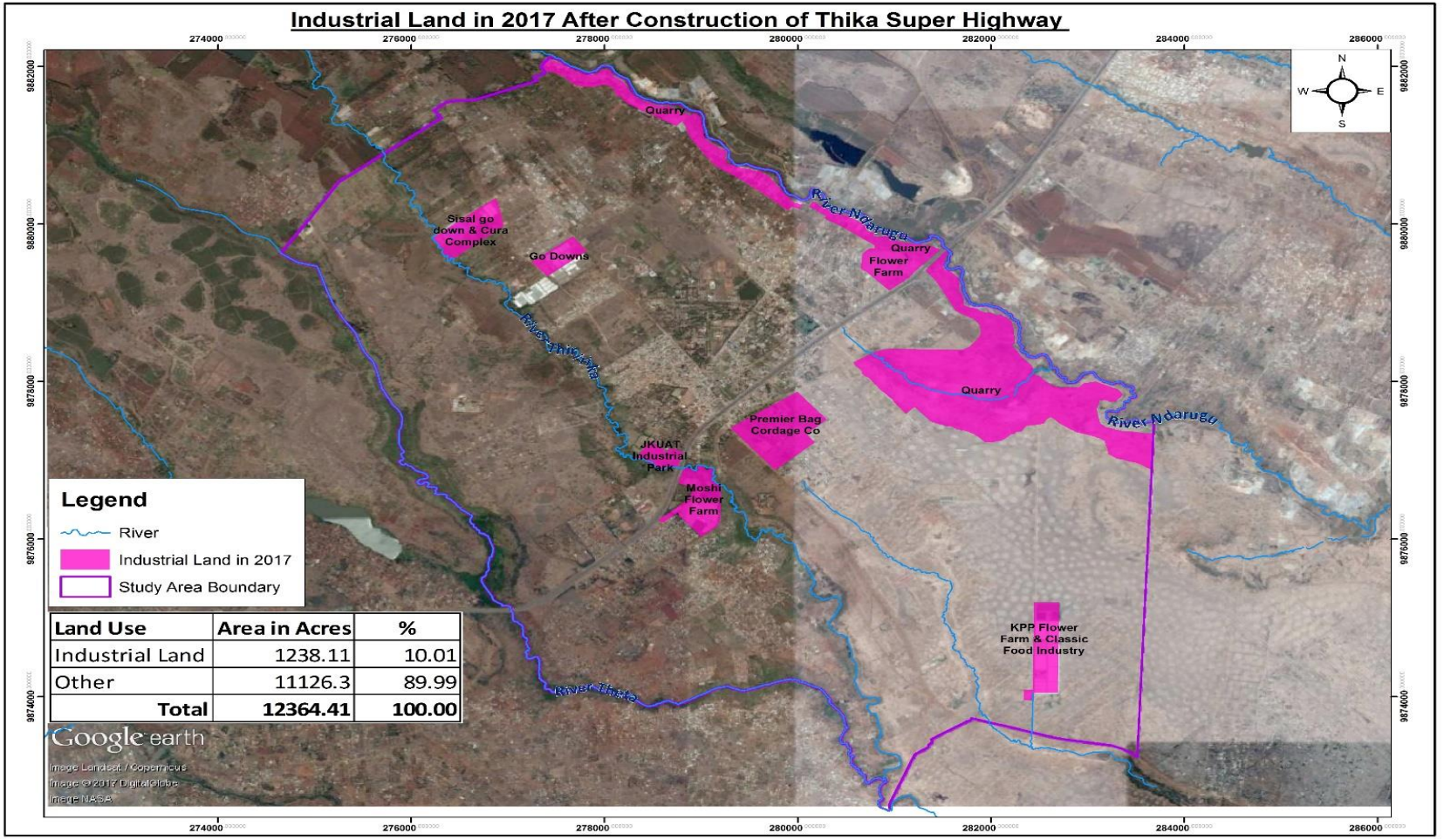


Figure 4.23: Showing Industrial Activities in 2017

Source: Google Earth as Modified by author 2017

Figure 4.24 explains comparison over years.

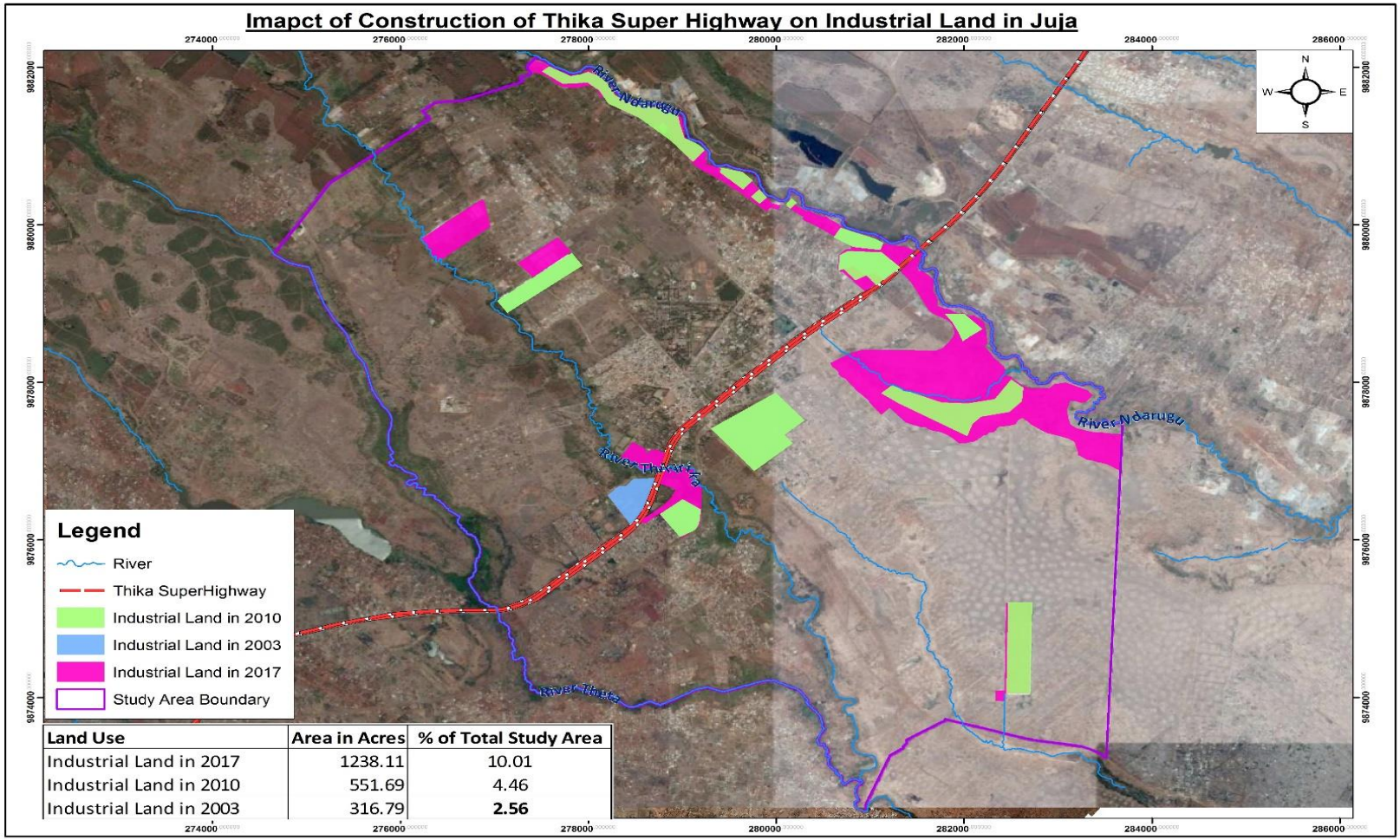


Figure 4.24: Showing the Impact of Thika Road on Industrial Activities by 2017

Source: Google Earth as Modified by Author 2017

From the above discussion it is evident that the construction and expansion of Thika highway has led to expansion of industrial activities within our study area. Even though dynamic the growth of the activities, it is part of defining factors to this particular town. And despite, the recognized potential, minimal information exists to guide development. The vast land continues sprawling into more of residential activities while constraining the industrial expansion. It is important to note the lessons from this case in order to guide proposal of sustainable corridor development policies with interventions that can guide further industrial development in Juja.

Table 4.13: An analysis of employees in some visited industrial enterprises

Source: Author 2017

Industry Type	Process	Name	No. of employees			Year of Establishment	Land size	Source of Raw Material	Main Market
			Skilled	Unskilled	Total				
Manufacturing	Manufacturing of Sisal fabrics	PBCC	Not specified	Not specified	100	Colonial Period	150 acres	Tanzania, Kilifi, Voi	
	Paper Recycling	Juja Pulp and Paper LTD	30	90	120	2011	9 acre or 50000 sq.Ft	Kenya; Uganda; Tanzania.	
	Maize Milling	Gatico Millers	3	6	9	2010	In Mixed development (flats)	All over Kenya	
	Manufacturing of Bags	Not Identified	22	23	45	2014	In the go-downs		
	Manufacturing of Polyvinyl	Supreme Poly(K) LTD	23	22	45	2014	In the Go-downs		
	Juice Production	Sky Foods	20	30	50	2014	----------	Within East Africa; Mombasa (mango); Egypt; Germany	
	Fresh Milk Production/Packaging Mangoes	Classic foods	27	23	50			Coast; Murang'a; Kiambu	

	Flour milling Yoghurt Processing								
	Maize Production	K – West Millers	10		10	2016	In Mixed development	All over Kenya and Tanzania	
	Livestock Salt (Vuga Vit)	Ava Chem LTD	7	15	22	2015	1/8 acres		
	Building Materials	Space and Style LTD	35	15	50	2017	6 acres		
Assembling	Maintenance and Fabrication	Hydro-Water Kenya LTD	70	2	72		In one if the Go-downs		
	Motor Cycle Assembly	Premier Trading	4	6	10		In one of the Go-downs		
	Processing and Packaging Avocado	VEGBROK	10	60	70	2014		All over Kenya; Murang'a Kiambu, Nyeri, Kisii	
	Computer Assemblage	JKUAT Industrial Park	60	2	62		21 Acres	Industrial Area; Mombasa	
	Processing and Packaging Drinking Water	Pack House Spring Waters	1	3or6	4or7	Not Specified	In the mixed Development	Juja	
Processing and Printing	Printing of Exercise Books and Calendars	Safari Stationary	5	20	25		In the Go-Down		
Juakali	Timber Yard	Not Identified	3	6-8	9-11		1/8 Acre	All over Kenya	
	Metal Fabrication	Not Identified	1	3	4	2015	In a mixed flat development	Juja	
	Metal Fabrication	Not Identified	3	1	4	2008	Within mixed development	Juja, Nairobi	
	Garage	Not Identified	2	3	5	2014	In a mixed development	Nairobi	

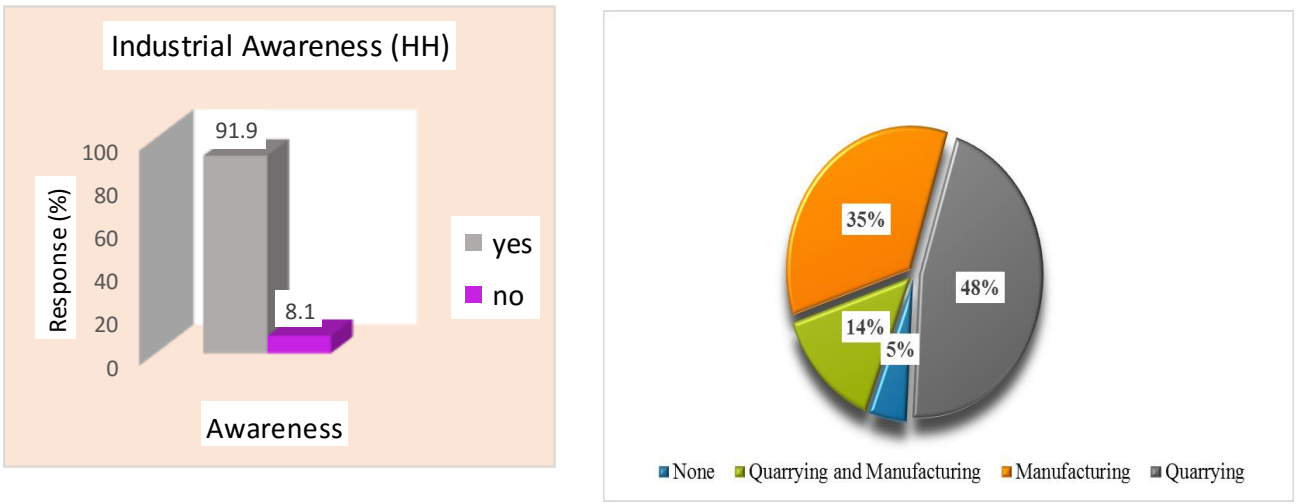
4.4.2 Contribution of Industrial Activities to Juja Town

The activities are part of the registered revenue collection in Juja Sub County. An industrial permit fee paid per an industrial enterprise in this town is Kenyan shillings, fifty nine, nine hundred (59,900/=) per year, therefore contributing to the sub county revenue collection that totaled to 21million and 17million Kenyan shillings in 2016 and 2017 respectively (Key informants). This is in support of the industrial GDP as well as the national one. From literature review (in section 4.2.4 above) both the national government and county government aspire to achieve and sustain 10% GDP from manufacturing thus more engagements towards the upward trend is required.

4.4.3 Employment in Industries

A detailed analysis on employment structure indicate that 59.46% operate their own enterprises while 40.34% are employees (figure 4.25). A more detailed analysis of employment in industries denotes it as a supplement to existing job avenues

Majority of the enterprises have employed 10 employees and above. In other cases like in quarrying, employment forms including practical cutting, loading/offloading, and transporting to building sites are a direct benefit to the residents. Focused group discussion confirmed that most of the transporting Lorries are owned by Juja residents.



A B

Figure 4.25 A & B: Showing Industrial Awareness and the Specific Identified Activities

Source: Author 2017

From the above analysis the potential of this sector is evident. The only part that is not clear to the population was the definition of industrial activities. The research showed that, despite the 92%, of the population being aware of the activities in the town, they were only able to single out manufacturing and quarrying as the only industrial activities within the area, with plastics as the main product from manufacturing (figure34 (B)). Further exploration through focused group discussion justified the response due to a minimal impact created by other existing industrial activities. However some activities e.g. milling, metal fabrication, processing of building materials has created some impact but its definition as an industrial is nonexistence. This explains why more forums are required in order to create awareness on industrial development with more inclusiveness strategies.

Proposed Investment, on Industrial Development.

1. Like other sectors, industrial sector can benefit from the Faith Based Organizations (FBOS). One through multiple uses of spaces (like indicated in section 4.4.4) and the community aspect created as discussed in the migration part. Response to land fragmentation is also evident as some are involved in amalgamating pieces of plots to have spacious and functioning spaces.
2. In their vision, donor affiliated organization envision to support range of industrial activities in Africa. This in support of the realized Africa's potential in the domestic markets and eventual extension to global level. The Nissin (Noodle production) industrial initiative have benefited from donor support with collaboration by JKUAT University (Field study 2017).The World Bank is already supporting the development of the sewer systems and with an appreciation of events in Juja and relevant policies, the potential of industrial activities can be realized. (Key informants 2017).
3. On the other hand some industrial development support and exist within the some institutions, they double as learning/research activities as well as income generating units (IUs). For instance the Nissin production factory has been proposed within the institution mentioned above; and agro based activities form an extra employment opportunity to the local community while creating extra economy.

Plate 4.20: A Proposed Nissin Production Factory

Source: Author 2017

4. Initiative calls by the Kenyan government towards promoting the industrial sector (literature review e.g. vision 2030) qualifies the same government as main financier to industrial activities with support of the Kiambu county government. An initiative with a vision to encourage innovation and commercialization of results while providing a central place for research outcome is the main reason why JKUAT collaborated with the Kenya government to set aside 21 acre land for an industrial park.

   The existence of CBOs in the study area reflects on an opportunity to financing industrial endeavors. Through social groups including women groups the population has been able to acquire land that is supporting housing (Field Study 2017). An integrated form of planning may also inform the same groups on the advantages of the aforementioned activities. A good example is a welfare association which had a vision to do 60 go-downs with proposed stores and office blocks. The welfare was already manufacturing soap; Kiaora Disability self-help group was also making beads products but it had not specific station.

5. Technological support through proxy by foreign partners may also form part of financing strategy. The fact that China and Japan have shown the interest of supporting JKUAT, similar extension to the community is likely to make development of industrial activities a reality. The only requirement in favor of this strategy is policy formulation as well as implementation.

6. The attraction of light industries is an indication of foreign investors i.e. foreign as from outside the local area. Some industries are branches to main companies found in Nairobi.

7. Proposed Go-downs: **a.)** Silver coin at the verge of completing sixty two (62) number go-downs, of size 11,400 and 9800 square feet. Build in Mirima-ini it occupies 13 acre land. The field study revealed that 6 number companies had expressed interest. **b.)** CURA Complex Juja with 43 number Go-downs which occupied a total of 82,000 square feet. Two (2) stores were already rented out t textile and food processing companies.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS.

5.1 Conclusion

According to the research findings the study made the following conclusions:

There is potential for the growth of industries within the study area. First proportionately industrial use holds number two user after the residential land use and that historically, functional industrial land is identified. Expansion to include more land is also possible through amalgamation of highly subdivided plots left for speculation. In spite of suburbanization which is a threat to this expansive land, that has also led to sprawling into residential land use, options for densification are available and can help to secure more land. The provision of public sewer system is one example elements that are to support densification.

Furthermore, the existing infrastructure is in support of development: First the road networks defining the town's centrality, while opening it into other regions including the larger Kiambu, the metropolitan region, most parts of Kenya and to a larger extent Africa region. Therefore terming it not only an industrial hub along the Nairobi Thika highway, but a regional hub that can provide linkages all over and consequently spur development. Coupled with its proximity to the JKIA international linkages are abounding. Industrialization in Juja therefore, will play a key role in creating a trickledown effect to the surrounding areas, consequently achieving the national development goals.

The rehabilitation of the railway may contribute to further support of this infrastructure. Moreover the upgrading plans of major transport network are justified and they will enhance the mobility and spatially increase the transformation of Juja town. The only challenge is the subdivisions that remain unguided to allocate inadequate local access roads. From literature review Etowah town leaders recognized that the railroad infrastructure was a valuable asset, not only for tourism, but for industrial distribution. The study area should also utilize the major transport network, Nairobi-Thika highway to support industrial ventures together with other projects. Secondly other infrastructure services such as water and energy are among the endowment that can be explored to encourage the venture of industrial development. They are available, they have supported the activities in decades, and the household population is

also supported by the same structures therefore showing a high level set for inclusion of industries systems.

That the socio economic characteristics are in support of industrial development: the increasing population that is also characterized by a balanced gender provides the needed threshold for adequate human resource as well as market for goods and services produced within the study area. Moreover, the sector contributes to provision of employment opportunities to the rapidly growing population with both skilled and unskilled jobs. It has the potential to create high end jobs by utilizing the available technology and research products from JKUAT consequently absorb the skilled persons from the same institution. Furthermore, the study found out that, majority of the people within the study area, are self-employed. The innovativeness created by self-employment is a factor of development that can form systems of industrial development at small levels to include SMEs. Nevertheless, their income levels indicated low paying jobs. Literature review in this study, reveal towns that made strategic decision to purchase and develop industrial parks, the goal of which was to create sustainable, living-wage jobs. Juja town exhibits similar opportunity to be explored by relevant government levels, planners and the community.

That community facilities offer dual access of spatial spaces with the main one, 'JKUAT's dual access that has included industrial developments. Furthermore history indicates synergistic relationship of this particular facility with the development of Juja town. However the long time attached support of agriculture is no longer a reality in the neighbourhoods. The transformation of the town therefore should be geared towards further strengthening of the relationship through stimulation of industrial development. It offers an opportunity to explore into science and technological parks (computer and motorbike parts assembling; JKUATESS's innovations with inclusion of technologies such as banana tissue culture; engineering innovations; and other research products).Together joint exploration into other available spatial areas is found necessary to offer the planning team the opportunity for inclusion of the whole community. Effective integrative strategies are a requirement to manage the growth and plan the town as an industrial village with definite direction of sustainability. Consequently dealing with substantial engagement of proportionate urban population, instead, of development that engages a section of population.

There have been the emergences of other forms of industrial activities that are spurring the growth of industries. Despite the registered characteristic of degradation of some activities that originally defined the industrial development, the emerging ones, form a supplement. Also noted is that development of the town will help in transformation of industrialization by providing value addition. While the emerging industries (light industries) focus on production of intermediate goods and services not only targeting metropolitan markets but also for local consumption, thus, reciprocating to rural economy. The industries can be utilized to provide community facilities such as community libraries and recreational areas as a way of creating rapport with the community and safe guarding the community's vision. However, complete and transparent proceedings between the government and the private sector will need to be fostered as they play a crucial role towards creating a sustainable industrial zone. Hence, provision of basic infrastructure and social amenities in support of the current development will be easily achieved through collaborative effort by the government, the private sector as well as the local community. Therefore, the PPP should be explored for further support.

The availability of building materials such as stones are essential towards reducing the costs incurred during construction. This gives the resident employment opportunities as they work in quarries while others can be employed as labor force during construction. However the mining resource is depleting, rehabilitation of the exhausted quarry land to include activities that compatibly exist and environmentally sound will be a solution to sustainable industrialization.

5.2 Recommendations

5.2.1 Preparation of Land -Use Plan.

There is need to prepare a detailed land use plan for Juja. This will guide current, ongoing and future developments. The land use plan should have detailed water supply and sewerage plans for current and proposed expansion, road networks and zonal plans for various land uses such residential areas to promote and guide densification of residential activities with well-defined and controlled zones within the study area. In addition to that, the plan needs to incorporate provisional plans for SMEs who are going to emerge as a result of the realized potential for industrial growth. Furthermore, the land use plan will direct development thus ensuring compatibility. This would in effect minimize the conflict experienced along the road network such as street encroachment by traders, motorists and businesses. In addition to that,

urban sprawl can be controlled thus protecting the Peri-urban areas. Furthermore, the land use plan ought to highlight areas for amalgamation to prevent fragment land use pattern where industries scattered within the study area thus contributing to land unsustainable land use.

5.2.2 Incorporating the Concepts of Mixed Land Use and Mixed Use Developments.

The study area will greatly benefit with the incorporation of such land use concepts in order to maximize the available land while utilizing the most out of it. Through mixed land uses, land would be used economically and sustainably. It will involve a range of complementary land uses aimed at maximizing industrial connectivity further fostering forward linkages. Complimentary land uses within the study area can be incorporated into one building such as residential cum commercial or commercial cum offices in order to free up some land that can be designated for other uses such as creating civic spaces and other community facilities. Lastly, this concept will contribute in reducing the Vehicular Kilometer Travelled (VKT) thus curtailing reliance on motorized transport. This will contribute to reduction of greenhouse gases emission.

5.2.3 Prioritizing, Infrastructural Development.

There is need to first create infrastructure needed for industries within the area before ground work begins. This involves: provision of roads and drainage facilities, street lighting, wastewater and solid waste disposal systems and recreational areas. This will attract investors. Furthermore, the existing supportive infrastructure such as the railway line needs to be rehabilitated to effect ease of movement of goods and services. In conjunction to that, other industries within the area need to be resuscitated to complement one another.

Land Amalgamation

Land within the study area has been highly subdivided. This creates disconnect between compatible land uses and thus creating conflict between the current land use pattern. Land amalgamation will offer an opportunity towards creation of Industrial Parks that are more efficient in land utilization. However, most of the land is privatized thus there will be need for government intervention to speed the amalgamation process as well as contribute in land acquisition from private holders.

5.2.4 Policy Based Recommendations.

Land Subdivision Control policies

One of the major causes of urban sprawl and emerging conflicting developments is the demand for land. This has forced most land owners to subdivide their land in order to make profit by allocating small parcels of land for sale. This practice strains allocation of other land use activities such as roads and way-leaves for public utilities. Through creating a comprehensive land use plan, industrial areas as well as those within it radius of influence ought to not be subdivided below certain acreage. This will promote cohesive land use pattern.

Public-Private Partnership.

One barrier to smooth development is exclusion of key stakeholders (Private stakeholders) from the process of development. By giving incentives to private stakeholders, this gives them security and confidence as they feel part of the planning process. The private sector is key, towards achieving a sustainable land use pattern as they are the majority land owners. Coined with the fact that the population indicated of the ability to invest, then integrated strategies can bring on board all parties. Hence, the local authorities will have to provide incentives to the parties involved both those working in the formal and the informal sector. Regular consultations have to be conducted between all stakeholders to ensure all are on the same page.

Securing land for Industrial Development.

There needs to be introduction of policies that safeguards land speculation in potential industrial areas. This will ensure that before land is subdivided and sold as a result of the expected developments, the government has already secured land and drawn out regulations for the accepted type of developments as well as setting up a robust management framework for efficient management of these zones. Furthermore, this will help protect plantations which industries depend on for their manufacturing products as well as for future expansion. Hence, ensuring raw materials are not sourced far thus reducing cost of production. Moreover, through such policies, industrial villages can be created. This will ensure that the town is urbanizing as well as creating job opportunities for its residents and making it independent.

Protecting of, Inherited, Industrial Plants.

There needs to be introduction of policies that safeguards historical plants. This is by either providing alternative strategies of the production system that originated with the plant or transforming it to a different procedure. PBCC for instance can be resuscitated by use of networks that open to immediate open lands in the Eastern Kenya together with the existing usable and supporting land in the coastal and East African region.

Alternatively transform PBCC to conform to the current definition of the town, with a mind of maximum utilization of the functional industrial land.

Creation of Industrial Villages

The indication of potential shows the 'industrial development', a concept with a future response to the global question of, 'How to sustainably plan for urban population', therefore the research recommends for planning of Juja town as an industrial village with main movers of: Science and Technological parks; and Industrial parks with SMEs

5.3 Areas for Further Research

1. Environmental evaluation needs are required to establish the suitable locations of varied industrial plants in this potential industrial town, the best options to be incorporated and best spatial designs to be utilized. For some industries, may be considered safe and thereafter they are discovered unfriendly. Juja is endowed with natural rivers and underground water. Research need to protect such spatial environmental as well natural resources for sustainable future.
2. Migrations into this nodal town bring in strong social economic networks and ties that can provide conduits for industrial development in Kenya and new orientation to industrial development in this particular town. A Research to unearth the strengths of these networks will enrich regional and urban planning. Secondary an understanding of the role this heterogenic community is required to play in planning for industrial activities in this particular town and how they can spread the benefits countrywide will definitely benefit the vision 2030.

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APPENDIX I

UNIVERSITY OF NAIROBI DEPARTMENT OF URBAN AND REGIONAL PLANNING

HOUSEHOLD QUESTIONNAIRE

***Disclaimer**: Any information provided is confidential and it will be used for academic purposes only.*

Questionnaire Code ☐

Date of interview…… Name of interviewer……..

L.R. No. ……

SECTION 1: RESPONDENT DETAILS

1.1 Name of respondent (Optional) . ……

1.2 Age: _____ years

1.3 Gender: Male ☐ Female ☐

1.4 Highest level of Educational:

None ☐

Primary school dropout ☐

Completed primary school ☐

Secondary school graduate ☐

Tertiary: ☐

1.5 Employment:

Unemployed ☐

Government ☐

Private organization/ business ☐

☐

Parastatal organization

Self-employed (Specify) . ……

1.6 If employed, what is the estimated distance to place of work?

1.7. Kindly indicate the average monthly income of your household

- ☐ Below Kshs. 10,000
- ☐ Kshs. 10,000 – 24,000
- ☐ Kshs. 24,001 – 60,000
- ☐ Kshs. 60,001 – 120,000
- ☐ Above Kshs. 120,000

1.8 How long have you lived here …….?

1.9 Where did you migrate from?

(a) Born here

(b) Nairobi County

(C) Within Kiambu County

(d) Other (specify county) …….

SECTION 2: SOCIAL INFRASTRUCTURE AND COMMUNITY AMENITIES

a) Education

2.1 Please indicate the institutions attended by members of your household:

Educational Facilities	Name	Private/ Public	Distance in Km		
			< 1.0	1.0 – 2.0	> 2.0
1. ECD Centre					
2. Primary School					
3. Secondary School					
4. Tertiary College/ Training institute					
5. University					
6. Other **(specify)**					

2.2 List the top **four (4)** challenges facing the provision of educational services in your area:

1. _____
2. _____
3. _____
4. _____

b) Healthcare Services

2.3 Please indicate the health facilities serving the members of your household:

Facility Name	Private/Public	Distance in Km		
		< 1.0	1.0 – 2.0	> 2.0

2.4 (a) Do you have access to ambulance services?

Yes ☐ No ☐

(b) If yes, specify the provider _____

2.5 List the top **four (4)** challenges facing the provision of healthcare services in your area in the order of importance:

1. _____
2. _____
3. _____
4. _____

c) Housing

2.6. Who owns the house you live in?

a) Employer
b) Rented
c) Own

2.7. Type of house

☐ Bungalow/Masonette ☐ Row Housing

☐ Flat

2.8 Please indicate the community facilities that serve your household:

Facility	**Distance in km**				**Provider (public or private)**
	Name	**< 1.0**	**1.0 – 2.0**	**> 2 km**	
Parks					
Place of Worship					
Market					
Playground					
Cyber café					

d) Transport

2.9 Please state your main means of transport on daily basis. (Tick appropriately)

a) Matatu
b) Boda boda
c) Personal Vehicle
d) Company Vehicle

3.0 Please rate your satisfaction with your means of transport on a scale of 1 – 5 where 5 is the least satisfied. ……

3.1 What challenges do you face on your roads? (Tick Appropriately)

a) Narrow Roads
b) Poor Connection
c) Inaccessibility

e) Water

3.2 Please select your main source of water.

- ☐ Piped Water
- ☐ Private operators/vendors
- ☐ Borehole
- ☐ River/stream
- ☐ Rain water
- ☐ Shallow wells

3.3 Water provider.

- ☐ RUJWASCO
- ☐ County Council
- ☐ Water Vendors
- ☐ Others (specify)……

3.4 How much do you pay for water per month? Ksh……

f) Sewerage and Sanitation Services

3.5 Do you have access to a sanitary facility?

A. Yes
B. No

3.6 If "Yes" in 5.13 above,

a) What kind of facility?

A. Flush toilet
B. Pit latrine
C. Other (specify)…….

b) If flush toilet in (a) above, what type of connection do you have?

A. Sewerage connection
B. Septic Tank

3.7 Method of solid waste disposal used

A. Burning
B. Burying
C. Open dumping
D. Collection by County government
E. Collective by private company (specify name of company)…….

3.8 How much do you pay for sanitary services per month? Ksh……

g) Security Services

2.6. Who provides security in your neighborhood? _____

2.7. Please indicate the distance (in km) from your home to the nearest police station

- ☐ Less than 1.0 km
- ☐ 1.0 – 2.0 km
- ☐ 2.1 – 3.0 km
- ☐ 3.1 – 5.0 km
- ☐ More than 5.0 km

2.8 How would you rate the level of insecurity and/ or crime in your neighborhood?

- ☐ Very low
- ☐ Moderate
- ☐ High
- ☐ Very high

2.9.1 What is the security concerns affecting your neighborhood?

……

……

……

2.9.2 What do you consider to be the major causes of insecurity in your neighborhood?

……

……

……

SECTION 3: INDUSTRIES

3.1.0) Are you aware of any industrial activities in Juja?

A. Yes
B. No

3.1.2. ☐ Quarrying ☐ manufacturing ☐ Packaging ☐ Assembling

3.2.0. Are you involved in any kind of industrial activity?

C. Yes
D. No

3.2.1. If yes specify (Tick as appropriate)

A. Employee

B. Owner

3.2.1. Which type of Industrial Activity? …….

3.3.0. What is your perception on any change of industrial activities after expansion of Thika highway (i.e compare before and after)

……

……

……

SECTION 3: OTHERS

4.1 Do you own any land in Juja?

A. Yes

B. No

4.2 If yes what is the status of ownership?

1.3. What is the name of the Main company that sold to you land

……

……

……

4.3. In your own perception what is the future of land uses in Juja?

……

……

……

4.4 Kindly list some of the impacts of the expansion of the Thika road on your livelihood.

……

……

……

Thank You Very Much for your Time.

APPENDIX II

UNIVERSITY OF NAIROBI DEPARTMENT OF URBAN AND REGIONAL PLANNING

COMMERCIAL ENTERPRISES QUESTIONNAIRE

***Disclaimer**: Any information provided is confidential and it will be used for academic purposes only.*

Questionnaire Code

Date of interview…… Name of interviewer……..

L.R. No. ……

Business Type……..

SECTION 1: RESPONDENT DETAILS

1.1 Name of respondent (Optional) ……

1.2 Age: ……years

1.3 Gender: Male ☐ Female ☐

1.4. Highest level of Educational:

None

Primary school dropout ☐

Completed primary school ☐

Secondary school graduate ☐

Tertiary: ☐

1.5. Kindly indicate the average monthly income of your household

- ☐ Below Kshs. 10,000
- ☐ Kshs. 10,000 – 24,000
- ☐ Kshs. 24,001 – 60,000
- ☐ Kshs. 60,001 – 120,000
- ☐ Above Kshs. 120,000

1.6 Do you live in Juja? ----------

1.7 How long have you lived in Juja? ----------

1.8 Where did you migrate from?

a) Nairobi

b) Within Kiambu County
c) Other (Specify county)

SECTION: INFRASTRUCTURE AND SERVICES

A) Transport

2.1 Please state your main means of transport on daily basis. (Tick appropriately)
a) Matatu
b) Boda boda
c) Personal Vehicle
d) Company Vehicle

2.2 Please rate your satisfaction with your with your means of transport on a scale of 1-5 where 5 is the least satisfied ……

2.3 What challenges do you face on roads within Juja? (Tick Appropriately)
a) Narrow Roads
b) Poor connection
c) Others (Specify)

B) Security Services

2.4 Who provides security for your business? ----------

2.5 Please indicate the distance (in Km) from your business to the nearest police station

Less than 1.0 km
1.0 – 2.0 km

2.1 – 3.0 km

3.1 – 5.0 km

More than 5.0 km

2.6. How would you rate the level of insecurity and/ or crime in your neighborhood?

- ☐ Very low
- ☐ Moderate
- ☐ High

2.7 What is the security concerns affecting your neighborhood?

……
……

……

2.8 What do you consider to be the major causes of insecurity in your neighborhood?

……
……

C) Water

2.9 Please select your main source of water

- ☐ Piped water
- ☐ Private operators/vendors
- ☐ Borehole
- ☐ River/stream
- ☐ Rain water
- ☐ Shallow wells

3.0 If water indicate provider

- ☐ RUJWASCO
- ☐ Kiambu county council
- ☐ Water vendors
- ☐ Others (specify) ……

3.1 Are there any challenges in water provision in Juja?

……

……

……

d) Sewerage and Sanitation Services

3.2 Do you have access to sanitation?

3.2.1 What is your method of sanitation

Sewerage

Pit latrine

Septic

3.2.2 Is it shared or one family facility? Shared not shared

3.3 Are there any challenges in sanitation provision in Juja?

……

……

……

3.4 Method of solid waste disposal used

Burning

Burying

Open dumping

Collection by county government

Collective by private company (specify name of company)

3.5 If collected and disposed, how much do you pay per month? Ksh.

SECTION 3: INDUSTRIES

3.1.0 Are you aware of any industrial activities in Juja?

A. yes

B. No

3.1.1 If yes specify

Quarrying

Packaging

Assembling

Manufacturing (Kindly Specify)……

3.2.0 Are you involved in any kind of industrial activity?

A. Yes

B. No

3.2.1 If yes specify (Tick as appropriate)

A. I supply raw materials

B. I buy their products

C. Others (Specify)

3.3.0 What is your perception on any change of industrial activities after expansion of Thika highway (i.e compare before and after?)

……
……

……

SECTION 4: LAND AND THIKA ROAD

4.1.1 Do you own any and in Juja?

A. Yes

B. No

4.1.2 Which size of land----------

4.2.1 If yes what is the status of ownership?

……
……

4.2.2 Into which use is it intended for?

……
……

4.3 What is the name of the main company that sold to you land…….

4.4 In your own perception what is the future of land uses in Juja?

……
……

……
……

4.5 Kindly list some of the impacts of the expansion of the Thika road on your business venture and your livelihood.

……
……

……
……

5. Kindly list some of the impacts of the expansion of the Thika road on Juja town

……
……

……
……

6. Any other comment

……
……

……
……

Thank You Very Much for your Time

APPENDIX III

UNIVERSITY OF NAIROBI DEPARTMENT OF URBAN AND REGIONAL PLANNING

Questionnaire for Industrial Enterprises

***Disclaimer**: Any information provided is confidential and it will be used for academic purposes only.*

Questionnaire Code ☐

Date of interview…… Questionnaire code…….

Name of interviewer…….. L.R. No. ……

Section I:

1.1 Name of the respondent.

_____

1.2 Gender

◯ Male ◯ Female

1.3 Which of the following best describes your age bracket?

☐ 18-24 ☐ 25-34 ☐ 35-44

☐ 45-54 ☐ 55-64

1.4. Which of the following best explains your residential status

☐ I Live within Juja ☐ I Live outside Juja

1.4.1 If you live in Juja, when did you start living there?

☐ I was born in Juja ☐ 0-1yrs ☐ 2-5yrs

☐ 6-10yrs ☐ More than 10yrs

1.5 Where did you migrate from?

☐ From within Kiambu county ☐ From Nairobi

☐ Others, specify_____

1.5.1. Why did you migrate to Juja

Section II: Activity Details

2.0. What is your position in the industrial enterprise?

_____

2.1 What do you deal with?

_____

2.1.1 Where do get your raw materials from

2.1.2 Kindly indicate where you do sell your products

_____

_____

2.2 How many employees work in your enterprise?

_____

Category/No	Skilled	Non skilled	Total
Women			
Men			

2.3 Do you own the land the enterprise occupy?

☐ Yes ☐ No

2.3.1 I f yes, what is the status

☐ Freehold ☐ Lease ☐ Others (specify)

2.3.2 Do you consider the land the industrial enterprise activities occupying adequate?

☐ Yes ☐ Not

2.3.3If not adequate what are your future plans?

_____

_____

2.3.4. What was the previous user of the land?

_____

2.3.5 What is your vision? (In terms of expansion plan of your activities)

☐ Within Juja ☐ not within Juja

Section III: Infrastructure and Social Amenities

A) Water

3.1 What is your main source of water?

☐ Piped water ☐ Borehole

☐ Shallow Well ☐ River

3.2. Who is your provider?

_____ _____

_____ _____

3.3.1 Please indicate the approximate amount of water you use every month

_____

3.3.2 Is the water supply enough.

3.4.1 Kindly indicate the challenges in water provision

_____

_____

_____

3.4.2. What are some of the mechanisms put in place to counteract the challenges?

_____

_____

B) Sewage

3.5 Please indicate the type of waste generated from your premise

_____

_____

3.5.1 How do you dispose the waste? ;

a. Solid waste _____

b. Liquid waste;

i. Connected to sewer ☐

ii. Septic ☐

3.5.2 What are some of the challenges of waste disposal?

_____

_____

_____

C).Energy

3.6.1 Indicate your main source of energy

_____

3.6.2. Indicate adequacy level (where level 5 is the least)

☐ 1 ☐ 2 3 ☐

☐ 4 ☐ 5

3.6.3 If not adequate what are mechanisms put in place to improve on energy

_____

_____

_____

Housing

3.7. How are your workers housed?

☐ The company provides

☐ Renting in the neighborhood

Health Facilities;

3.8.1 Do your workers access health care?

☐ Yes ☐ No

3.8.2. Please indicate the health facility supporting your workers.

_____

3.8.4Indicate some of the challenges faced whenever seeking for health services

_____

_____

Section IV: Environment

4.1. What are some of the activities you have put in place for environmental management?

_____

_____

4.3Please indicate some of the CSR project you support.

_____

_____

Section V: others

5.1. What are influences of Thika Road in your business _____

_____

5.2. 1. Will you encourage other prospective industrialist to locate here?

_____

_____

5.2.2. Why?

_____

_____

5.3 .1Are you aware of any development regulations required to set your industrial enterprises

☐ I am aware

☐ I am not aware

5.3.2 If yes which ones?

_____

_____

5.4Other comments……
…….

_____

Thank You Very Much for the Time spent

APPENDIX IV

UNIVERSITY OF NAIROBI DEPARTMENT OF URBAN AND REGIONAL PLANNING

PHYSICAL PLANNING DEPARTMENT INTERVIEW SCHEDULE

***Disclaimer**: Any information provided is confidential and it will be used for academic purposes only.*

Questionnaire Code

Date of interview…… Name of interviewer……..

L.R. No. ……

1. Name of the respondent……
2. .Please indicate your position in the institution……
3. A) Do you have a development plan that is controlling development within Juja town?
   ☐ Yes ☐ No

   b) If yes when was it prepared?.....

   c) If in process, what are the key proposals in the following major sectors?

   Industrial activity…….....

   Roads network……..... …

   Sewerage…….....

   Landfills…….....

   Water…….....

   Infrastructure…….....

4. How are you approving despite of rapid development
   ☐ Adhering to some order
   ☐ Change of user through proponent request

5. What is the trend of development in the town?

……

……

……

6. Does the town have a delineated boundary?

☐ Yes ☐ No

If yes, are the activities sprawling beyond the boundary

……

……

……

7. What are some of the challenges facing planning the town?

……

……

……

APPENDIX V

UNIVERSITY OF NAIROBI DEPARTMENT OF URBAN AND REGIONAL PLANNING

RUJWASCO: INTERVIEW SCHEDULE

***Disclaimer**: Any information provided is confidential and it will be used for academic purposes only.*

Questionnaire Code

Date of interview…… Name of interviewer……..

L.R. No. ……

1. Please indicate your mandate

   ……

   ……

   ……

2. What are some of the water projects in Juja?

   ……

   ……

   ……

3. Are you aware that Juja is coming up as an industrial hub?

   ☐ Yes ☐ No

4. Would the current water resource, support the industrial activities?

   ☐ Yes ☐ No

If not, what are the measures that you have put in place to support the activities?

……

……

……

5. What are other challenges of the water resource in Juja?

……
……
……

6. . In your own perception what is the future of land uses in Juja?
……
……
……

Thank You Very Much for your Time

APPENDIX VI

UNIVERSITY OF NAIROBI DEPARTMENT OF URBAN AND REGIONAL PLANNING

TRANSPORT DEPARTMENT (KIAMBU COUNTY) INTERVIEW SCHEDULE

Transport Department (Kiambu County)

1. Do you have a plan that guide development in Juja?

   ☐ Yes ☐ No

2. Do you have any planner for multi- model transport?

   ☐ Yes ☐ No

3. Are you aware of industrial activities in Juja?

   ☐ Yes ☐ No

4. What are some of the challenges that you face in Juja

……

……

……

5. Do you perceive changes of industrial activities after the expansion of the Nairobi-Thika Highway

   (Kindly explain)

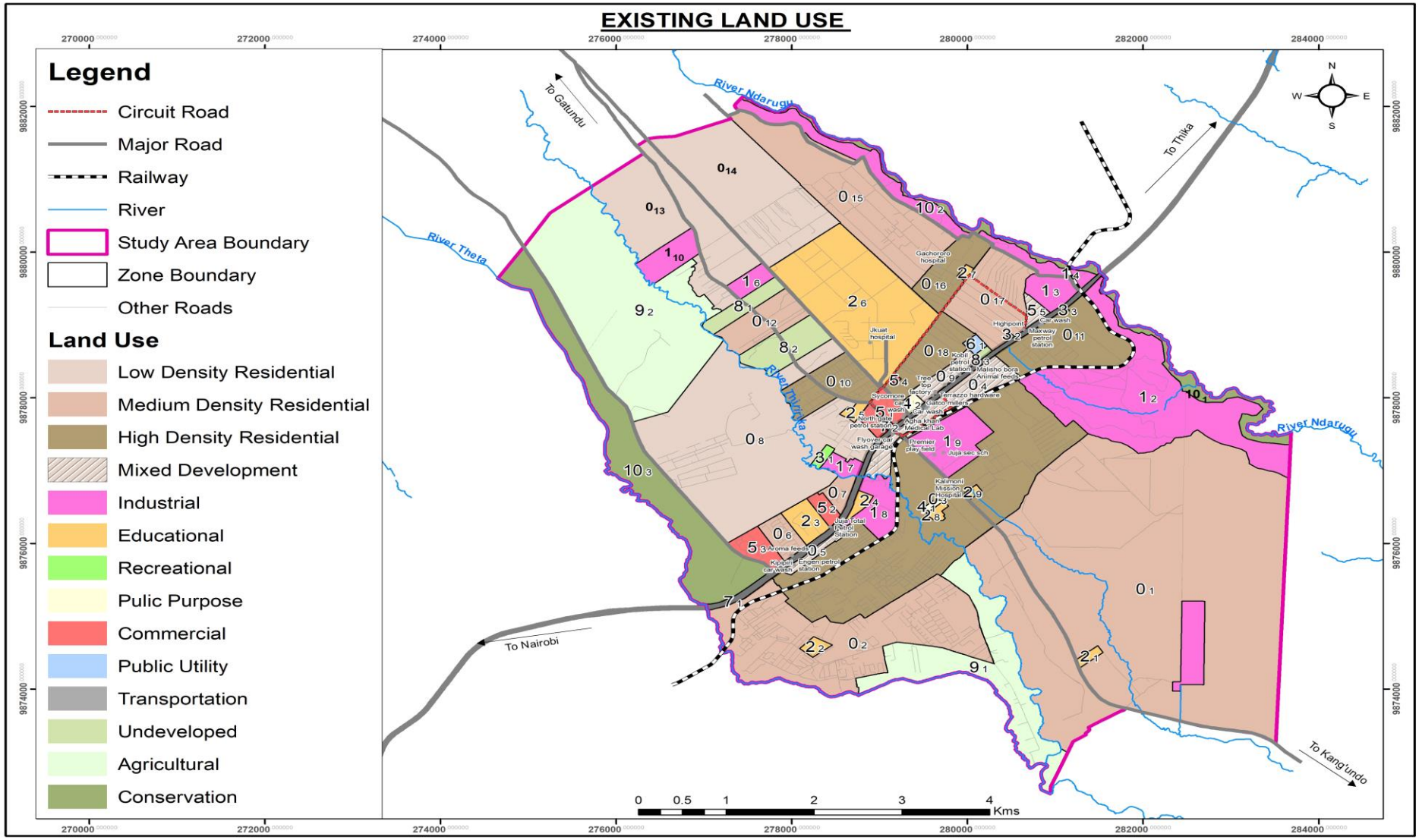
……

……

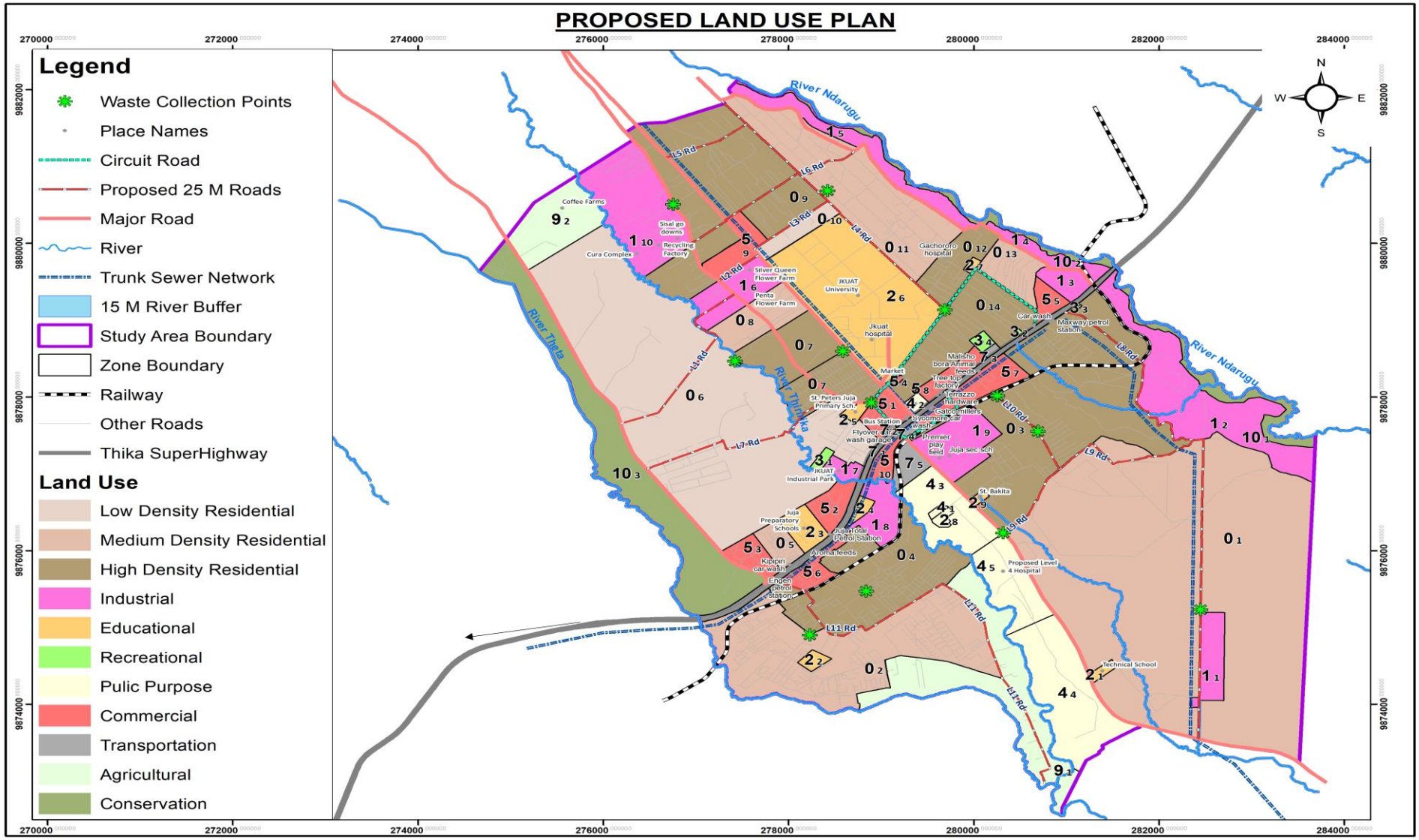
……

Thank You Very Much for your Time

APPENDIX VII
EXISTING LAND USE MAP



APPENDIX VIII
PROPOSED LAND USE PLAN



APPENDIX IX

TABLE SHOWING ZONAL LAND USE SUMMARIES

Code	Zone	Land Use	Names	Area
0	1	Medium Density Residential		2841.84
0	2	Medium Density Residential		690.55
0	3	High Density Residential		1040.09
0	4	Mixed Development		120.79
0	5	Mixed Development		23.04
0	6	Medium Density Residential		44.86
0	7	Medium Density Residential		28.02
0	8	Low Density Residential		986.63
0	10	High Density Residential		130.04
0	12	Medium Density Residential		108.65
0	13	Low Density Residential		444.38
0	14	Low Density Residential		492.02
0	15	Medium Density Residential		463.61
0	16	High Density Residential		104.04
0	17	Medium Density Residential		212.49
0	18	High Density Residential		128
0	11	High Density Residential		226.72
0	9	Mixed Development		43.4
1	1	Industrial		77.54
1	2	Industrial		613.84
1	3	Industrial	Flower Farms	51.83
1	4	Industrial		51.37
1	5	Industrial		123.9
1	6	Industrial		31.67
1	7	Industrial		24.59
1	8	Industrial		73.88
1	9	Industrial	Premier Bag Cordage Company	124.59
1	10	Industrial		64.91
2	1	Educational	Technical School	9
2	2	Educational		12.98

2	3	Educational	Juja Preparatory Schools	44.83
2	4	Educational		12.62
2	5	Educational	St. Peters Juja Primary Sch.	11.09
2	6	Educational	JKUAT University	512.41
2	7	Educational	Gachororo Public Schools	5.07
2	8	Educational	Missionary School	8.62
2	9	Educational	St. Bakita	5.16
3	1	Recreational		9.33
3	2	Recreational		1.14
3	3	Recreational		0.3
4	1	Public Purpose		4.32
4	2	Public Purpose	Police Post	11
5	1	Commercial		49.48
5	2	Commercial		21.14
5	3	Commercial		46.01
5	4	Commercial		1.35
5	5	Mixed Development	Flower Farms	17.57
6	1	Public Utility		14.32
7	1	Transportation		112.14
7	2	Transportation		1.57
8	1	Undeveloped		51.85
8	2	Undeveloped		102.17
9	1	Agricultural		385.77
9	2	Agricultural		883.31
10	1	Conservation		88.45
10	2	Conservation		66.2
10	3	Conservation		507.92
		Total		**12364.41**