



**THE UNIVERSITY OF NAIROBI**

**The Effects of Standard Gauge Railway on Industrial Property  
Values, a Case Study of Athi River Town.**

RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT FOR THE  
AWARD OF A MASTER OF ARTS IN VALUATION AND PROEPRTY  
MANAGEMENT


BY: LAWRENCE SANG KIPNGETICH

**Reg. No. B92/75645/2014**

**SCHOOL OF THE BUILT ENVIRONMENT  
DEPARTMENT OF REAL ESTATE AND CONSTRUCTION  
MANAGEMENT**

## DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Signature.......... Date.....26-NOV-2021.....

Lawrence Sang Kipng'etich

Reg. No. B92/75645/2014

### Supervisor's Declaration

This project has been submitted for examination with my approval as a University Supervisor.

Signature.......... Date.....26. 11. 2021.....

Name of Supervisor Mr. Nicky M. Nzioki

## **ACKNOWLEDGEMENT**

First, I acknowledge and give thanks to the Almighty God for being with me this far. He equipped me with grace and strength which have been an encouragement and a pillar throughout my academic life.

Second, I appreciate the University of Nairobi, Department of Real Estate academic staff for instilling me with valuable knowledge and perseverance skills.

Lastly, I am grateful to my supervisor **Senior Lecturer Mr. Nzioki** for his timely guidance, inspiration and moral support during my research process.

## **DEDICATION**

To my dear wife (Doris Cheron) and my beloved children (Stephany C. Sang & Abraham Kiptoo Sabulei), May the Almighty God bless you

## ABSTRACT

The railway lines act as routes in enhancing movements of people and goods from one location to another in a given region or urban area. These functions which contribute to property value have both economic and environmental effects on the given location. The focus of the Standard Gauge Railway (SGR) was to enhance accessibility to the study area, Athi River has a dominance of industrial properties. This category of real estate property is mainly concerned with uses such as wholesaling, warehousing, processing, and manufacturing. These properties may be classified as light industrial park, heavy industrial park and industrial park for storage/wholesale uses. This study therefore explores the general contributions of railway development on the industrial property values. The study identifies and discusses various variables associated with a railway transport and the property values in the industrial areas.

The study was undertaken in Athi River area in the County of Machakos. The sampling frame for the area of study comprised the business community users of railway network and the residents. Primary data was collected through a field survey within the study area. The interviews schedules and structured questionnaires and direct observation were the methods used in data collection. An analysis was done to explain the finding using applied meta-analytical procedures and interpretation is achieved using SPSS data analysis.

Notably, this study shows that the development of SGR as a transit investment has affected the industrial property values positively. The SGR investment enhanced access to other locations from station locations. It also enhanced the property appeal to investors and uses, increasing the likelihood for developing the property. However, the development of the SGR had also some negative impacts on property values attributed to factors such as noise, visual intrusion, and the connotation that rail goes hand in hand with industrial uses. The study finds indications to support the assertion that the SGR has had a significant effect on the value of industrial property within the study area. The study recommends that: more investment in industrial properties along the SGR; change of the current institutional, policy and legal agenda; monitoring the rates at which the values and prices of the industrial property by government among others.

## TABLE OF CONTENTS

<b>DECLARATION</b> .....	<b>ii</b>
<b>ACKNOWLEDGEMENT</b> .....	<b>iii</b>
<b>DEDICATION</b> .....	<b>iv</b>
<b>ABSTRACT</b> .....	<b>v</b>
<b>TABLE OF CONTENTS</b> .....	<b>vi</b>
<b>LIST OF TABLES</b> .....	<b>x</b>
<b>LIST OF FIGURES</b> .....	<b>xi</b>
<b>ABBREVIATIONS AND ACRONYMS</b> .....	<b>xii</b>
<b>CHAPTER ONE</b> .....	<b>1</b>
<b>1.0 INTRODUCTION</b> .....	<b>1</b>
1.1 Background of the Study.....	1
1.2 Statement of the Problem .....	3
1.3 Objectives of the Study .....	4
1.3.1 General Objective .....	4
1.3.2 Specific Objectives .....	4
1.4 Research Questions .....	4
1.5 Hypothesis testing .....	4
1.6 Significance of the Study .....	4
1.7 Scope of the Study .....	5
1.7.1 Study Area.....	5
1.7.2 Conceptual Scope .....	5
1.8 Research Methodology.....	6
1.9 Organization of the Study.....	6
1.10 Definition of Key Terms .....	7
<b>CHAPTER TWO</b> .....	<b>8</b>
<b>2.0 LITERATURE REVIEW</b> .....	<b>8</b>
2.1 Introduction .....	8
2.2 Theoretical Background of the Study .....	8
2.2.1 Thunen Theory .....	8
2.2.2 Economic Theory of Demand and Supply .....	9
2.2.3 Concept of Land Value .....	10
2.3 Railway Development.....	11

2.3.1	Standard Gauge Railway (SGR) in Kenya.....	12
2.3.2	Factors Influencing Railway Development.....	13
2.3.3	Impacts of Railway Development .....	13
2.3.4	Effects of Railway development .....	14
2.4	Industrial Property .....	15
2.4.1	Types Industrial Property.....	15
2.4.2	Property Values .....	17
2.5	Policy Framework on Railway Infrastructure in Kenya .....	17
2.5.1	The Kenya Railways Act .....	17
2.5.2	The Integrated National Transport Policy.....	17
2.5.3	Vision 2030 .....	18
2.6	Factors Affecting Industrial Property Values .....	18
2.6.1	Location .....	18
2.6.2	Labor force.....	19
2.6.3	Physical Characteristics .....	19
2.6.4	Economic Factor.....	19
2.6.5	Government Intervention .....	20
2.6.6	Industrial Agglomeration .....	20
2.6.7	Transportation and Infrastructure .....	20
2.6.8	Technology Level.....	21
2.7	Challenges Facing Industrial Property Development .....	21
2.7.1	Lack of Transparency in Property Market .....	22
2.7.2	Lack of Accurate Transaction Data .....	22
2.7.3	Lack of Historical or Current Market Statistics on Demand and Supply .....	22
2.7.4	Property Acquisition with Inadequate Compensation .....	23
2.7.5	Complexity with Property Transaction Process .....	23
2.7.6	The Liquidity of Real Estate Market .....	23
2.7.7	Taxation of Real Estate Property.....	23
2.8	Railway Stations and Property Values .....	24
2.8.1	Case Study: Eastern Massachusetts.....	24
2.8.2	Case study: Portland .....	24
2.8.3	Case Study: Los Angeles County .....	25
2.8.4	Case Study: San Diego County .....	25
2.8.5	Conceptual Framework.....	25

<b>CHAPTER THREE .....</b>	<b>27</b>
<b>3.0 RESEARCH METHODOLOGY .....</b>	<b>27</b>
3.1 Introduction .....	27
3.2 The Study Area .....	27
3.2.1 Population Dynamics of the Study Area.....	27
3.2.2 Household Sizes .....	28
3.3 Research Design .....	28
3.4 Target Population of the Study .....	29
3.4.1 Real Estate Professions .....	29
3.4.2 Tenant to the Industrial Property.....	29
3.4.3 The Industrial Property owners .....	30
3.5 Sampling Procedures.....	30
3.5.1 Sample Size.....	31
3.6 Data Collection Procedure.....	32
3.6.1 Observation .....	32
3.6.2 Photography .....	32
3.6.3 Interviews.....	32
3.6.4 Questionnaires.....	33
3.6.5 Literature Review .....	33
3.6.6 Pilot Study.....	33
3.6.7 Validity .....	33
3.6.8 Reliability.....	34
3.7 Data Analysis and Presentation .....	34
3.8 Study Limitation .....	35
<b>CHAPTER FOUR.....</b>	<b>36</b>
<b>4.0 DATA PRESENTATION AND ANALYSIS.....</b>	<b>36</b>
4.1 Introduction .....	36
4.2 Response Rate.....	36
4.3 Findings on Industrial Property .....	37
4.3.1 Industrial Property within Athi River Town.....	37
4.3.2 Industrial Property Values .....	38
4.3.3 Industrial Property Rentals.....	41
4.4 Aerial Image Analysis.....	42
4.5 Conclusion.....	43



4.6	Factors Influencing the Industrial Property Values .....	44
4.6.1	The Factors Influencing the Development of SGR in Athi River .....	45
4.7	The Effects SGR Development .....	46
4.8	Challenges on Industrial Property Development .....	46
4.9	Hypothesis Testing.....	48
<b>CHAPTER FIVE.....</b>		<b>50</b>
<b>5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS.....</b>		<b>50</b>
5.1	Introduction .....	50
5.2	Main Findings.....	50
5.2.1	The extend of industrial property development .....	50
5.2.2	The effects of the Standard Gauge Railway on industrial property .....	50
5.2.3	The causes of variations in values of industrial property along SGR. ....	51
5.2.4	The challenges of developing industrial properties along railway line .....	51
5.3	Conclusions .....	51
5.4	Recommendations.....	52
5.5	Suggestions for Further Research .....	52
<b>REFERRENCES .....</b>		<b>54</b>
<b>APPENDICES.....</b>		<b>59</b>
Appendix A: Questionnaire for the Real Estate Professions.....		59
Appendix B: Questionnaire for Tenants in the Industrial Property .....		61
Appendix C: Questionnaire for the Property Owners .....		63
Appendix D: Images of Study Area .....		65
Appendix E: Google Map for the study area.....		67

## LIST OF TABLES

Table 3.1: Population Projections for the study area .....	27
Table 3.2: Projected Household Sizes.....	28
Table 3.3: Cronbach’s alpha values .....	34
Table 4.1: Response Rate for Data Gathering .....	37
Table 4.2: Anova, Single Factor Analysis.....	38
Table 4.3: T-Test Results Analysis Price of Warehouse.....	40
Table 4.4: T-Test Analysis on Values of Industrial property .....	42
Table 4.5: Factors influencing the Industrial Property values.....	44
Table 4.6: The table of factors influencing the development of SGR in Athi River .....	45
Table 4.7: Table of Effects of SGR on industrial property .....	46
Table 4.8: The challenges of SGR on the Industrial Property development .....	47
Table 4.9: Challenges of Industrial Property.....	48

## LIST OF FIGURES

Figure 2.1: Conceptual Framework .....	26
Figure 4.1: The types of Industrial Property within Athi River Town .....	37
Figure 4.2: Land Value.....	38
Figure 4.3: Price of Industrial Property.....	39
Figure 4.4: Effect of SGR on Land Appreciation of Land values .....	41
Figure 4.5: Rent values for Industrial Property .....	41
Figure 4.6 Figure 4.6: A map showing land uses .....	43
Figure 4.7: The factors influencing the Industrial Property values .....	44
Figure 4.8: The factors influencing the development of SGR in Athi River .....	45
Figure 4.9: The figure showing how SGR have affected industrial property .....	46
Figure 4.10: The challenges of SGR on the Industrial Property development.....	47

## **ABBREVIATIONS AND ACRONYMS**

<b>C.B. D</b>	Central Business District
<b>C.C.C.C</b>	China Communications Construction Company Ltd.
<b>C.R.B.C</b>	China Road and Bridges Corporation
<b>E.A.C</b>	East African Community
<b>E.I.A</b>	Environmental Impact Assessment
<b>EPZ</b>	Export Processing Zone
<b>GoK</b>	Government of Kenya
<b>I.C.T</b>	Information Communication Technology
<b>K.R</b>	Kenya Railways
<b>K.R.C</b>	Kenya Railways Corporation
<b>KEPSA</b>	Kenya Private Sector Alliance
<b>L.R.T</b>	Light Rail Transit
<b>NEMA</b>	National Environmental Management Authority
<b>R.D.L</b>	Railways Development Levy
<b>S.G.R</b>	Standard Gauge Railway
<b>SPSS</b>	Statistical Package for Social Sciences

# CHAPTER ONE

## 1 INTRODUCTION

### 1.1 Background of the Study

The growth of cities has relied on the efficiency of good railway transport, and today the world's largest cities no longer rely on motorized transport (Takao & Norihisa, 2015). According to Baruch, 2013, the development of railway transport can possibly affect the economy of an urban area through reduction in cost of travel and time spend while moving around. It can also improve the activities of the City Centre, thus increasing the cluster of economies in the urban area. Urban railway transport is viewed a great encouragement towards intensive development especially around railway terminals. It is also a significant mean in protection of the urban environment through minimising over relying on cars and offers an alternative to the over relying on cars (Kinuthia, 2014).

Until the 1960s, African countries did not consider the urban transport important to the economic development and governance (Patrick et al., 2015). Accordingly, the institutions framework and the physical infrastructure developed during the colonial period still controls the African railway transport systems. The transport system is also guided by policies and procedures set up in early decades of African independence. These policies which have not been revised have led this transport system to depreciate over the years after independence. In the past decades, structural adjustment programmes through renewed policy frameworks and financial adjustments in some of African countries like South Africa and Egypt led to a renewed interest in developing the railway transport infrastructure (Irandu, 2015). This was occasioned by factors such as the trade liberalization, regulations on national trade and transfer of state-owned entities to private like the parastatal. As a result, there have been significant restructuring of transport systems in Africa (Patrick et al., 2015).

In August 2013, the Republics of Kenya, Rwanda and Uganda held an infrastructure summit in Uganda that culminated to the signing of the three-fold treaty on the advancement and operation of the Standard Gauge Railway (SGR). This railway line was meant to run from the Mombasa City in Kenya to Kigali in Rwanda through Kampala in Uganda. The Standard Gauge Railway development was meant to have branches; one branch line from Naivasha Town to Kisumu City in Kenya; and other branch line from an area called Pakwach/Gul-Nimule Uganda). In May 2014, the South Sudan government also followed in suit when it assented to the agreement where the SGR line was to be extended to Juba. The Partner States were required to come up with a suitable policy and procedures for the development and operations of the Standard Gauge

Railways. The policy and procedures which had been developed were consented to member states in May 2014 (Northern Corridor Integration Projects, 2018).

Kenya and Tanzania led in the development of railway transport in the East Africa. The Tazara Railway in Tanzania, East Africa is commonly referred to as the Uhuru Railway or the Tanzam Railway links the port of Dar es salaam to Kapiri Mposhi in Zambia's Central Province. The railway line was built by efforts from governments of Zambia, Tanzania, and China to remove landlocked Zambia's dependence on South Africa for economic support (Barigaba, 2017).

The Mombasa- Malaba railway line which was developed in the early 1890s by the colonial regime, is the main railway line which serves the Republic of Kenya. This railway network has experienced disrepair over the years as a result of low level of maintenance, inadequate technology in railway line management leading to almost outdated transport system in the affected towns and the country at large. This has also affected connectivity between various towns and urban areas in the country (Mairura, 2015).

The Government of Kenya is constructing two corridors of Standard Gauge Railway (SGR) transport system which shall entail modern, high capacity transport to handle both passengers and freight within the country. The railway line begins at the Mombasa (Port City) on Indian Ocean shores and extends through the Northern corridor via Nairobi, Kisumu to Malaba. The first phase of the SGR line launched in 2017 cuts through Kwale, Taita Taveta, Makueni, Machakos and Kajiado from Mombasa towns and terminates in Nairobi City. The second phase started from Nairobi City to Naivasha town through Narok town. The third and final phase shall traverse from Naivasha, through Bomet, Nyamira, Kisumu, Yala, and Mumias to Malaba towns (Barigaba, 2017).

The development of infrastructure such as the Standard Gauge Railway, International Airport, Ports and Super Highway in most of Countries especially the Sub-Saharan African have attracted tremendous attentions by most governments (AFDB, 2016). These developments are likely to rejuvenate not only the domestic productivity but also, they will affect real estate developments. Therefore, this research shall examine the likely outcome of the infrastructure development of such magnitude as the SGR on industrial property.

The focus of the SGR was to enhance manufacturing and the study area, Athi River has a dominance of industrial properties. This category of real estate property is mainly concerned with those properties developed to be used for a wide range of industrial uses including commercial practices that is limited to wholesaling, warehousing, processing, and manufacturing

(Bowes & Keith, 2016). These properties may be classified into three sub categories that are; light industrial park, heavy industrial park and industrial park for storage/wholesale uses. The industrial property in Nairobi City, was zoned within Industrial area located along Mombasa road, Enterprice road and Kangudo road/Outering Road. The industrial zones are supported by other uses such as recreational areas and the space requirement would be computed based on the use of space standards and population of the city.

The study shall explore the general contributions and impacts of the railway development on the real estate development with special reference to industrial property. The study shall identify and discuss various variables associated with a railway transport and real estate investment with special interest on how the property values in the industrial areas have been affected.

## **1.2 Statement of the Problem**

Investment in infrastructure of a large magnitude like SGR is an instruments employed by developeming nations to provide alternative for problems associated with road transport and land-uses. This investment is also used to promote growth in manufaturing and industrial activities. The railway transport tends to have relative advantage over other modes of transport influenced by speeds of containerization, high costs of energy and new expansions of traffic and bulk trade. The development of the SGR has paved way to the upsurge of the real estate property causing the property market also to grow. This has led to the gradual but steady rise in the values of property adjacent to this real estate development especially in urban and suburban areas.

The Kenya Uganda and Rwanda who had signed an agreement for the development of SGR expect economic shift and boost to the respective country's GDP (The Star, 2017). The elevation of Kenyan economic development along the railway line, the need for satisfactory and long-term transport capacity as well as strengthening the competitiveness of the railway vis-a-vis various transportation modes quidded the development of SGR in Kenya. This SGR was also meant to, facilitating the collection and distribution of ports and improve on the organization and dispatch railway transport system (Cervero & Michael, 2017). This principle shows an indication that the industrial properties were part of the design of SGR and they were designed along various railway Stations.

The announcement of the development of SGR attracted land buyers and property owners to speculate on real estate and land prices. During this point of announcement, the values of property were directly impacted especially properties that are along the route of the railway line. Similarly, there was a likely impact on the industrial properties. Most properties close to both the new and old railway stations were affected.

The research project shall determine the effect the development of SGR has caused on the value of industrial property. The investigation was carried out to determine what has happened since the announcement of project in Kenya. The outcome was described based on the causes and effects of SGR on industrial property values. The key variables assessed for the study are the prices on property values and number of structures influenced by the development of the SGR. This is assessed by comparing the situation before and after the development of the SGR.

### **1.3 Objectives of the Study**

#### **1.3.1 General Objective**

The study intends to evaluate the impacts of Standard Gauge Railway on industrial property since the announcement of project in Kenya. This study described these impacts based on the effects the standard gauge railway on industrial property values along Athi River region.

#### **1.3.2 Specific Objectives**

Specifically, the study shall be guided by the following objective:

- i. To examine the extent of industrial property investment within the Athi River town.
- ii. To determine the effects of the standard gauge railway on industrial property.
- iii. To describe the causes of variations in values of industrial property along Standard Gauge Railway.
- iv. To evaluate the challenges of developing industrial properties along railway line.

### **1.4 Research Questions**

- i. What extent is the development of standard gauge railway within industrial zone?
- ii. What are the effects of the SGR on industrial property?
- iii. What are the causes of variations in values of industrial property along SGR?
- iv. What are the challenges of developing industrial properties along railway line?

### **1.5 Hypothesis testing**

The hypothesis that was tested was the null and alternative that were:

**H<sub>0</sub>**: The location of industrial property from the SGR does not affect the value of the property.

**H<sub>1</sub>**: The location of industrial property from the SGR affects the value of the property.

### **1.6 Significance of the Study**

The railway transport system has an important role in enabling economic development for many countries in the world. The railway transport has been diversified by dynamic technology from steam engine trains to current electrified trains (Todd, 2012). The latest technology in rail



transport has led to explosion in industrialization, an occurrence which is being felt in several Urban centres especially within the region of the Nairobi Metropolitan. The new level of industrialization being propelled by the railway development is affecting the sustainability of real estate development especially the industrial properties. Athi River Town for instance, there is a major influx of investment in industrial property. Industries are mushrooming within this zone as the ultimate destination for industrial development as a result of the development of SGR. Several industrial properties existed before the construction of the SGR such as Athi River Steel Plant, Fortis Industrial Park, Export Processing Zone Authority (EPZA) Factory and Kapa Oil Refineries among others. Therefore because of this study, the government through Kenya Railway Corporation and Ministry of Transport would learn on the wide effect of the SGR on industrial property. The study shall also advise the real estate investors on the possible impacts cause by the SGR on industrial properties. The public shall also be informed on the social, environmental and economic outcomes caused by the SGR to generate liveable societies and help the industrialization process.

It is thus imperative to study the changes on industrial property caused by the developemnt of the railway. The research specifically looks into the likely effects of SGR on industrial property within Athi River town of Machakos County.

## **1.7 Scope of the Study**

### **1.7.1 Study Area**

The physical extent or the study area was within Athi River town and its surrounding in Machakos County. The study was restricted to investigation of the effects of the SGR on the industrial properties within the study area which is Athi River town mainly because of the Athi River SGR station.

### **1.7.2 Conceptual Scope**

The study focused industrial property developers in real estate industry. The evaluation is within the context whereby the development of SGR calls for ascertainment of its performance towards the industrial property in Kenyan to establish its eventual effects. Parameters derived from the industrial property developer's satisfaction was sought in depth to bring about a comparison. Based on the industrial property developers' perspective: the number and extent of industrial projects, the cost incurred while purchasing the property and the effect of the SGR on property and the challenges experienced. Whereas on the other hand, variables from government officer's point of view will include: the land values along the SGR, the effects of the SGR and the challenges in delivery of industrial property within the study area.

Furthermore, the study will attempt to find out the challenges faced by the industrial property development caused by the development of SGR and thorough examination of the legislative framework governing it, investigating the opportunities as well as analysing the success and failures of the SGR development. The research hypothesis states that a development in rail structure causes and increase in properties within the railway line.

## **1.8 Research Methodology**

The quantitative and qualitative methodology of research and data collection shall be used in this study. Data was collected and qualified bases on responses received form the respondents. The method is the most suitable in such a study because the data collected can be analysed easily to illustrate the impact of real estate development on the industrial properties within Athi River area from the answered research questions.

A sample of the population within Athi River was considered in order to represent the total population based on the study objective. Mugenda (2003), refer to a sample as an actual number of cases or entities, components or subjects in a population that were monitored and is important in determining the statistical precision of the study. This study considered a random sample from industrial properties within the study area. A clustered sample was also considered on the general population within Athi River to represent the views of dwellers.

The primary data was gathered through structured questionnaires. The questions in the questionnaires were both closed and open ended designed in a manner in which the respondent would easily interpret and give answers appropriately. This assisted to capture all required information for solving the principal problem.

## **1.9 Organization of the Study**

This research project has been organised in the following format:

**Chapter One:** This is the first chapter of the research project and forms the introduction, where the background information of the study topic is discussed. It also discusses the statement of the problem, the research objectives and questions, scope of the study project and the justification of the research.

**Chapter Two:** This section has the discussion of the various existing literature and theories relevant to this study. This literature shall guide in the subsequent field research for the selected scope of the study. It has the following vital sub-sections; introduction, literature review, legal framework, and the conceptual model.

**Chapter Three:** This section contains the research design and methodology adopted for this research project. It has highlighted the design used in research, study area, study population and the targeted respondents, sampling approach, instrument and methods used for collection of data, techniques to analysis data, with considerations of ethical issues in the research,

**Chapter Four:** This section constitutes the data analysis and presentation. It highlights the results on the data collected from various respondents where the questionnaires were directed to and response made as well as other approaches used on data collection.

**Chapter Five:** This section contains the summary of findings, recommendations and proposed areas where other research can be carried out similar to this study.

### **1.10 Definition of Key Terms**

**Development controls** - Refers to government regulations that legalize the use of land. They include zoning laws, building codes, and rent controls among others.

**Industrial property** This is a category of real estate property mainly concerned with uses such as wholesaling, warehousing, processing, and manufacturing. These properties may be classified as light industrial park, heavy industrial park and industrial park for storage/wholesale uses.

**Land** - Land refers to the physical slump, any permanent structure erects on it, the geo-space below and the air above.

**Land use** - Land use refers to the activity of man directly related to land or simply human use of land.

**Value** - Value relates to a reasonable or appropriate monetary figure equivalent to the element or commodity during sale or exchanged. It also, the worthiness of an element/ action or commodity in money or goods at a given time, market price or the quality of a thing based on its assumption of being more or less on demand, treasured and important.

## CHAPTER TWO

### 2 LITERATURE REVIEW

#### 2.1 Introduction

This chapter contains the review of studies done by other scholars on the effects of railway transport on property values, keenly focusing on industrial property globally. Among the literature reviewed are works done by local scholars on land use, land use values and causes of land value appreciation. The literature further reveals that most studies in the past have relied on data from tax assessors' records and have been majorly on the impact of highway facilities. However, the literature is modest in covering the direct effect of railway transport system on industrial property in Kenya.

#### 2.2 Theoretical Background of the Study

##### 2.2.1 Thunen Theory

The Thunen theory advanced by Von Thünen in 1863 emphasizes that the value land and land use depend on the cost of transportation within an urban area. According to Von Thunen, it is possible to apportion the value of land based on the transport expenses influenced by the location of the property and a given level of productivity, (Grass, 1992). Other successful studies by economists upgraded this prototype on values of the property including the bid-rent model (Alonso, 1964; Muth, 1969). This model on bid-rent is established based on the fact that someone is willing to part with an amount of money dependent on the location of the property. Therefore, the model stipulates that a rent gradient decreases as the distance from the core of the urban area or urban node increases, leading to an equilibrium of demand for the land. These theories therefore advance a key perimeter in describing the variance between land or property values based on the movements as measured by the distance covered to the core of the urban area or urban node and the subsequent costs incurred. The model adopted assumptions of the physical features of the property such as productiveness in the case of Thünen.

Over time the hedonic pricing model became popular that evaluated the characteristics of the land such as the physical features to be a vital component in explaining the disparities in values of land and property. The pricing model helps to identify the internal factors affecting a certain good. In assessing property, the cost of land is in essence influenced by the characteristics of the land (size, services, appearance) as well as the characteristics of the surroundings. The bid-rent theory considers that the size of land or properties rise with an increase in the distance to the core of the urban area (Fujita, 1989). The expenses on transportation while being reviewed as a

measure of accessibility seems limited when it comes to the urban properties. Some studies presented a more general concept of nearness of a place that combines all attributes that influence the possibility of interaction for a location for a given property (Hansen, 1959; Martellato et al., 1998). Despite having a wide-ranging description of the concept of access to a place simple measurement are applied due to the inadequate information and suitable measuring technique.

Nevertheless, the idea of accessibility is subjected to problems related to definition and measurement. The index on nearness to a place for property leads to an increased value for a property. In the previous explorations on land values, ecological features were overlooked, however the theory on hedonic price simplifies their considerations. The idea of ecological features has more problems on definition and measurement compared to the concept accessibility. The SGR project in Kenya was therefore subjected to an Environmental Impact Assessment, EIA study alongside Environmental Audit during the implementation. After defining and gaging the concept of ecological features, the relationship with the land value is described as: the property value is higher whenever the favourable amenity index is higher. The study adopts a theoretical context from most of the studies that includes physical landscapes, accessibility perceptions and amenity factors.

### **2.2.2 Economic Theory of Demand and Supply**

Numerous studies like study done by Tsatsaronis and Zhu, (2014); and (Girouard, Kennedy, Noord & Andre, 2016), have been researched based on the principle of free economy the dealings of the demand and supply forces that control the value of industrial property. These demand factors include population growth, size of household, household income and employments, income tax policy and interest rates and house rent expenses (Girouard et al., 2016). Alternatively, the factors of supply like the accessibility and land prices, manpower, raw materials and investment to supplement supply of houses (Tsatsaronis & Zhu, 2014).

The factors of demand and supply which determine the real values of housing either have an immediate or future effect (Tsatsaronis and Zhu 2014). The growth of disposable income in a household, steady growth in population, the tax system features that might promote home ownership while discouraging other forms of obtaining wealth and the optimal interest rates level are some of the factors that influence demand for Real Estate The other factors that include the time taken for planning and construction of a property and the static nature of current town planning framework can affect the supply for housing units.

The other element on restrictions of the availability land for real estate development of home uses can affect the supply of housing which in turn also affect the value of house. These would include

unfriendly building regulations, standard of zoning rules, bureaucratic land administration processes, thereby restricting the level of land development (Girouard et al., 2016). This deters the level of delivery and supply of houses. Furthermore, an unforeseen increase in the interest rates by the lending institutions raises costs developing houses, or a harmful effect to the economy. This will therefore decrease the demand for houses, while house values will not grow it its likely to decline (Himmelberg, Mayer & Sinai, 2015). The relationship between demand and supply which are important factors shall eventually settle at an equilibrium value.

This theory will be very important in this study as it will address the theoretical explanations of population variable on the demand side and construction costs variable on the supply side.

### **2.2.3 Concept of Land Value**

Land has been defined or viewed in diverse ways by different people. For instance, land as a factor of production, land as space, or as a form of wealth among others (McLaughlin, 1988). In Kenya, where the constitution is the primary source of law governing the land, Article 260 of the Constitution of Kenya 2010 refer to land as; “land includes: whatever is on earth’s surface and the subsurface matters like rocks, subsoils, water body, marine waters, natural resources contained on or under the surface and the air space above the surface” (Constitution, 2015).

Additionally, various Acts of Parliament give various definitions of land. According to the Physical Planning Act (Cap 286), land is any land covered with water, any buildings or other things attached to it, and any interest or right of easement in, to or over the land. Food Agriculture Organization (FAO) further defines land as “a geographical extend on earth’s described through terrestrial surface including all attributes of the biological elements above or below the earth.”

Guided by the focus of this study, land includes the physical slump, any permanent structures erected on it, the geo-space below and the air above according to Williamson (1983). This definition brings out the aspects of land stated in the constitution without contradiction and it blends with the study regarding land utilization.

Value as defined in economics refers to the regard in which something is thought of or can be switched for within existing situations on the market. Simply states as the higher the esteem the greater the exchange power. That means for a commodity offered in great demand, several options are usually will be proposed for exchange. Conversely, if the item is held in low esteem, less things or options will be offered in exchange. The term “value” as stated by Ricardo’s relates to a reasonable or suitable monetary or commodity equivalent for things exchanged for; the equivalent in monetary or goods at a current state of time also the market price; or the quality of

a thing according to which it is supposed as more or less desirable, valuable and significance (Sraffa, 1951).

Land use is man's activities directly related to land or human use of land (Turner et al, 1994). Land use can also be defined as the accommodation of all man's activities on land and the way land is basically used for agricultural purposes, forest, and ranges. In current literature, the use value of a commodity is considered the direct utility one receives from its utilization. The routine value of the commodity shall depend on the needs and wants of the consumers of the product. Use value is simply the value of a property for a particular use or to a particular user, reflecting the extent of the property contributing to the function or profitability of an enterprise (Burkhardt, 1998).

Forkenbrock (1990) suggests that uniform environments do not apply to various locations. This means that the value of land is a function of other variables, furthestmost important are the uses nearby the piece of land. Forkenbrock points at other factors capable to affect land values other than land use controls; accessibility; availability of capital funds, topography, drainage, regional growth or decline, supply and demand relationships in the local real estate markets. The highlighted factors make isolating the influence of the SGR difficult particularly with regards to the net gains of the society as a whole because of land value appreciation along the SGR route.

Fejarang (1994) discovered that prices of real estate property depend on its location. The demand and the bidding process push the prices up for a property as the location turn out to be more attractive when influenced by certain characteristic like the proximity to the CBD that influences an increase in property prices. Investments in infrastructure to support transport system to an extent it eases the demand near the CBD through appealing for more residential development around the transport corridor and nodes (Fejarang, 1994). Properties close to transport nodes like the railway stations, benefit through reduced transport time and cost to access their destination thereby profiting on the infrastructure developments. It is expected that a price curve will decrease as one locates away from the station due to a decline in prices.

### **2.3 Railway Development**

There is a growing interest from both scholars and experts on the problems related to both infrastructure and railway development. Railway development is favored by developing nations as it has the capabilities of developing the appeal and value of efficient urban public transport as it leads to a sustainable and efficient transport network (Du & Malley, 2006). The railway transport systems are implemented due to an increase in populations and dependence on motor vehicles that congest roads causing a decrease in the standard of living. Realizing new railway

transport systems into an urban environment is problematic in initial phases but the long-term paybacks are permanent.

The development of railway stations is capable of attracting real estate development like retail center, shops and warehouses for commercial purposes; residential and causing to increased property values (Edwards & Mackett, 1996; Gibbons & Machin, 2015). The real estate developments can be organized around the location of the railway stations. The movement of regional and national freight can also emerge because of an efficient railway transport. The formation of railway station hubs along the railway could solve the problem of overdependence on private motor vehicles transport around the area.

### **2.3.1 Standard Gauge Railway (SGR) in Kenya**

The SGR project is a key and leading project for the Kenya's Vision 2030 meant to help in strengthening cooperation among East Africa Community, EAC, through promoting economic development within the region. The project is within the Kenya National Transport Policy, KNTP – Moving a Working Nation (2009). The cargo flow along the SGR is expected to have bulk loads including fuel oil and petroleum products, shipped containers and cement transported from Mombasa Port and to Nairobi, Naivasha Kisumu and Malaba. It will also facilitate the transportation of local commodities produced along the railway line. The railway transport will also meet the demands for local passenger. The project is expected to rejuvenated existing urban centers situated along Mombasa-Nairobi highway caused by the business opportunities associated with the project. Apart from the existing 33 crossing stations other 5 stations will be constructed at Voi, Mariakani, Mtito Andei, Sultan Hamud and Athi River towns. The SGR has great economic benefits that will be realised both during and after development caused by the project works. Since the commencement of the project, both the KRC and CRBC clarified that construction materials are locally available will be procured from various places within the country. The project is expected to use 40% of local materials for the construction, civil works and job opportunities (Transport Newsletter Kenya, n.d)

SGR has two railway stations namely Imara Daima and Syokimau Railway Station. These stations are mainly commuter station that serve the residential neighbourhoods. Several studies indicate that passenger railway transport have a advanced impact on property value compared to other modes of travel (Cervero, 1984; Cervero and Duncan, 2016; NEO Rail II, 2016). Trips to Mombasa have begun with the train making two trips in a day at an affordable price for an average Kenyan.



Consequently, the size of parking spaces available within the railways station combined with the closeness to the railway station to the centre of the town increase the effect on the value of property (Bowes and Ihlanfeldt, 2016). The stations parking slots make it convenient for passengers boarding the train. These stations have also attracted other commercial points around the park such as coffee shops and industrial parks.

### **2.3.2 Factors Influencing Railway Development**

The growing rate of transit modes especially rail and expansion of roads have come at a peril in as much as they have propelled land values globally. The issues related with rise of railways transport has been preferred by governments because of its abilities to increase the appeal and quality of urban transport system thereby leading to a sustainable and well-organized transport system (Du & Malley, 2006). Railway line remains the most energy efficient mode of transporting both cargo and passengers with capability of high volume at high speeds (GoK, Ministry of Transport 2015).

The development of the rail in location based facilitated by the availability of resources. The location is in reference to proximity to major public centres and social amenities and the security of lives and property is very essential to prospective investors. The infrastructure development influence locations and contributes to the appreciation property value. Location is by far the most important factor and that although it is non-controllable due to the fixed nature of land, its attributes play a huge role in controlling land values.

### **2.3.3 Impacts of Railway Development**

Several factors lead to the variation of property values as a result of development of railway station on the. According to Debrezion et.al, the property values can be affected based on the level of services, land uses and demographic segmentation (Debrezion, Pels & Rietveld, 2015).

#### **i. The Level of services provided by railway transport.**

The service levels provided in railway transport in terms of transport networks, service coverage, connectivity and the passenger capacity vary for several railway stations. Railways stations create different impact on the value surrounding properties. Railway station at similar levels can contrast in the level of service and superiority of amenities. The impact level of railway stations on the surrounding properties vary owing to extend service and excellence of facilities available at the stations (Debrezion 2004). According to Bowes and Ihlanfeldt, 2016, serverices such as adequate parking facilities at the railway stations have a greaterer positive impact on the value of the property.

## **ii. The Type of Land Use.**

The railway stations have varying effects on various properties including commercial, industrial and residential properties. The railway development has significant impact on the different property types as it is significantly felt closer to the stations on industrial and commercial land uses compared to residential properties. It is also clear that a property value of residential properties is as easily identifiable as compared to commercial properties.

## **iii. The Demographic Segments**

Income and socio-economic factors of a given location are probably to have influence on the property values. Property closer to a railway station is valuable and could attract multiple real estate developments characterized by high density development compared to low-density developments (Nelson, 1998; Bowes & Ihlanfeldt, 2016). The low-income population tend to rely heavily on public transport thus the property is attractive increasing the population due to proximity to the station.

### **2.3.4 Effects of Railway development**

#### **a. Increase in real estate development**

An important effect of railway development is the increase in the quantity of existing and the potential of residential neighborhoods a distance to employment centers, retail areas like shopping malls, recreation facilities, and other activities. This upsurge in accessibility to these facilities, which means the decrease in operating costs, incurred moving from one point to another demonstrates the important direct effect accrued to the railway users (Gamble, *et al*, 1978).

#### **b. Increase in the movement of people and goods**

Commonly, individuals who commute by train perceive that transporting people to and from their workplaces is the main reason of the railways. Robert Peel in the late 1830s reveals that: “Whatever improvement in communication will enable the poor man to carry his labour, perhaps the only valuable property he possesses, to the best market... must be a decided advantage, not only to him, but the community at large”. It was noted among the funders in the Great Western Railway line that the merchants of Bristol have a different opinion to Robert. Their main concern in investing in the line was to link Bristol City to London. The connection enabled movement of goods across the two ports faster than they could using the canal, hence the city gained advantage over Liverpool their competitors in the transatlantic trade.

### **c. Increase in prices of property**

There is evidence that railway transport systems have a bigger impact on the prices of property than other transport systems have due to the development of railway and access to entire region (Cervero 1984). The rise in transport system presents a quick and influential effect towards the land uses and demand for properties which are beneficial in mobility while increases the land values. In other studies, Landis (1995) found consistently a relationship on the impacts of railway development on housing values due to high standard of services the rail transport systems provided. Therefore, capitalization profits based on this analysis rely on frequent, consistence and speedy service of the rail to a bigger market area.

According to Armstrong (1994) found out that property that are close to the railway stations directed impose a premium on the selling price. In his analysis, he reviewed the closeness to the railway station and the effect this would have on the property value. Armstrong concluded that the effect of commuter rail is generated by the nearness and independent proximity impacts.

### **d. Minimization of the access costs**

Reliability of the rail transport, allows for lowering of the general access costs to the real estate properties including the industrial properties. Railway development is likely to result in the improvement of access road to the industrial properties, which shall have to be expanded in terms of capacity, according to the improved traffic generation, and in line with prevailing political issues in favour of rail or in line with the public sector and environment protection.

## **2.4 Industrial Property**

The Industrial property shall be discussed in the widest sense and in this study, they shall apply not limited to industry and commercial property, but also to include agricultural and exploration and manufacturing industries.

### **2.4.1 Types Industrial Property**

The industrial property market involves of difference types of properties. The following descriptions is of categories of property falling within industrial class;

#### **1. Warehouse/ Distribution Buildings**

These categories of properties are those with space ranging from 50,000 – 500,000 square feet in one story buildings. The properties are usually used by distributing business inventory for storage and warehousing. These buildings also have several loading zones for trucks and lorries, and parking lots sufficient for heavy traffic. The buildings could consist of a small office space.

## **2. Cold Storage or Refrigeration Buildings**

These are industrial properties created to hold a huge volume of freezer space incorporated with cold storage facilities and are mostly used as a distribution centre for food products.

## **3. Heavy industrial properties**

These properties house particular machines commonly used to produce heavy goods or sensitive materials. The buildings are usually connected with high capacity, electric power made of three-phase connections and high capacity water lines, heavy ductwork, high volume ventilation, buss ducts, exhaust structures, floor drains, cranes and storage tanks.

## **4. Light Manufacturing Buildings**

Light manufacturing is a space that does not need extensive heavy machine or plant and space as opposed to the heavy industrial buildings. It shares similar activities as those that take place in flex buildings.

## **5. Telecom/ Data Hosting Centers**

The centers are dedicated industrial structures situated in closer to main communications facilities to enable connection to an enormously power supply with a capability of powering larger telecommunication equipment like servers and telecom switches among others. These centers have strong floor bases to support big weight of the machines, generators and specialized HVAC. These properties include Cyber Centers, Switching Centers, Telecommunication Centers, and Web Hosting Facilities.

## **6. Flex Buildings**

The building has the ability to house various uses, that is comply more than a single facility such as showroom retail sales, office space, research and development, light manufacturing, or used for small warehouse and distribution purposes.

## **7. R&D Buildings**

These building holds high technology including computers, electronics, and biotechnology. The flex building offer office space, manufacturing, and warehouse space as wide range of uses in one location, which are alternative space for the main activities. Presently, some of the spaces are converted to campus-like business parks with shared architecture design, detailed landscaping, and plenty of surface parking and open space.

## **8. Showroom Buildings**

These industrial developments offer a combination of retail space for displaying goods with extensive storage and distribution facilities. The developments are designed with half of the space set aside for sales and distribution.

## **2.4.2 Property Values**

The theory in property values can be explained based on the following: An increase in property demand depends on the attractiveness of the location due to certain characteristics like transport and nearness to CBD, thus leading the high prices. Therefore, closer to the urban center could be bear huge quality, which favors the property values. However, improvement in transport system in a given city is likely to reduce the demand of property close to the CBD by inviting households' settlements around the stations (Fejarang 1994). Properties located near the development enjoy benefits from these investments. The accessibility of the property is increased depending on the nearness to a transport facility and hence the property value.

## **2.5 Policy Framework on Railway Infrastructure in Kenya**

### **2.5.1 The Kenya Railways Act**

The railway line built during the 1890s and the port in Mombasa was the beginning of current transportation in Kenya. The first years of the 20<sup>th</sup> century, railway line was develop connecting the Mombasa port to Nairobi and extending further to Kisumu city (Patrick et al., 2015). the Kenya Railways Act Cap 397 established Kenya Railways Corporation (KRC) in 1978 to manage the operations of Railway. This government owned parastatal assumed the operations of East African Railways Corporation (EARC) in 1977 after the disbanding of the East African Community (EAC). The Railway Act amended in 2015, provides for responsibilities of the Corporation while overseeing the operations of the Railway line. The Act also mandates the Corporation to coordinate and integrated with port facilities and auxiliary road transport services.

### **2.5.2 The Integrated National Transport Policy**

The Ministry of Transport formulated the Integrated National Transport Policy in 2009 with the aim of giving solution to resolving problems in the transport like; lack of an urban/rural transport policy, unsuitable modal split untapped regional role of the transport network, pollution of the urban environmental and institutional deficiencies. Kenya lacked comprehensive policy to govern the operationality transport modes such as railway and ports (Irandu, 2015). Transport being a key perimeter in socio-economic development in Kenya and in response to national development strategy and Vision 2030, an Integrated National Transport Policy was developed. This policy also aimed at promoting both economic integration and establishing suitable institutional systems. It also helped in developing appropriate financing mechanisms and maintaining a synchronized transport system, land use planning and management systems,

developing a national transport information database, enhancing investments in the transport sector, enhancing public awareness, among others.

### **2.5.3 Vision 2030**

The Kenya Railways Corporation (KRC) has a role towards the achievement of Vision 2030; to resolutely linkage to the country by a railways network from main airports, ports, roads, and water channels among others together with the telecommunications facilities. Several leading projects in conformity with Vision 2030, being implemented include; Nairobi commuter rail service development, LAPSSET project; connected from Lamu port with Northern Kenya to South Sudan and Ethiopia; and standardization of railway gauge in Kenya.

The Kenya Railways Corporation through its Strategic Plan 2012-2017 aim at making the railway transport perform its right role in providing safe, efficient and reliable transport services for passengers and goods for all Kenyans. This strategic plan is in line with the Kenya Vision 2030.

## **2.6 Factors Affecting Industrial Property Values**

There are numerous explanations on why the property values to appreciate. The fact is that an investor real estate property will look for a mixture of factors that will result in the value to appreciate (Verheye2015). Some of the factors which shall probably determine the values of property are;

### **2.6.1 Location**

The real estate market is dependent to the prevailing economic status of the area because of the immobility nature. The location characteristics of a property should be well-thought-out in the examining the property value (Kim 2014). It noted that location features such as social-economic, transportation, zoning, topography, utilities, environmental and public policies are likely to determine the values of a property. Henneberry (2013) also detailed the location features, management and design of a property to have impact on the venture value. Fundamentally, the land may be in either at a good location, average locations or a poor location in the industrial areas. Industries with good locations will obviously have better value and the description of an advanced location will be different for each industry.

The land in urban areas could be suitable because of superior urban mobility. The infrastructure services in towns including the highways and light railways will promote mobility and reduce the transport costs and delivery times. Therefore, the urban industries are likely to gain in the sharing inputs, labor and skills knowledge matching and spillover. As a result, more industries

come ups which latter leads to increase land values. Hoag (2015) also argues out that a region with many industrial land and sufficient space for the development of a factory will have higher value.

### **2.6.2 Labor force**

Labor force is where a factory may require people to operate the plant therefore the lack of manpower will deter the operation and progress of the manufacturer. Labor is thus very significant for industrial manufacturing sector. In circumstances where there in need for expert, it may be beneficial to set up the plant in an area close to the suburbs as it is more accessible to labor in the low-income areas and the demand for the land is low (Hsia & Green, 2016). Thus, the industries property near to the outskirts of a town could be sold at a higher price.

### **2.6.3 Physical Characteristics**

The value of industrial property is determined by the size of a property. The price per unit would therefore decrease with the increase in the cumulative building size. In Philadelphia, according to Ming and Hin (2016), the land size affects the value of land in and industrial neighborhood. The other factor that he noted causes variation of land value was on the over-zoning of the industrial land. Industrial land is more flexible when huge space convenient whenever the firms intends to expand their facilities at a reasonable cost (Lin and Ben 2014). The value of the land is directly related to size of the property or the building where the decline in the value of the property experienced (Thomas 2017). The design of industrial property which sets out the dimensional for the movement in the property will also have an effect on the value of the building. Henneberry (2013) stated that a non-institutional design would have reduced the value of the building.

### **2.6.4 Economic Factor**

Economic activities and their conditions such as trade, manufacturing and employment directly affect the real estate development. Benjamin, Zietz and Sirmans (2013) and Ming and Hin (2016) claimed that the key pointers of economic circumstances touching on the market of rela estate property include per capita income and real wages, gross domestic product (GDP), unemployment rate, building material index consumer price index (CPI), and vacancy rate in a building, among others. Economic factors are explained within the parameters of supply and demand. Economic demand sum of the income for given community and its distribution, population as well as available capital. It also deals with the current real estate supply and the competitive environment of existing developments.

Jackson and White (2015), they property value in connected to type of product, the heterogeneity of the tenants and the value addition level all which will have impact on the rentals. The end point will also have an impact on the demand of the tenants, as uncertainty of the income is linked to expansion and improved competitive characteristics. They also observed that the history of a property may also influence its demand. Variations in GDP may also affect the rentals rates for industrial property due to rise in demand. Jackson and White (2015) argued that spending from consumers and supply of properties also influence rents for industrial property.

### **2.6.5 Government Intervention**

According to Zhang et al., (2018), planning policies and development zones affected development of China's industrial land. The use of subsidies to set lower market prices the governments offered large-scale investors in the rural land thus attracting the manufacturing companies and boost the growth of GDP through industrialization. The price for the public developer (government) in Taiwan is reported to be lower than the price for private developer. In addition, industrial parks developed by the government may have an impact on the price of industrial land for complex reasons, including good locations, and displeasure with administration.

### **2.6.6 Industrial Agglomeration**

Industrial agglomeration is where organizations decide to merge operational spaces to establish more strength to face the prevailing economies on the basis of different regional environmental features, (Hoover 2014). It may also denote to a concentration of industrial activity in order for entities to profit economically from one another. This phenomenon is suitable for small businesses, where they could not create their own economy. Its effect on industries can be where they are able to save on labor; transport and marketing costs.

### **2.6.7 Transportation and Infrastructure**

Infrastructure types comprise facilities that enables inland trade, which can be categorized as local infrastructure. According to Martin and Rogers (2015), a nation whose infrastructure are not well developed may have to restrict the industrial location as a result of the trade incorporation. The magnitudes of property values which can either be minor or major may be determined by the proximity of any property from railway line. General, the property value rises as a result of the reduction in transportation cost, (Martin & Rogers, 2015). A study by Ko and Cao (2013), while researching on the relationship between travel costs by rail and property values was analyzed, discovered that a subway station affected rental rates perpendicular to the



facility near to the station. Other similar results show that the distance of the property from railway line has an evidently affected the value of the property or land (Hsia & Green, 2016).

Arauzo (2015) also shows that the major infrastructural development has a substantial effect on the location of the industries. This includes identifying the industry's right location towards available infrastructure in order to lower transportation costs. Setting up of transport systems for the industrial sector must also relay on the required costs, hence the value of the industrial properties will also be affected.

### **2.6.8 Technology Level**

Wang, Shi and Zhang (2017) observed that technological advancement adds value to industrial property. Technological advancement apart from optimizing production methods, it also promoted efficiency at work place, optimizes processes of production, and also endorses efficiency in energy consumption. The level of technology will increase the value of industrial property is cost-effective and is geared to profit-making activities where funds are saved involving advanced technology in the operations.

## **2.7 Challenges Facing Industrial Property Development**

The retarded population growth between 1980s and 1990s, and the prevalence of poverty in Kenya may have led to slow growth in the infrastructure development including the railways and airports. During this period, most governments has less focus on railway development as this was not a priority on their development agendas. African countries had unique and dynamic demographic needs which needed to be addressed including drought and handling communicable diseases.

Railway development as a form of public investment is capital intensive prompting an overreliance on donor funding from developed countries and development institutions for most of African countries in terms of grants and loans that are channeled towards railway development (Gutman, Amadou & Chattopadhyay, 2015). This dependency has led to countries to remain indebted due to high loans received for many years.

There has been substantial hindrance towards operative regional integration in most of African countries. This has been affected by the country's less infrastructure development in transportation and insufficient capacity to benefit from the probabilities of modern railway development.

The challenges faced due to changing social and political environments has also hindered efforts towards development of railway infrastructure. The absence of advanced tactics to avoid

problem related to finances has also led to the huge shortfall development of railway Infrastructure (Kenya Economic report, 2009).

Another critical hindrance facing railway infrastructure in Kenya is the shortage in human resource. The manpower capacity within the institution mandates to development railway infrastructure like Kenya Railways is inadequate in terms of reforms and current technology. The poor inter-institutional coordination and constant interference would deepen this challenge which eventually would risk the achievement of railway development.

Developers in industrial property are likely to face numerous challenges including the land values, reserves and development loans with restrictions to raise money.

### **2.7.1 Lack of Transparency in Property Market**

The dynamic real estate sector is evolving and it faces lack of transparency. There have been examples of impervious and dishonest trends through poor administration of land and poor management of available information on real estate markets. This is caused by failures in the implementation of existing frameworks on property markets that has led to grave consequences to the development of property and investment. Investors and tenants tend to overlook the regions and areas where they are unable to address these deficiencies as an alternative to this they look for markets that are more transparent.

### **2.7.2 Lack of Accurate Transaction Data**

The opaqueness in the industrial property market could be accredited to limited data on property prices or values. This leads to inaccurate valuation estimations. Notwithstanding the promising outcomes produced using property values form secondary sources, there is still need to ensure availability of the most recent information on transaction in order to ensure accuracy.

### **2.7.3 Lack of Historical or Current Market Statistics on Demand and Supply**

The supply of real estate to some extent property depends on activities for the property in demand caused by gaps in construction market. Consequently, rent or property values fluctuate. The supply of property is sometimes static in the short-run leading to the increase in prices as demand increases in times of economic progress. Determining the change in industrial property over time enables an assessment of availability of property. Public institutions require permission for property development to guarantee compliance with health and safety codes. High rates vacancy in property signifies low demand for the property hence less units will be constructed.

#### **2.7.4 Property Acquisition with Inadequate Compensation**

Property and land acquisition are essential in a real estate market as it deals with aspects of the ongoing market values and addresses the failures in supply of necessary property for development. It also enhances the welfare of the citizens in the process of developing public utilities. These include the need to provide collective goods such as, infrastructure network and public services - schools, hospitals, parks and regeneration (Grover et al., 2007). The aim of land acquisition is to avail the real estate property for intended use within an identified location. The public institution may invoke the compulsory acquisition approach as provide in the laws to obtain the desired development. In other times, the reward is generous, fair and efficient during the displacement of people from existing homes and communities. Sometimes the owners could receive less of more value for the property acquired depending on the assessment. Where the procedure is not followed deliberately or the execution is carried out poorly, the intended development in real estate property may not be achieved (FAO, 2008).

#### **2.7.5 Complexity with Property Transaction Process**

A real estate property transaction is a multifaceted, process that can encompass many stakeholders and legal requirements which could take months before it is finalized. Investors in industrial property need to understand that real estate property transaction process which falls into three stages. These are consideration of the level of unlikelihood at each phase of the transaction and evaluation of the risks are involved, learning to distinguish investors expectation guided by expertise objectives; and the attainment of an appreciation for the value of the work involved alongside the transaction of the investors.

#### **2.7.6 The Liquidity of Real Estate Market**

Liquidity in real estate property markets can be related to the aspect of trading or market liquidity. Goodhart (2008) states that liquidity has many features and context in regards to real estate markets. Liquidity does not only refer to the amount of transaction but its influence on cost and price of the property as well. It also infers to liquidity as occurrence and property risks involved in monetization.

#### **2.7.7 Taxation of Real Estate Property**

Property taxation refer to the outgoings to the authority who provides common services like the provision of refuse collection and garbage disposal, paved roads and street lighting. According to Syagga, 1994, land rates payable to authorities are based on the current value of undeveloped site or improvements on site or a combination of both.

## **2.8 Railway Stations and Property Values**

A railway station could be evaluated either as transport node or as a place within a given geographical area, (Bertolini and Spit, 1998). The properties nearby a railway stations are affected through, accessibility and increase in facilities.

### **2.8.1 Case Study: Eastern Massachusetts**

The study to evaluate importance accessibility to local and regional area through commuter rail service in Eastern Massachusetts was done. The study found prove of the capitalization driven by access to commuter railway stations. Another evidence of capitalization was based on the access time while driving compared to walking time to the stations. It points out that properties located within a railway station have higher property values than properties located away from the station. Additionally, nearness to commuter railway development has some negative effect on property values.

### **2.8.2 Case study: Portland**

A study was conducted in Portland regarding value of undeveloped land and it showed that an announcement of plans to build a new transit system or extend an existing one had a positive effect on the sale prices of proximate vacant land (Knaap et al. 1999). Using hedonic models, the study concluded that the sales price per acre of unimproved land increased after the announcement of development plans. Initially, within the first year, there was a large increase in sale. In the second year, the property value showed that prices had decreased from the previous year but they remained at price levels higher than those prior to the announcement. In Kenya, upon the announcement of the SGR project, the sale values of undeveloped land are expected to have increased. The speculative increase reflects on the market sorting or spike of interest on developers.

Transit-oriented development has a positive impact including; addressing the urban traffic congestion problem and facilitating a more efficient urban land use arrangement. The markets in real estate indicates how concentrating developments around major transit facilities is important. The replica in the effect of proximity to transport facilities like railway stations and freeway interchanges on industrial properties is the Santa Clara County, and California Cities. In this towns, hedonic pricing theories were used as a basis for other factors like accessibility to the local area and the standard of neighborhood against isolating the impact of proximity on land values. Considerable capitalization benefits were on several commercial properties near a light railway stations and a large portion of commercial land in business district and within a distance a short distance to the commuter railway station. This finding was beneficial to commercial

investors and lenders as well as railway line management authorities. The assessment will assist in coming up with innovative financing programs in real estate. Considerate knowledge on the current value of properties adjacent to railway transport could be a basis for understanding the public-private development practice.

### **2.8.3 Case Study: Los Angeles County**

Further studies in Los Angeles County indicate the county had the worst traffic congestion in the USA, which anticipated the value of land and properties to rise near major transport nodes. The study examines this assumption while testing the hedonic price models. Sometimes the premiums on land value were known, however the general effects were irregular and unpredictable. In some studies, benefits of railway development manifested in multi-family housing close to the railway stations while other categories of property near the railway did have a less value. Properties meant for residential that are adjacent to railway stations had lower selling prices while properties for retail and shopping malls sold for more. This can possibly be explained that land values near major transit stops depended on the land uses and the form of real estate development.

### **2.8.4 Case Study: San Diego County**

Varying land uses along various railway transport channels that served San Diego County were found to have led to increase in land values whenever Hedonic price models was evident in the case of residential housing. The most noted impacts were on the multi residential houses, while for single -family housing adjacent to commuter railway stations, multifamily housing near railway stations and commercial properties, had a significant effect on the land values. Multi-family parcels along railway corridors experienced positive capitalization impacts in the range of 2% to 6%. There were also some cases of very large and commercial properties accrued negative capitalization and small benefits along rail-served corridors.

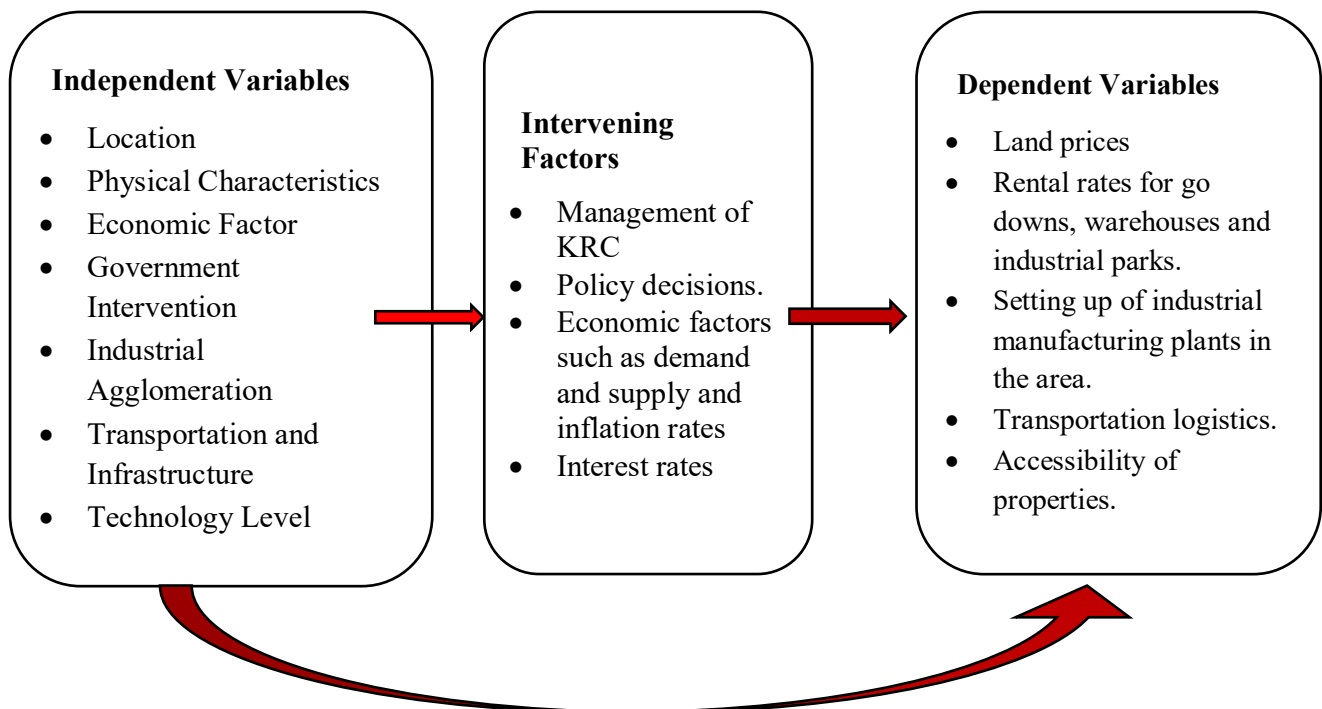
### **2.8.5 Conceptual Framework**

The railway transport structure in Kenya is exhibited through the existing by existing physical railway infrastructure and regulatory framework. Public institutions are responsible in guarantee effective operation through sound management of SGR for benefits such as economic growth in urban areas, improved quality of services, affordable transport costs, environmental conservation and protection, decreased in the travel time among others.

Referring to industrial property values, the price growing has been majorly due to the introduction of SGR. Other factors, other than location, have also significantly driven the prices up in the area.

Independent variables here refer to the factors that do not change and are fixed in nature whereas dependent variables change depending on the independent variables. In the framework, the intervening factors are seen as the factors that cut across or apply to both independent and dependent variables. These intervening factors directly affect both variables. However, the independent variables still directly affect the dependent variables.

**Figure 2.1: Conceptual Framework**



## CHAPTER THREE

### 3 RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter presents the research method which was used in undertaking this study. This comprises the design of the study and sample, area of study, techniques applied in collection of data. According to Berg (2009), research methodology is where the researcher lay doe a specific plan to be followed in order to reach at the solution to the research problem and it entails a proposal on data collection and data analysis.

#### 3.2 The Study Area

The study was undertaken in Athi River area in the County of Machakos. The name Athi originates form the Athi-Galana river system. The Athi River town is named after the first part of the river and the town is directly connected to Nairobi City through Mombasa Road and Namanga Road, a section of the Trans African Highway and forms the Great North Road. Effectually, the area has also been connected to Nairobi and other parts in the country through the Standard Gauge Railway. The town is significantly industrialized with a number of factories, mostly the cement factories including: Athi River Mining Company, East Africa Portland Cement Company, Bamburi Cement and Kenya Meat Commission. A railway station was built in 1920 has along the Mombasa – Nairobi line within the Athi River town.

##### 3.2.1 Population Dynamics of the Study Area

The Mavoko Sub-County in which the study area is located had a total population of 136,181 in the year 2009. Athi River town being the location of the study had the highest population of 50,854 according to the census report 2009. The population growth rate for the Mavoko sub-County is estimated to grow at 1.7% annually while towns like Kitengela shall grow at 5.5% and for Athi River Town is estimated to grow at 5.2%. Therefore, the current target population of Athi River town which was at **50,854** in 2009, is estimated is grow to about **80,254** the current year as shown in the table below.

**Table 3.1: Population Projections for the study area**

Year	2009	2016	2017	2018	2019	2020
Mavoko Sub County	136,181	138,496	150,675	153,237	155,842	158,491
Kitengela	30,453	32,128	41,990	44,299	46,736	49,306
<b>Athi River Town</b>	<b>50,854</b>	<b>53,498</b>	<b>68,932</b>	<b>72,516</b>	<b>76,287</b>	<b>80,254</b>

Source: Republic of Kenya: Economic Survey Various Issues

### 3.2.2 Household Sizes

Athi River town had 68.3% of its households having a maximum of 3 members based on the 2009 Population and Housing Census results. This is an indication that most residents have small families as shown in the table below.

**Table 3.2: Projected Household Sizes**

Ward/Sub-county/County/Country	Proportion of Household Members (Size)			
	0-3 (%)	6-Apr (%)	7+ (%)	Total
<b>Athi River</b>	<b>68.3</b>	<b>27.0</b>	<b>4.7</b>	<b>17,853</b>
Kitengela	66.9	27.2	5.9	10,220
Mavoko	64.7	28.4	6.9	44,156
Machakos	42.3	42.6	15.1	260,780
Nairobi	62.4	31.0	6.6	968,477
KENYA	41.5	38.4	20.1	8,493,380

**Source: Republic of Kenya: Economic Survey Various Issue**

### 3.3 Research Design

Gilbert A and Dawn I (2015), stated that a design for the research is the structure that guides the study while undertaking data collection and analysis. It is the scheme that is adhered to in a study. Research design ensures that a study will be relevant to the problem and that it follows economical procedures. This study uses the case study design as a qualitative approach to data analysis and involves complete observation of the environment, since the objectives require a detailed and intensive analysis. The case study approach proved to be the most appropriate as it provides an opportunity for intensive analysis of many specific details often overlooked and also allows for an in-depth study. It also describes the existing phenomena; "what is the current status" while referring to variables in a given case (Noresh, 1993). The process involved a reconnaissance survey of the Athi River Town which was aided in the delimitation of the area of study.

Participatory observation of key study parameters and unstructured interviews were used in data collection for real estate professionals, industrial property tenants and property owners. This was to aid into understanding the performance of SGR development on industrial property, in order to generate an intensive and detailed examination of the case. In particular, the study identifies the presence of SGR development on industrial region.



### **3.4 Target Population of the Study**

A population in research project is referred to as any cluster of persons, entities or institutions that have some similarity or resemblances which are of interests to the researcher (Cooper, 1996). The target population is therefore an imaginary set of individuals, objects or actions whose outcome whenever are generalized will assist in resolving the problem in the study (Mugenda and Mugenda 2003). They possess at least one common characteristic. The researcher therefore needs to identifies the accessible population and the target population for the study. This study targeted the industrial properties along the standard gauge railway project within Athi River Town. It is ordinarily from the population of the study that the researcher selects the sample. Consequently, the target population under investigation are likely to be either dispersed in a various location or the sample may be too huge for the researcher to investigate them. Thus, the population within the Athi River town was the target population in this research.

Among the targeted group were the professionals in real estate like the valuers and estate agents practicing within the study area. The other target group was the industrial property owners or developers of industrial investments and the tenants for the industrial properties. This population was targeted because it is believed they have a better knowledge of the operations and trends of the railway operations within the study area.

The industrial property development process has many players and may affects a lot of people within given town and the following are key affected stakeholders which the study has targeted:

#### **3.4.1 Real Estate Professions**

The target population of profession in real estate was to limited to the extent of standard gauge railway development within industrial zone within Athi river town. Additionally, to assess the number of industrial properties in comparison to the SGR development. Did the development of SGR have an influence on the industrial property with regards to values and availability of land? How is the industrial property market within the study area due to the SGR development? The stakeholders were key in providing information on the challenges of developing industrial properties along the SGR and railway line.

#### **3.4.2 Tenant to the Industrial Property**

They help to examine the effects of the standard gauge railway SGR on industrial property dictated by the level services provided by SGR to tenants; and the costs of renting a property within and without the SGR line within Athi River.

### **3.4.3 The Industrial Property owners**

This population will assist to determine the extent of standard gauge railway development within industrial zone within Athi river town. The values of industrial property project in comparison to the SGR development was evaluated. Did the development of SGR influence the industrial growth with regards to property values and availability of land? The stakeholders were key in providing information on the challenges of developing industrial properties along the SGR and railway line. They also provided information that assisted to evaluate the effects of the standard gauge railway on industrial property dictated by the level services provided by SGR and the costs of renting a property within and without the SGR line within Athi River.

### **3.5 Sampling Procedures**

Sampling is an exercise where the researcher identified a representation of the entire population. This was based on the research objectives and study questions to be answered. According to Mugenda (2003), the size of the sample is the definite quantity of subjects or elements, cases or entities in a sample population to be investigated and is important in determining the statistical precision of the study.

The study required data from the entire professional group but due to constraints of time and budget, a sample of the population had to be selected. The nature of the research needed the members of the sample to be; registered valuers, licensed estate agents, land owners within the vicinity and tenants of industrial space in the area of study.

According to Museleku (2012), sampling can either be probabilistic or non-probabilistic. Probabilistic sampling can be done using approaches such as random sample, stratified random and cluster sampling models. The non-probabilistic sampling also known as purposive sampling is encompasses the quota sampling and opportunity sampling. This study intends to use the following techniques:

#### **a) Simple Random Sampling**

In this sampling technique every entity in the population has same probability of being selected part of the response (Kothari, 2004). During the investigation using the household and business questionnaires, transects were derived from the core of the town to a radius of 2km outer wards of Athi River Area.

## b) Purposive Sampling Purposive

This sampling approach is really judgmental action by the researcher, it is an independent or discriminating sampling; the procedure relies on the investigator's decision on picking the units such as people, cases, actions, organizations, pieces of data to be deliberated on. This system of sampling supported the investigator in collecting specific information from a particular population of interest such key informants from real estate firms. The administrative offices and major industrial developments in Athi River were identified and interviews using the purposive sampling.

### 3.5.1 Sample Size

Considering the time, personnel and financial constraints, the research used a sampling technique(s) to determine a smaller number of respondents from the population to use in the study is referred to as a sample. The choice of sample size should be equal to or greater than thirty that can satisfy the requirement for most practical purposes even when the population is finite.

The population of Athi River Town is 80,254 persons hence the sample size was identified using the formula recommended by Nassiuma (2015) as follows:

$$n = \frac{NCv^2}{(Cv^2 + (N-1) e^2)}$$

Where n = sample size

N = population

Cv = Coefficient of variation (take 0.5)

E = Tolerance of desired level of confidence, take 0.05% at 95% confidence level

$$=198$$

The sample size for the tenants to the industrial property was calculated by use of a formula by American Marketing Association (2017), this is a simplified formula to calculate sample sizes.

$$Ss = \frac{Z^2 \times (p) \times (1-p)}{C^2}$$

(American Marketing Association, 2017)

Where;

Ss = sample size

Z = 1.96, the standard normal deviate at the required confidence level of 95%

p = 0.5, percentage picking a choice, (expressed as a decimal)

$c = 0.02$ , confidence interval ( $0.02 = + 2$ )

Therefore,

$$S_s = \frac{1.96^2 \times 0.5 \times (1 - 0.5)}{0.02}$$

$$S_s = 50$$

Hence a total of 50 questionnaires were administered in the study.

### **3.6 Data Collection Procedure**

The gathering of primary data from the field was through questionnaires. This were preferred since responses were grouped in a standardized way and they were objective compared to discussions, that are relatively fast to gather information and potentially data from a large portion of a group (Burns, 2015). Other methods and instruments of data collection were used and these included the following;

#### **3.6.1 Observation**

The physical characteristics that were important to the study such as the physical condition of railway infrastructure in Athi River were gathered and recoded. This data was very useful in verifying the other data collected through questionnaires.

#### **3.6.2 Photography**

The photographs were taken during the visit to the study area which provided valuable information for analysis and others were borrowed from Kenya Railway report useful for illustrating the railroad progress of the SGR, the railway stations in the area and land use distribution along the railway reserves.

#### **3.6.3 Interviews**

This technique involved gathering of information through face to face contact with persons in the in Athi River area of Machakos County. Designed interview schedules were also used (Appendix I &II), where the investigator sat with the respondent and administered structured questions. The interviews were carried out by visiting the administrative offices, industries, real estate firms and railway transport management offices. A trial study before the actual interviews was undertaken to ensure final schedules were well formulated. Questions for the interview were well explained to safeguard the integrity of the information form the respondents and their answers hence increase data validity and accuracy.

### **3.6.4 Questionnaires**

Information were gathered using surveys forms known as questionnaires which had both open and closed questions. The open questions provided the respondent an opportunity to express their views while in the closed questions the respondent was obliged to rank given options of various factors. The questionnaires were administered to the population of study. The questionnaires were dispersed to the sampled clusters of respondents through drop and pick method, and they were given time to fill while some were left and picked later.

### **3.6.5 Literature Review**

This was meant to obtain secondary data from existing relevant theories, publications and past studies. The output of the review includes demand and supply of properties surrounding the stations including their rental levels.

The study aided to document the progress made in restructuring railway transport in the Nairobi metropolitan and the continued progress of the SGR. The extensive review of relevant literature was carried through published and unpublished materials sources gave arithmetical data on cargo haulage levels, and socioeconomic potential of railway transport. The researcher went to numerous institutions including Kenya Railway Corporation headquarters and Ministry of Transport and Infrastructure, where some of the literature was obtained.

### **3.6.6 Pilot Study**

The reconnaissance study was carried out using questionnaires by directing them to the respondents prior to the main investigation. According to Cooper and Schindler (2003), a pilot also known as reconnaissance is conducted to identify the likely weaknesses in the study's design, data collection instruments and procedures. The pilot study helped the researcher to examine the efficiency and simplicity of research tools and the ease of use by administrators (Mugenda & Mugenda, 2003). The investigator conducted a reconnaissance to test the soundness and independency of conducting the research in order to obtain consistent data leading towards the main objective. Mugenda and Mugenda (2003) proclaims that, the accuracy of the data gathered is heavily rely on the collection tools in terms of soundness and reliability.

### **3.6.7 Validity**

Validity or soundness is the extent to which outcomes acquired from the analysis of the data truly signifies the phenomenon under investigation (Robinson 2017). Soundness was checked by having objective questions in the questionnaire and by pre-testing the instrument used through a pilot study to identify and change any ambiguous, awkward, or offensive questions and

technique as emphasized by Cooper and Schindler (2003). According to Mutai (2015), a data collection instrument can be validated by proving that the items, content and construct validity was established to ensure the items representative sample of the skills and traits are present in the area to be measured. According to Cohen, Manion and Keith (2007), Validity can be checked by choosing an appropriate scale, ensuring there are adequate resources required for the research to be undertaken, selecting the appropriate methodology and the research questions, avoiding too long or too short interval between pre-test and post-test, ensuring standardized procedures for data gathering or for information administering tests, and tailoring the instruments to consider the concentration span for respondents.

### 3.6.8 Reliability

Reliability refers to a measure of the degree in which research instruments yield consistent results (Mugenda & Mugenda, 2003). During this study, reliability was ensured by pre-testing the questionnaire from a selected sample of respondents working in the standard gauge railway but it was not included in the final analysis. Cronbach's alpha was applied to measure the reliability of the gathered data, Cronbach's alpha is a coefficient of internal consistency (Robinson, 2017).

**Table 3.3: Cronbach's alpha values**

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent (high stakes testing)
$0.7 \leq \alpha < 0.9$	Good (low stake testing)
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

It can be noted that a greater number of items in the test can artificially inflate or cause an increase on the value of alpha and a sample with a narrow range can deflate it, so this rule should be used with caution.

### 3.7 Data Analysis and Presentation

The study selected a selected quantitative and qualitative method of data analysis. Data collected from the field through questionnaires and interviews were analyzed qualitatively and was used to make judgement. The quantitatively information collected though questionnaires from the field were analyzed. Descriptive analysis as suggested by Kothari, (2004) in the analysis of distributions of one variable which gives outlines of persons, groups and other subjects on the multiple characteristics such as size, frequency, efficiency and preference was carried out, which. This data was presented using tables, pie charts, graphs, diagrams and frameworks of the flow

of different scales brought up by respondents. The SPSS (Statistical Package for Social Sciences) software was used to analyze data. Descriptive statistics such as means, frequency, percentages, and frequency distribution were used to meaningfully describe the distribution measurement. This analysis also informed on the patterns, trends and relationships of all the variables. Also, the inferential statistics such as correlation and regression model were used to show the effects of standard gauge railway on industrial property values in Athi River.

### **3.8 Study Limitation**

There were numerous challenges that hindered access to information. The first limitation was suspicion and mistrust by the sources, especially the real estate companies and agents. Most were not ready to share or avail their records. The researcher had to be very persuasive and, in some cases, pretended to be a potential client to get a response.

The second challenge experience was limited information regarding industrial property values and prices in relation to the SGR prices. Since the SGR is still a new phenomenon, there is very little information regarding its effects on values and prices of industrial properties. The investigator relied on data from only ten real estate companies. There was limited information from other government institutions on real estate companies apart from the Kenya Bureau of Statistics. However, the investigator did find out that the real estate companies collect data from other institutions and assembles a composite index henceforth the data is supposed to be reliable.

## CHAPTER FOUR

### 4 DATA PRESENTATION AND ANALYSIS

#### 4.1 Introduction

This chapter gives the summary of findings based on the data gathered from the study area. The data collected was founded on the following objectives: To examine the extend of standard gauge railway development within industrial zone; To determine the effects of the standard gauge railway on industrial property; to describe the causes of variations in values of industrial property along SGR; and to evaluate the challenges of developing industrial properties along railway line.

The validity, accuracy and reliability assumptions were based on the authority of the entities' trustworthiness as reliable sources for data from the market. The data was then entered into SPSS version 21.0 and analysed for interpretation on how the advent of the SGR affects rates and values of industrial property in proximity using multivariate and descriptive regression models. The results were presented primary using descriptive information including tables, pie charts, graphs and photographs, it enabled the researcher establish statistical conclusions about data's behaviour and secondly through inferential statistics to evaluate how the dependent and independent variables related in the study.

#### 4.2 Response Rate

A total of 50 questionnaires were administered within Athi River to the real estate profession, public together with the tenants. Out of the 50 sampled population, 35 of them were filled and returned by the respondents. According to Mugenda (1999), a response rate of 50% is sufficient for analysis and reporting when administering questionnaires, 60% is a good response while 70% is very good. In this study the average response was at 70% is very good for analysis. The number still is higher than the minimum acceptable respondent number of 30. A single interview was administered to the Chief valuer to seek his views on the possible impacts in the industrial property. The land and property owners were considered to me a key source of information; thus, they were giving more weight more questionnaires were admitted to them compared to real estate professionals and the leasing tenants. The owners are also factual in terms of costs and impact as they have a first-hand experience. In gathering data, the questionnaires were distributed and the response was as follows:



**Table 4.1: Response Rate for Data Gathering**

Respondent	Total Number Issued	Response rate	Percentage (%)
Real Estate Professions	10	8	20
Land and Property Owners	30	18	60
Leasing tenants	10	9	20
<b>TOTAL</b>	<b>50</b>	<b>35</b>	<b>100</b>

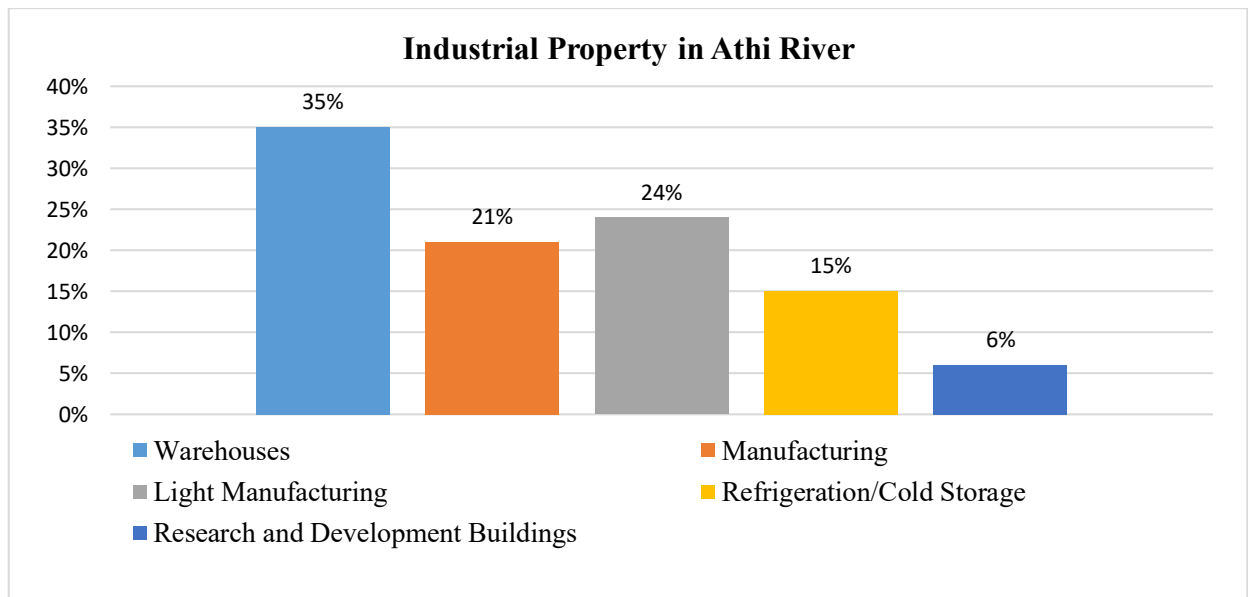
**Source: Field Survey, 2020**

The Table 4.1 indicates that the number of respondents in real estate professions were 8, those in the leasing and tenant were 9 and majority of the respondents were land and property owners were 18. The response rate indicated that the response rate indicated This indicates a percentage of 20%, 60% and 20% represented the real estate professions, land and property owners and leasing tenants respectively.

### 4.3 Findings on Industrial Property

#### 4.3.1 Industrial Property within Athi River Town

**Figure 4.1: The types of Industrial Property within Athi River Town**

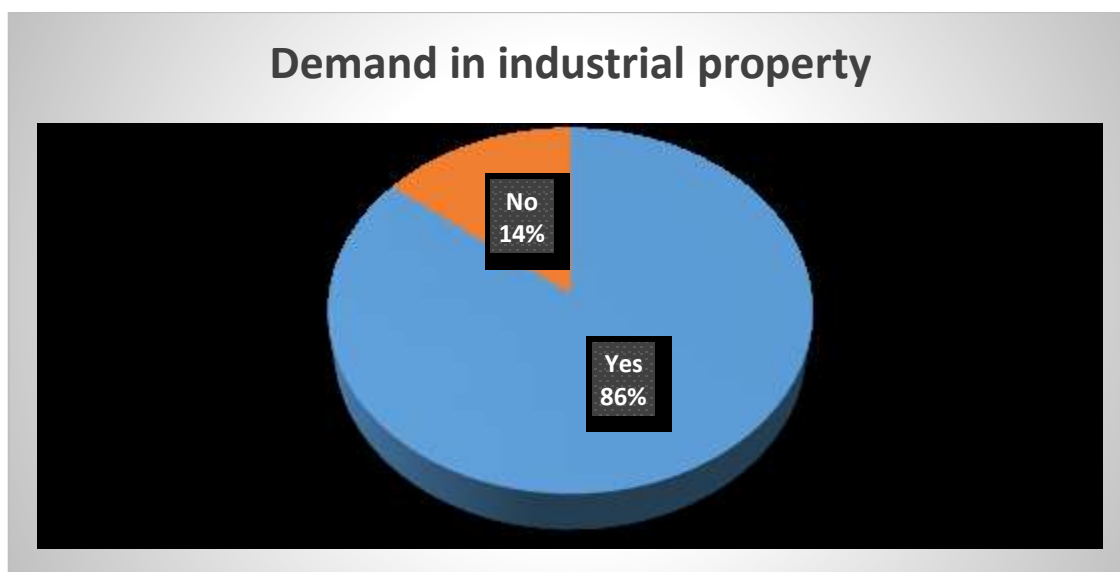


**Source: Field Survey 2020**

The respondents indicated the types of industrial property they are involved. In their responses majority of the industrial property were warehouses at 35%. The second most dominant property were the light manufacturing at 24%. The others industrial properties identified by the respondents were; Manufacturing and heavy industrial building at 21%, Refrigeration/Cold Storage Buildings at 15% and Research and Development Buildings was at 6% as shown in the Figure 4.1 above.

### 4.3.2 Industrial Property Values

Figure 4.2: Land Value



Source. Field survey 2020

The location that is suitable in that area where the properties located within 500m of the SGR. The value of property that is closer to the SGR the more valuable it is. The Figure 4.2 indicates that demand in the industrial property that is close to the SGR has more demand which is represented by 86% those who stated low demand of industrial demand were 14%. This indicates that the area has more value and this can lead to the assumption that the prices of the land will also increase according to the law of demand and supply. The analysis points out that the railway station has a higher impact on property values within proximity to its location either for the transport of good or raw materials.

Table 4.2: Anova, Single Factor Analysis

Statistical analysis Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Real estate Professions	35	1994	52.47368	843.6615		
Tenant in the industrial property	35	700.8	18.44211	135.803		
Property Owners	35	161.5	4.25	5.318784		
ANOVA						
Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	46677.78	2	23338.89	71.09856	1.32881E-20	3.078057
Within Groups	36436.98	111	328.2611			
<b>Total</b>	<b>83114.76</b>	<b>113</b>				

Source: Field Survey 2020

The table 4.2 above indicates that the mean strengths range from a low of 4.25 for property owners to as high as 52.47 for real estate professions. Our sample means are different. The differences we see in our samples might be the result of random sampling error. In the ANOVA table, the p-value is 1.3288E-20. Because this value is less than our significance level of 0.05, we reject the null hypothesis. Our sample data provide strong enough evidence to conclude that the three-population means are not equal.

The table above indicates that the value of land estimated by the price of a plot reduced significantly with proximity to SGR Station. The values are supported by the value of p which equals to  $p < 0.05$ . Comparison of Property value between 2008 (no SGR) and after 2013 (commencement of construction) were conducted by using sale prices of the warehouses and go-downs and rent paid in the proximal study areas as indicators. The sale prices of warehouses were assessed in million Kshs. and results presented in graphs.

**Figure 4.3: Price of Industrial Property**



**Source: Field Survey 2020**

It is clear from the graph above that the price of warehouses in Athi River as from 2013 were higher represented by 52.59% as compared to 2008 represented by 7.97% before development of the SGR. To verify these results, we conducted a subsequent data analysis using t-test as the test statistic.

**Table 4.3: T-Test Results Analysis Price of Warehouse**

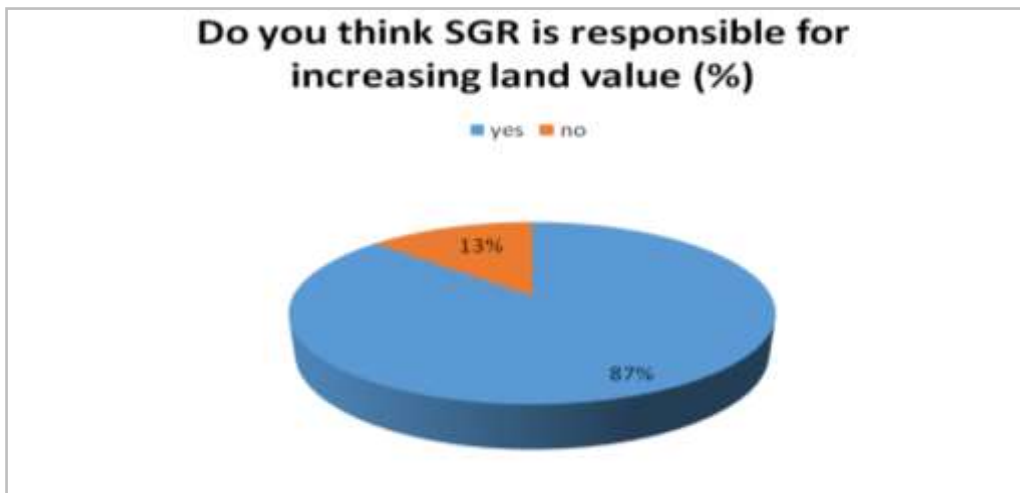
Price of industrial property T-Test Results Analysis				
t-Test: Paired Two Sample for Means				
	<b>before 2008</b>	<b>After 2013</b>		
Mean	7.969811	52.59434		
Variance	23.40022	509.4525		
Observations	35	35		
Pearson Correlation	-0.40604			
Hypothesized Mean Difference	0			
Df	52			
t Stat	-13.0312			
P(T<=t) one-tail	2.61E-18			
t Critical one-tail	1.674689			
P(T<=t) two-tail	5.22E-18			
t Critical two-tail	2.006647			

**Source. Field Survey 2020**

The mean support further since the mean indicates that the highest mean and variation was indicated in 2013 and the lowest means is before 2020. The t-value is -13.0312 which indicated that it is less than 0.05. Therefore, we reject the null hypothesis and the alternative hypothesis becomes true. A T-test analysis on the prices of warehouses with regards to the location of the SGR gave a Pearson Correlation coefficient of -0.46. This explains that the relationship between the variable is negative and weak therefore recommendation is given for further analysis using different variables.

The result indicates a reverse relationship showing that proximity to the SGR increases the warehouse prices that declines as one moves away from the SGR line. Table 4.3 above indicates that there was a significant increase in the price of warehouses from 2008 to 2013 since using t values and DF produce a p value where  $p < 0.05$ . P being less than 0.05 is a great evidence against the null hypotheses where there is no significant difference between the variables.

**Figure 4.4: Effect of SGR on Land Appreciation of Land values**

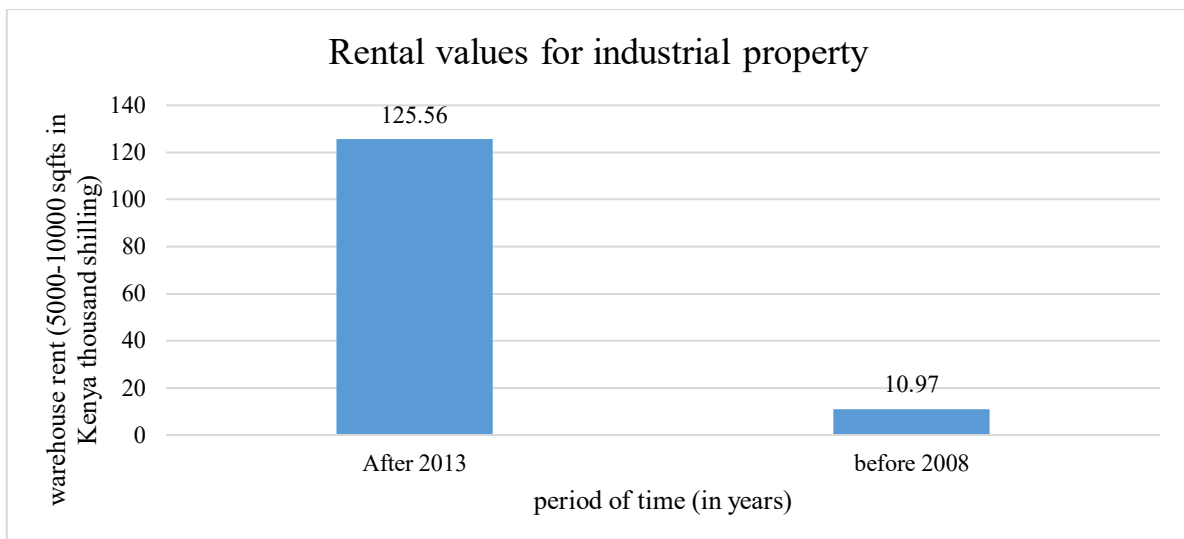


**Source. Field Survey 2020**

Out of the total respondents, 87% of the people supported the opinion that land values had grossly been influenced by the initiation of the SGR project. This is an indication of urban development in the area in terms of business development, transport system and high employment and in that case, people will reside in area where the factor of production is cheap and easy to access.

### 4.3.3 Industrial Property Rentals

**Figure 4.5: Rent values for Industrial Property**



**Source. Field Survey 2020**

The tabulation from the questionnaires indicate a relationship between the property value and the development of the SGR line. As indicated in the figure 4-5 above, the rent values before the construction and the rent values after the constructions show a significant growth. After 2013,

the warehouse rent is higher than that before 2008. The analysis was further tested using the T-test analysis by using the Pearson's correlation coefficient as shown on Table 4.4 below.

The property variable was tested to show any correlation with the development of the SGR line. The value reported was +0.46. The value of the test shows a stronger relationship between the variables in the concentration is within a snow ball relationship with the best line of fit in an ascending slope.

**Table 4.4: T-Test Analysis on Values of Industrial property**

<b>T-Test: Paired Two Sample for Means</b>		
	<i>Variable 1</i>	<i>Variable 2</i>
Mean	119.2453	232
Variance	2235.958	2215.846
Observations	35	35
Pearson Correlation	0.460147	
Hypothesized Mean Difference	0	
df	52	
t Stat	-16.7442	
P(T<=t) one-tail	6.76E-23	
t Critical one-tail	1.674689	
P(T<=t) two-tail	1.35E-22	
t Critical two-tail	2.006647	

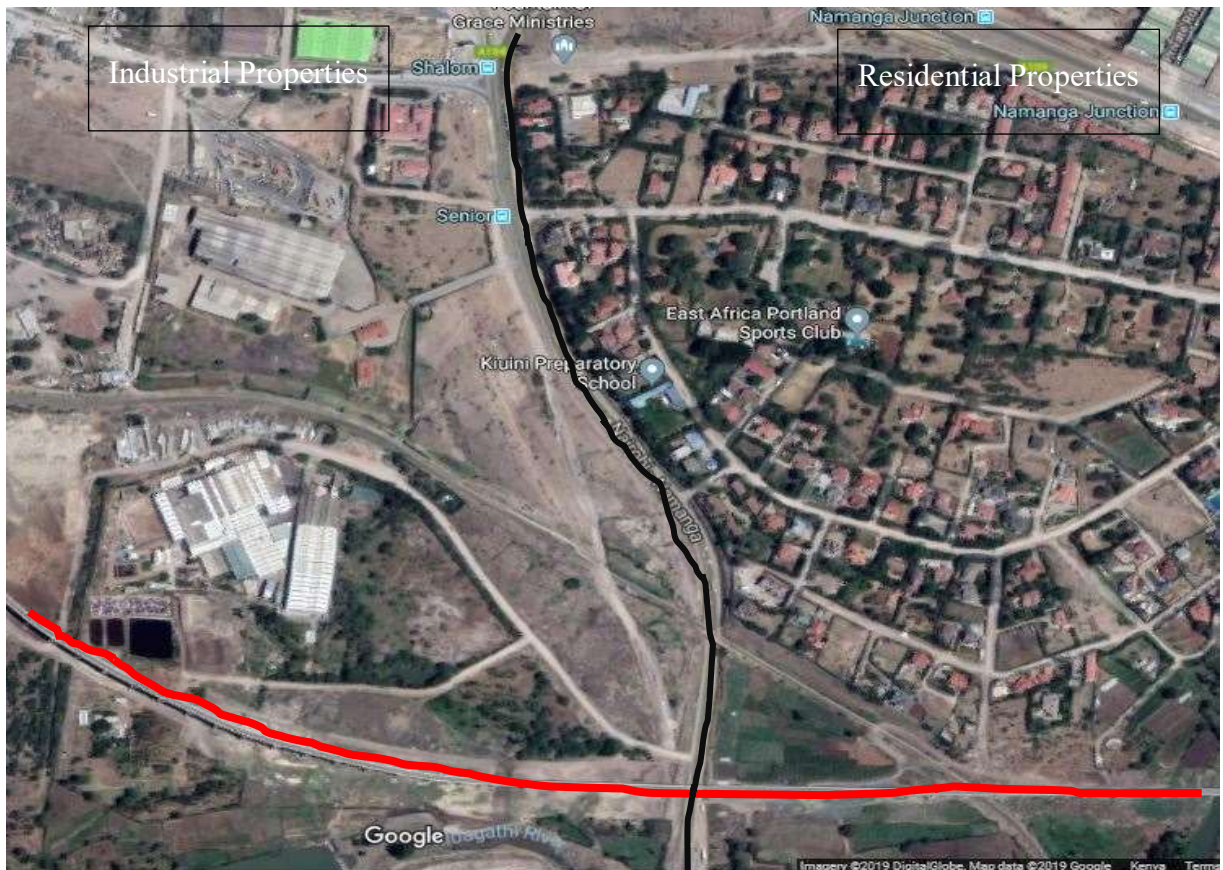
**Source. Field Survey 2020**

The analysis of the property prices was noted to be influenced by the proximity to the railway stations with industries nearer charging more rent values compared to those far away. The variations are however not very significant. The findings analysed agree with the expected results that the railway lines have a wider coverage thus influences significantly properties within the line.

#### **4.4 Aerial Image Analysis**

In evaluating the aerial image of the study area, industries develop next to the railway line while residential property are located after the buffer zone, which is the Nairobi Mombasa Highway in black. The image enhances the understanding of the development that occurs next to a railway development, however it may be difficult to ascertain the property values without an actual field study. SGR line is indicated by the Red line on the image below.

**Figure 4.6 Figure 4.6: A map showing land uses**



**State source and where are the other photographs you said you would use.**

#### **4.5 Conclusion**

The presence of a railway station or the development of a railway line has attracted wide research from an economic perspective. Some studies have evidently tried to quantify this relationship. Based on the presentation above, we can conclude that there was a significant increase in the rent of warehouses from 2008 to 2013. Calculation of  $p$  gives 0.00001 which is less than 0.05 making the variables relevant to the study. Moreover, the  $t$  value is significantly showing a relationship exists between property values and the construction of the SGR line influenced by the proximity to the railway line.

The aim of the study was to assess if there exists an organized explanation as to the impact of the SGR line on properties. It was noted however that in some properties the effect was not significantly felt but in others the values or industrial properties increased. The study showed that industrial properties increase in value because of development compared to other studies that show a decline in values of residential houses near the railway line. The study therefore shows that commercial land uses benefit positively with the proximity to a railway line. The

study desires to seek more meta-analysis and research on the variables that influence property values and how the relationship responds with influences of other land uses.

#### 4.6 Factors Influencing the Industrial Property Values

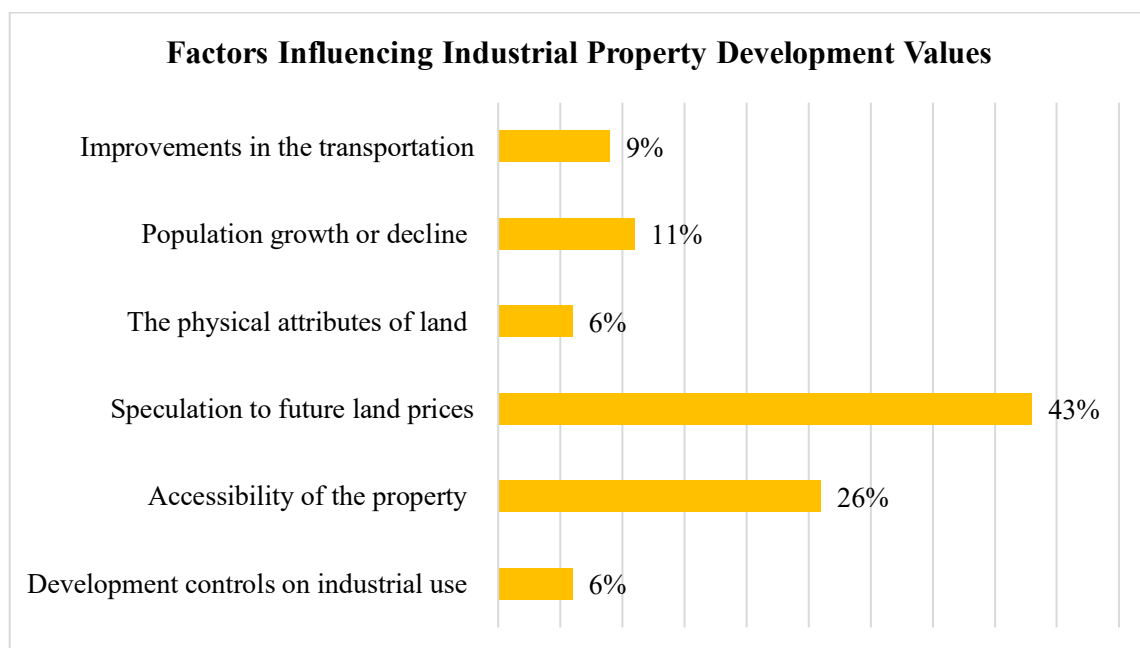
The study also intends to find out the factors influencing the industrial property development within the study area. The respondents indicated that speculation to future land prices at 43% was the major factor that affected the land values in the study area. The second factor was the Accessibility of the property at 26%. The others factors identified by the respondents were; Population growth or population decline within the area at 11%, Improvements in the transportation at 9%, Development controls on industrial use of land and the physical attributes of land include soil fertility, climate, location and topography, both at 6% as shown in the figure 4.6 below.

**Table 4.5: Factors influencing the Industrial Property values**

Factor	Frequency	Percentages
Speculation to future land prices	15	43%
Accessibility of the property	9	26%
Population growth or decline	4	11%
Improvements in the transportation	3	9%
Development controls on industrial use	2	6%
The physical attributes of land	2	6%
Proximity to Social Amenities	0	0%

Source. Field Survey 2020

**Figure 4.7: The factors influencing the Industrial Property values**



Source. Field Survey 2020



#### 4.6.1 The Factors Influencing the Development of SGR in Athi River

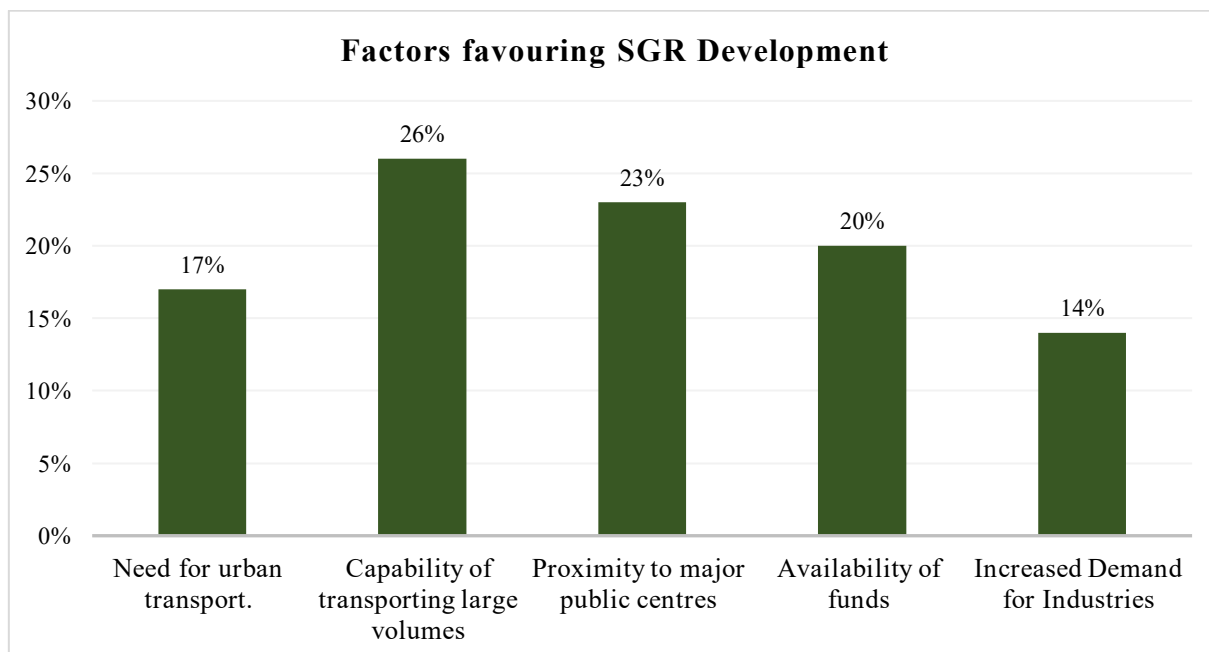
The study points out the factors favouring the development of Standard Gauge Railway within the study area. The respondents indicated that the need to have high capability of transporting large numbers of people at high speeds at 26% was the major factor that led to development of SGR in the study area. The second factor was the proximity to major public centres and social amenities at 23%. The others factors identified by the respondents were; the availability of funds for railway development from the central government at 20%, Need for modern and improved urban transport at 17%, and the increased demand for industries leading to rise in the economic status of the area at 14% as shown in the figure 4.7 below.

**Table 4.6: The table of factors influencing the development of SGR in Athi River**

	<b>Factors</b>	<b>Frequency</b>	<b>Percentages</b>
1	Need for urban transport.	6	17%
2	Capability of transporting large volumes	9	26%
3	Proximity to major public centers	8	23%
4	Availability of funds	7	20%
5	Increased Demand for Industries	5	14%
	<b>Totals</b>	<b>35</b>	<b>100%</b>

Source. Field Survey 2020

**Figure 4.8: The factors influencing the development of SGR in Athi River**



Source: Field Survey 2020

#### 4.7 The Effects SGR Development

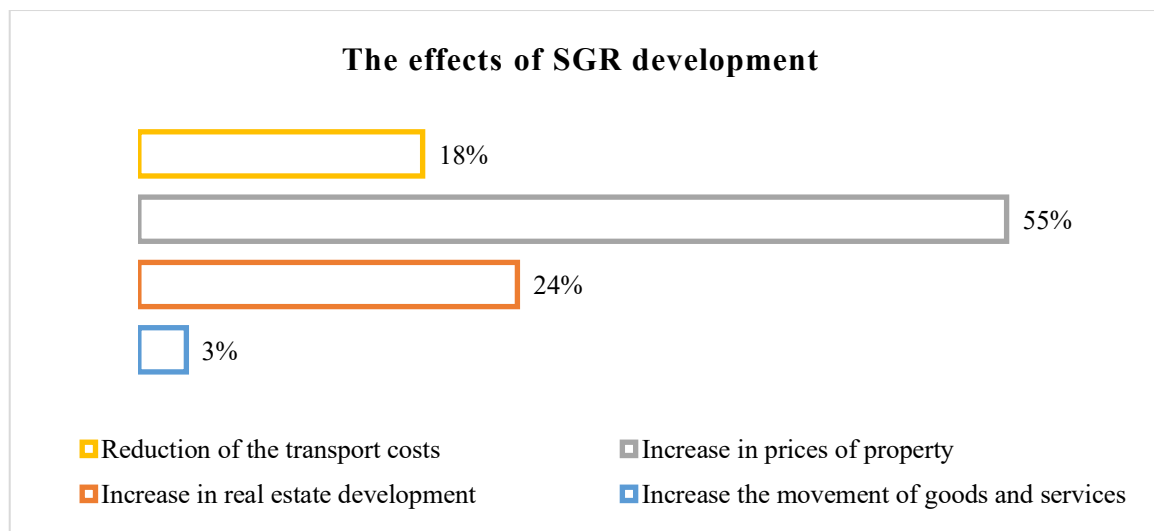
The study finds out the results of SGR development on industrial property within the study area. The responses showed that there has been increase in values of industrial property at 55% as the major effects of development of SGR in the study area. The second effect was the increase in development of real estate properties like residential and commercial which support the operation of industrial activities within the study area at 24%. The others result of SGR development identified by the respondents were; the reduction and minimization of the transport costs at 18%, the increase in the movement of goods and services in and out of the study area at 3% as shown in the figure 4.8 below.

**Table 4.7: Table of Effects of SGR on industrial property**

Effects	Frequencies	Percentages
Increase the movement of goods and services	1	3%
Increase in real estate development	8	24%
Increase in prices of property	18	55%
Reduction of the transport costs	6	18%
<b>Total</b>	<b>33</b>	<b>100%</b>

Source: Field Survey 2020

**Figure 4.9: The figure showing how SGR have affected industrial property**



Source: Field Survey 2020

#### 4.8 Challenges on Industrial Property Development

The study finds out which challenges have been brought about by the development SGR on the industrial property in Athi River town. The responses indicated that the major challenge in the Industrial development was the property acquisition with inadequate compensation at 40% in

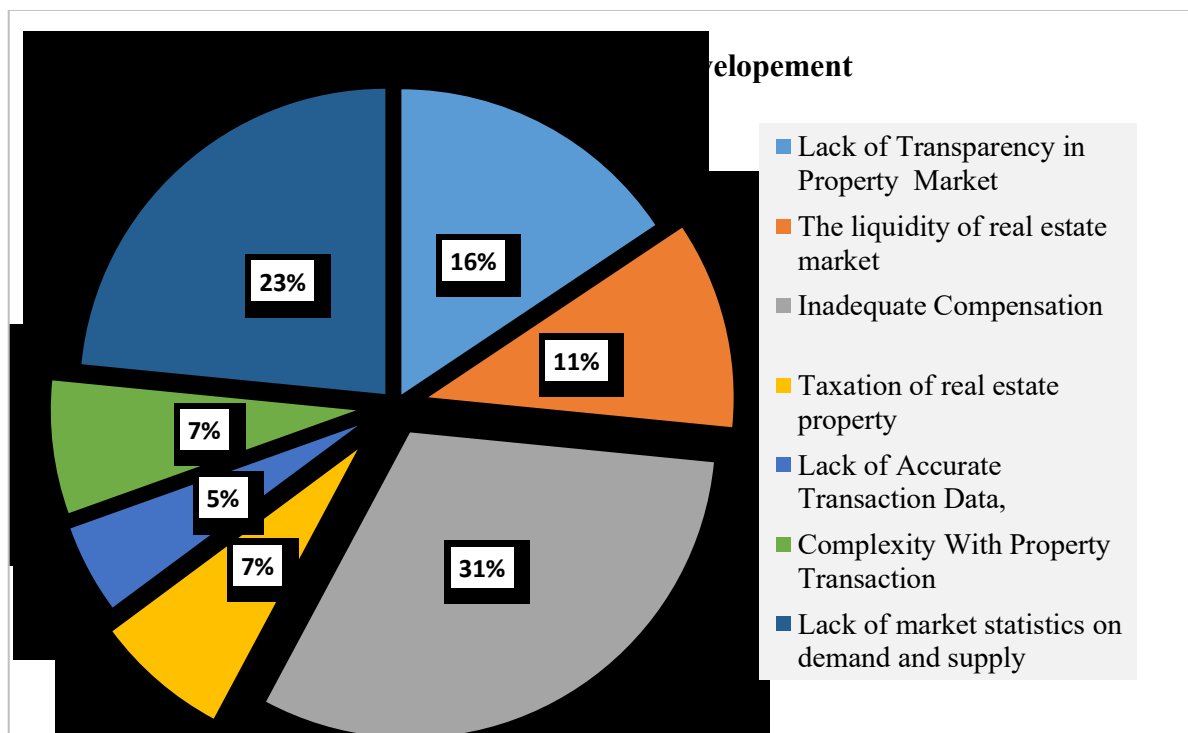
the study area. The second challenge was the lack of transparency in property market within the study area at 20%. The others challenge of SGR development identified by the respondents were; the liquidity of real estate market at 14%, the taxation of real estate property and complexity with property transaction both at 9%, lack of accurate transaction data on real estate property within the study area at 6% and lack of market statistics on demand and supply for the industrial property at 3% as shown in the figure 4.9 below. The t-test values were explained in table 4.8.

**Table 4.8: The challenges of SGR on the Industrial Property development**

	<b>Challenges of Industrial Property development</b>	<b>Frequency</b>	<b>Percentages</b>
1	Lack of Transparency in Property Market	7	20%
2	The liquidity of real estate market	5	14%
3	Inadequate Compensation	14	40%
4	Taxation of real estate property	3	9%
5	Lack of Accurate Transaction Data,	2	6%
6	Complexity with Property Transaction	3	9%
7	Lack of market statistics on demand and supply	1	3%
	<b>Total</b>	<b>35</b>	<b>100%</b>

Source: Field Survey 2020

**Figure 4.10: The challenges of SGR on the Industrial Property development**



Source: Field Survey 2020

**Table 4.9: Challenges of Industrial Property**

t-Test: Paired Two Sample for Means	
	Challenges of Industrial Property development
Mean	2.428571429
Variance	1.781512605
Observations	35
Pearson Correlation	0.930981156
Hypothesized Mean Difference	0
df	35
t Stat	-5.877787602
P(T<=t) one-tail	6.20526E-07
t Critical one-tail	1.690924255
P(T<=t) two-tail	1.24105E-06
t Critical two-tail	2.032244509

**Source: Author (2021)**

The table indicates that the t-test statistics is  $-5.88 < 0.05$ . The p- value for both the one tail and two tail analysis are  $6.21E-07$  and  $1.24E-06$  respectively. Since the p-value is also less than 0.05 ( $p\text{-value} < 0.05$ ), this analysis indicates that the model is significant and in that case there is challenges of industrial property development. As represented in the figure some challenges are severe and are encountered by majority of industrial property owner and some are minor.

#### **4.9 Hypothesis Testing**

The main objective of the study was to determine the impacts of Standard Gauge Railway on industrial property since the announcement of project in Kenya. The hypothesis with the guidance of the objectives was carried out to determine test whether the model was significant.

According to the t-test and the p-value states that the first hypothesis is true. This means since the t-test and the p-values are less that the confidence interval of 0.05 then we accept the null hypothesis that there has been industrial property development within the study area. This explains why there is transportation increase and population growth.

According to the ANOVA analysis the p- value is less than 0.05 and thus we accept the null hypothesis. Therefore, standard gauge railway affects industrial property i.e. increase in demand, prices increase of property and urbanization of the area within.

There is variation in values of industrial property along the SGR due to an increase in demand of the property around the SGR. This is the third hypothesis where the null hypothesis is accepted since the p-value is less than 0.05. ( $P\text{-value} = 1.32881E-20 < 0.05$ ).

Due to development there are challenges that are encountered where majority agreed on lack of compensation and lack of transparency in the property. The t test statistics is  $-5.88 < 0.05$  (p-value $<0.05$ ). This therefore led to the acceptance of the null hypothesis which state that there are challenges of developing industrial properties along railway line.

## CHAPTER FIVE

### 5 SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents findings, conclusions and recommendations to the research problem derived from the findings of this study. As far as the recommendations are concerned, the study has come up with both a policy framework and recommendations for further research.

#### 5.2 Main Findings

The aim of this study was to find out the effects of Standard Gauge Railway on industrial property a case of Athi River town. For this study to realise the above aim of the study, the research specifically sought to be guided by the following objective: to examine the extend of industrial property development within the study area, to determine the effects of the standard gauge railway on industrial property, to describe the causes of variations in values of industrial property along SGR and to evaluate the challenges of developing industrial properties along railway line.

##### 5.2.1 The extend of industrial property development

The study found out that 35% of the property forming the majority of the industrial property within Athi River were warehouses, followed by the light manufacturing at 24%. Others industrial properties existing within the study area were; manufacturing and heavy industrial building at 21%, Refrigeration/Cold Storage Buildings at 15% and Research and Development Buildings at 6%.

##### 5.2.2 The effects of the Standard Gauge Railway on industrial property

The research found out that majority land values had grossly been influenced by the initiation of the SGR project. It was also found out that there was a significant increase in the rent of warehouses from 2008 to 2013.

The study also found out that the need to have high capability of transporting huge numbers of people at high speeds was the key factor favouring the development of Standard Gauge Railway within the study area. It was also clear that the other factors were; the proximity to major public centres and social amenities, the availability of funds for railway development from the central government, the need for modern and improved urban transport, and the increased demand for industries leading to rise in the economic status of the area.

The study revealed there has been increase in development of real estate properties like residential and commercial that support the operation of industrial activities due to the development of SGR within the study area. The other results of SGR development identified were; the reduction and minimization of the transport costs, the increase in the movement of goods and services in and out of the study area.

### **5.2.3 The causes of variations in values of industrial property along SGR.**

The study discovered that speculation on future land prices at 43% was the main factor influencing the values of industrial property development within the study area. The factor of with 26% was accessibility to the industrial property is another significant factor affecting the land prices due to development of SGR within the study area. The others factors identified were population growth or population decline within the area at 11%, the improvements in the transportation, development controls on industrial property and land uses, and the physical attributes of land include soil fertility, climate, location and topography.

### **5.2.4 The challenges of developing industrial properties along railway line**

The study reveals that the property acquisition with inadequate compensation was the major challenge on the industrial property from development of SGR in Athi River town. The second others challenges were lack of transparency in property market within the study area, the liquidity of real estate market, the taxation of real estate property, the complexity with property transaction, lack of accurate transaction data on real estate property and lack of market statistics on demand and supply for the industrial property.

## **5.3 Conclusions**

Based on the above findings, the study indicates that warehouses are the major category of industrial property located within Athi River. The area also has other industrial property like the light manufacturing; manufacturing and heavy industrial building, refrigeration or cold storage buildings and research and development buildings.

The research identified that majority of land values had grossly been influenced by the initiation of the SGR project. It was noted that there was a significant increase in the rent of industrial properties between the periods of 2008 to 2013.

The study concludes that the need to have high capability of transporting huge numbers of people at high speeds was the main cause of the Standard Gauge Railway development. It is evident that the proximity to major public centres and social amenities, the availability of funds for railway development from the central government, the need for modern and improved urban transport

and the increased demand for industries leading to rise in the economic status of the area have contributed towards development of SGR within Athi River. The analysis concludes that there has been increase in development of real estate properties like residential and commercial which support the operation of industrial activities due to the development of SGR within the study area.

#### **5.4 Recommendations**

Based on the results from the study and conclusions, the continued upsurge in industrial property and real estate values along the study area is explained by the construction of the SGR. Experts in real estates and economic analysts should realize the importance of sensitize their society on observing these trends in order to make knowledgeable estimates of industrial property values and prices. Experts should also encourage investors and potential investors to invest in industrial properties along the SGR and towns that will be serviced by the SGR.

Redefining the railway's role through change of the current institutional, policy and legal agenda, committing to that role and executing appropriate transport policy framework for realizing that role, implementing strategic reform and restructuring to guarantee productivity under the conditions, training and facilitation for top management for strengthening purposes, extra availability of resources and implementing reform and management control to withstand the efficiency of the system.

The government should also closely monitor the rates at which the values and prices of the industrial property are rising so as to sustain it at practical levels. This is because the cost of industrial property will definitely have an impact on the cost of production of goods, leading to high prices of manufactured goods.

The study also suggests that government takes a active role in collecting and examining data on the effect of the SGR on industrial property. The data available was very scanty and was mainly from the private sector. Such data would assist policy makers and the government should invest in studies such as this one.

#### **5.5 Suggestions for Further Research**

The research findings set a basis for further research in a number of areas. First, the results shown that SGR has impacted significantly on the value of industrial property. Further studies could be carried out to confirm this assertion.



Secondly, the findings indicated that the rise in value of industrial property could be explained by the SGR. Further studies could be conducted in other towns serviced by the SGR to confirm these findings.

Thirdly, this study focused on the effect of the SGR on industrial property value. Other investigations should be done to find out the effect of SGR on residential, commercial and other properties within the study area and beyond.

A more advanced research could be done to assess the impact of other variables on land values such as varying land uses, distances, type of railway development.

This study faced the limitation of secondary data especially on the number of properties that existed before and after the construction of the SGR due to speculations or prior plans to develop. However, there were signals that the public institutions are working towards gathering of data on industrial properties as part of its aim to industrialize by the year 2030 as per the Kenya Vision 2030. Availability of more data on variables such as demographics and supply of industrial property should be stretched.

## REFERENCES

- Arauzo Carod, J. M. (2015). *Determinants of industrial location: An application for Catalan municipalities*. *Papers in Regional Science*, 84(1), 105-120
- Armstrong, R. (1994). *Impacts of Commuter Rail Services as Reflected in Single Family Residential Property Values*. *Transport Research Record*.
- Barigaba, J. (2017). *East Africa: Rift Valley Railways Running Out of Time to Salvage Concession*. *The East African* (Nairobi).
- Benjamin, J., Zietz, E., & Sirmans, S. (2013). The environment and performance of industrial real estate. *Journal of Real Estate Literature*, 11(3), 279-324.
- Beron, Y. H. (2004). *Hedonic Price Functions and Spatial Dependence: Implications for the Demand for Urban Air Quality*. In R. F. L. Anselin, *Advances in Spatial Econometrics*. Berlin: Springer-Verlag.
- Bianco, K. J. (1999). *Light Rail Transit Impacts in Portland: The First 10 years*, 78th Annual Meeting. Portland: Transportation Research Board.
- Bowes, D. R., and Keith R. I. (2016). Identifying the Impacts of Rail Transit Stations on Residential Property Values. *Journal of Urban Economics*, 50, 1-25.
- Brod, S. L.-W. (1997). *Measuring the Neighborhood Benefits of Transit Accessibility*. *Transportation Research Record* 1576.
- Cambridge Systematics, Inc. (1999). *Quantifying the Impacts of a Light Rail Transit Station on Adjacent Property Values*. Unpublished manuscript.
- Cervero, R. and Michael D. (2017). *Land Value Impact of Rail Transit Services in San Diego County*. Report prepared for National Association of Realtors Urban Land Institute.
- Chalermpong, M. B. (2016). *New Highways, House Prices, and Urban Development: A Case Study of Toll Roads in Orange County, CA*. California: Housing Policy Debate.
- Court, A. (1939). *Hedonic Price Indexes with Automotive Examples*, In: *The Dynamics of Automobile Demand*. New York: General Motors.
- Debrezion, E. P. (2007). *The impact of rail transport on real estate prices: An empirical analysis of the Dutch housing market*, Working paper. Amsterdam: Department of Spatial Economics, VU University.

- Du, C. M. (2006). *Relationship Between Transport Accessibility and Land Value*. Transport Research Records.
- Eck, K. G. (2016). *Accessibility Measures: Review and Applications*, RIVM Report No. 408505 006. Netherlands: National Institute of Public Health and the Environment.
- ECONorthwest. (1991). *The Economic Impacts of Transit Improvements*. Portland, Oregon: Prepared for Tri Met.
- Federal Transit Administration. (2015). *Transit Benefits 2015 Working Papers: A Public Choice Policy Analysis*. Washington, D.C.: Federal Transit Administration, Office of Policy Development.
- Folkesson, M. M. (1999). *Accessibility Measures for Analyses of Land- Use and Travelling with Geographical Information Systems*. Sydney: Department of Technology and Society, Lund Institute of Technology.
- Follain, E. J. (1985). *Estimating the Demand for Housing Characteristics: A Survey and Critique*. Regional Science and Urban Economics.
- Foo Sing, T. (2017). Valuing renewal options in public industrial leases in Singapore. *Journal of Property Investment & Finance*, 20(3), 222-241.
- Fujita, M. (1989). *Urban Economic Theory: Land Use and City Size*. Cambridge: Cambridge University Press.
- G., M. O. (1999). *Research Methods: Quantitative and Qualitative Approaches*. Nairobi: Acts Press .
- Girouard, Kennedy, Noord & Andre, (2016). Intermetropolitan migration and housing values: Simultaneously determined? *Journal of Housing Economics*, 3, 77-91.
- Greene, W. (2003). *Econometric Analysis*, 5th Edition. New Jersey: Prentice Hall.
- Hansen, G. (1959). How Accessibility Shapes Land Use. *Journal of the American Institute of Planners*, 25 pp 73-76.
- Henneberry, J. (2013). *Conflict in the industrial property market*. Town Planning Review, 59(3), 241.
- Himmelberg, C., C. Mayer and T. Sinai (2015), "Assessing High House Values: Bubbles, Fundamentals and Misperceptions", *Journal of Economic Perspectives*, Vol. 19: 67- 92.

- Hoag, J. W. (2015). Towards indices of real estate value and return. *The Journal of Finance*, 35(2), 569-580.
- Hoover (2014)
- Hsia K. & Green J. (2016). Quality Management in Real Estate Industries. *International Journal of Scientific & Technology Research*, Vol. 8 Issue: 12.
- Ihlanfeldt, D. B. (2016). *Identifying the Impacts of Rail Transit Stations on Residential Property Values*. *Journal of Urban Economics*.
- Jackson, C., & White, M. (2015). Inflation and rental change in industrial property: a multi-level analysis. *Journal of Property Investment & Finance*, 23(4), 342-363.
- Kim, J. (2014). The Effects of Economic and Location Factors in Australian Property Market. *Pacific Rim Property Research Journal*, 9(4), 398-408.
- Ko, K., & Cao, X. J. (2013). Impacts of the Hiawatha light rail line on commercial and industrial property values in Minneapolis.
- Lin, S. W., & Ben, T. M. (2014). *Impact of government and industrial agglomeration on industrial land prices: A Taiwanese case study*. *Habitat International*, 33(4), 412-418.
- Man, J. O. (2008). *Urban Location and Housing Prices within a Hedonic Model*. *Regional Analysis and Policy*.
- Martin, P., & Rogers, C. A. (2015). Industrial location and public infrastructure. *Journal of International Economics*, 39(3-4), 335-351
- Ming, Y. S., & Hin, H. K. (2016). *Planned urban industrialization and its effect on urban industrial real estate valuation: The Singapore experience*. *Habitat International*, 30(3), 509-539.
- Osuji, J. M. (1995). *The Effect of Anticipated Transportation Improvement on Land Values*. *Regional Science of Urban Economics*.
- Palmquist, R. (1982). *Impacts of Highway Improvements on Property Values in Washington State*. Washington: Transport Research Board.
- Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy*.
- Ryan, S. (1999). Property Values and Transportation Facilities: Finding the Transportation-Land Use Connection. *Journal of Planning Literature*.

- Schürmann, K. S. (1997). *Accessibility Indicators: Model and Report*, SASI Deliverable. Dortmund: Institut Fur Raumplanung.
- Sirmans, J. D. (1996). Mass Transportation, Apartment Rents, and Property Values. *Journal of Real Estate Research*.
- Smith, D. H. (1993). *The Impact of Miami Metrorail on the Value of Residences Near Station Locations*. Miami.
- Smith, G. S. (2015). Accessibility Changes in Urban House Price Appreciation: A Constrained Optimization Approach to Determining Effects. *Journal of Housing Economics*.
- Syagga, P. M. (1994). *Real Estate Valuation Handbook*. Nairobi: Nairobi University Press.
- Theriault, F. D. (2006). *Testing the Temporal Stability of Accessibility Value in Residential Hedonic Prices*. Volos, Greece: Conference of the European Regional Science Association.
- Thomas, J. (2017). Environmental contamination and industrial real estate prices. *Journal of Real Estate Research*, 23(1-2), 179-200.
- Tsatsaronis, Kostas and Haibin Zhu (2014). *What drives housing value dynamics: cross country evidence*, BIS Quarterly Review.
- Vessali, K. V. (1996). *Land Use Impacts of rapid Transit: A Review of Empirical Literature*. Berkeley Planning Journal 11, 71-105.
- W, A. (1964). *Location and Land Use- Towards a General Theory of Land Rent*. Cambridge: Harvard University Press.
- Waddell, J. F. (2003). *A Hedonic Regression of Home Prices in King County, Washington, Using Activity-Specific Accessibility Measures*. Washington: Paper presented at the Transportation Research Board Annual Meeting.
- Wang, J. M., Shi, Y. F., & Zhang, J. (2017). Energy efficiency and influencing factors analysis on Beijing industrial sectors. *Journal of Cleaner Production*, 167, 653-664.
- Warntz, J. S. (1958). Physics of Population Distribution . *Journal of Regional Science*.
- Wegener, K. S. (2007). *Update of selected potential accessibility indicators*, Final Report, Urban and Regional Research (S&W) and RRG Spatial Planning and Geoinformation.

Weinberger, R. (2015). *Commercial property values and proximity to light rail: calculating benefits with a hedonic price model*. Presented at Transportation Research Board 79th Annual Meeting, Washington, D.C. January 9-13.

Zhang, L., Yue, W., Liu, Y., Fan, P., & Wei, Y. D. (2018). *Suburban industrial land development in transitional China: Spatial restructuring and determinants*. *Cities*, 78, 96-107.

## APPENDICES

### Appendix A: Questionnaire for the Real Estate Professions

I am by Lawrence Sang, a student at the University of Nairobi currently studying a Masters of Art in Valuation and Property Management. I am carrying research that focuses on **the Effects of Standard Gauge Railway on Industrial Property Values, a Case Study of Athi River Town**. Your responses will be treated as confidential and will be used for academic purpose only.

1. What is your professional occupation?  
.....  
.....
2. What is the name of your organization?  
.....  
.....
3. How long have you been managing industrial property within Athi River area?  
.....  
.....
4. Which of the following industrial property are you involved in the property management?
  - a. Warehouses
  - b. Manufacturing or heavy industrial building
  - c. Refrigeration/Cold Storage Buildings
  - d. Telecom/Data Hosting buildings
  - e. Flex Buildings
  - f. Light Manufacturing Buildings
  - g. R&D Buildings
  - h. Others Specify .....
5. What are the sale prices for 1 Acre of land for industrial development in the area?  
.....
6. What is the monthly rental charges for leasing an industrial property (per square foot)?  
.....
7. Has there been an increase in demand for industrial properties in Athi River area?  
Yes   
No
8. What are the factors have influenced the industrial property values in Athi River town?
  - a. Development controls on industrial use of land.
  - b. Accessibility of the property
  - c. Population growth or population decline within the area.
  - d. The physical attributes of land include soil fertility, climate, location and topography.
  - e. The proximity to social amenities such as schools and hospitals.
  - f. Speculation to future land prices
  - g. Improvements in the transportation
  - h. Others (Specify) .....

9. What are the factors likely influencing the development of SGR in Athi River?
  - a) Need to provide urban transport.
  - b) Capability of transporting large numbers of people at high speeds
  - c) The proximity to major public centres and social amenities
  - d) Availability of funds for Railway development
  - e) Others (Specify) .....
10. What are the effects of development SGR on the industrial property in Athi River?
  - I. Increase the movement of goods and services.
  - II. Increase in real estate development
  - III. Increase in prices of property
  - IV. Reduction and minimization of the transport costs
  - V. Others (Specify) .....
11. What challenges have been brought about by the development SGR on the industrial property in Athi River?
  - i. Lack of Transparency in Property Market,
  - ii. Lack of Accurate Transaction Data,
  - iii. Lack of historical or current market statistics on demand and supply.
  - iv. Property acquisition with inadequate compensation,
  - v. Complexity with Property Transaction Process
  - vi. The liquidity of real estate market
  - vii. Taxation of real estate property
  - viii. Others (Specify) .....
12. Do you think SGR has had a direct effect on the change in values for industrial property? Why?
 

.....

.....

.....
13. What recommendations do you make on industrial property development as a result of SGR?
 

.....

.....

.....

**THANK YOU FOR YOUR PARTICIPATION**



## Appendix B: Questionnaire for Tenants in the Industrial Property

I am by Lawrence Sang, a student at the University of Nairobi currently studying a Masters of Art in Valuation and Property Management. I am carrying research that focuses on **the Effects of Standard Gauge Railway on Industrial Property Values, a case study of Athi River Town**. Your responses will be treated as confidential and will be used for academic purpose only.

1. Name and Occupation of the respondent  
.....
2. How long have you lived in Athi River?
3. How far do you live from the SGR?  
.....
4. Do you work within Athi river Town?  
.....
5. If yes/ what is the name of your organization?  
.....
6. Have you been involved in industrial property letting/purchasing within Athi River area?  
.....
7. Which of the following industrial property are were involved?
  - a. Warehouses
  - b. Manufacturing or heavy industrial building
  - c. Refrigeration/Cold Storage Buildings
  - d. Telecom/Data Hosting buildings
  - e. Flex Buildings
  - f. Light Manufacturing Buildings
  - g. R&D Buildings
  - h. Others Specify .....
8. What are the sale prices for 1 Acre of land for industrial development in Athi River  
.....
9. What are the monthly rental charges for leasing an industrial property (per square foot)?  
.....
10. Has there been an increase in demand for industrial properties in Athi River area?  
Yes   
No
11. What are the factors have influenced the industrial property values in Athi River town.
  - i. Development controls on industrial use of land.
  - ii. Accessibility of the property
  - iii. Population growth or population decline within the area.
  - iv. The physical attributes of land include soil fertility, climate, location and topography.
  - v. The proximity to social amenities such as schools and hospitals.
  - vi. Speculation to future land prices
  - vii. Improvements in the transportation
  - viii. Others (Specify) .....

12. What are the factors likely influencing the development of SGR in Athi River.
  - a) Need to provide urban transport.
  - b) Capability of transporting large numbers of people at high speeds
  - c) The proximity to major public centres and social amenities
  - d) Availability of funds for Railway development
  - e) Others (Specify) .....
13. What are the effects of development SGR on the industrial property in Athi River?
  - I. Increase the movement of goods and services.
  - II. Increase in real estate development
  - III. Increase in prices of property
  - IV. Reduction and minimization of the transport costs
  - V. Others (Specify) .....
14. What challenges have been brought about by the development SGR on the industrial property in Athi River?
  - i. Lack of Transparency in Property Market,
  - ii. Lack of Accurate Transaction Data,
  - iii. Lack of historical or current market statistics on demand and supply.
  - iv. Property acquisition with inadequate compensation,
  - v. Complexity with Property Transaction Process
  - vi. The liquidity of real estate market
  - vii. Taxation of real estate property
  - viii. Others (Specify) .....
15. Do you think SGR has had a direct effect on the change in values for industrial property? Why?
 

.....

.....

.....
16. What recommendations do you make on industrial property development as a result of SGR?
 

.....

.....

.....

**THANK YOU FOR YOUR PARTICIPATION.**

### Appendix C: Questionnaire for the Property Owners

I am by Lawrence Sang, a student at the University of Nairobi currently studying a Masters of Art in Valuation and Property Management. I am carrying research that focuses on **the Effects of Standard Gauge Railway on Industrial Property Values, a Case Study of Athi River Town**. Your responses will be treated as confidential and will be used for academic purpose only.

1. Name and Occupation of the respondent  
.....
2. How long have you owner a property in Athi River
3. How far is your property from the SGR?  
.....
4. Have you been involved in industrial property valuation within Athi River area?  
.....
5. Which of the following industrial property are you involved?
  - a. Warehouses
  - b. Manufacturing or heavy industrial building
  - c. Refrigeration/Cold Storage Buildings
  - d. Telecom/Data Hosting buildings
  - e. Flex Buildings
  - f. Light Manufacturing Buildings
  - g. R&D Buildings
  - h. Others Specify .....
6. What are the sale prices for 1 Acre of land for industrial development in the area  
.....
7. What is the monthly rental charges for leasing an industrial property (per square foot)?  
.....
8. Has there been an increase in demand for industrial properties in Athi River area?  
Yes   
No
9. What are the factors have influenced the industrial property values in Athi River town.
  - i) Development controls on industrial use of land.
  - ii) Accessibility of the property
  - iii) Population growth or population decline within the area.
  - iv) The physical attributes of land include soil fertility, climate, location and topography.
  - v) The proximity to social amenities such as schools and hospitals.
  - vi) Speculation to future land prices
  - vii) Improvements in the transportation
  - viii) Others (Specify) .....
10. What are the factors likely influencing the development of SGR in Athi River.
  - a. Need to provide urban transport.
  - b. Capability of transporting large numbers of people at high speeds
  - c. The proximity to major public centres and social amenities
  - d. Availability of funds for Railway development

- e. Others (Specify) .....
- 11. What are the effects of development SGR on the industrial property in Athi River?
  - I. Increase the movement of goods and services.
  - II. Increase in real estate development
  - III. Increase in prices of property
  - IV. Reduction and minimization of the transport costs
  - V. Others (Specify) .....
- 12. What challenges have been brought about by the development SGR on the industrial property in Athi River?
  - i. Lack of Transparency in Property Market,
  - ii. Lack of Accurate Transaction Data,
  - iii. Lack of historical or current market statistics on demand and supply.
  - iv. Property acquisition with inadequate compensation,
  - v. Complexity With Property Transaction Process
  - vi. The liquidity of real estate market
  - vii. Taxation of real estate property
  - viii. Others (Specify) .....
- 13. Do you think SGR has had a direct effect on the change in values for industrial property? Why?
 

.....

.....

.....
- 14. What recommendations do you make on industrial property development as a result of SGR?
 

.....

.....

.....

**THANK YOU FOR YOUR PARTICIPATION**

**Appendix D: Images of Study Area**

**Plate 1: The Construction stage of the Standard Gauge Railway**



**Source: Kenya Railway Report 2016**

**Plate 2: A Completed Section of SGR near Athi River**



**Source: Kenya Railway Report 2016**

**Plate 3: A Bridge Section of SGR over Nairobi Mombasa Highway**



**Source: Kenya Railway Report 2016**

**Plate 4: Portland cement industry, a few meters from the SGR Line**



**Source: Field Study, 2020**

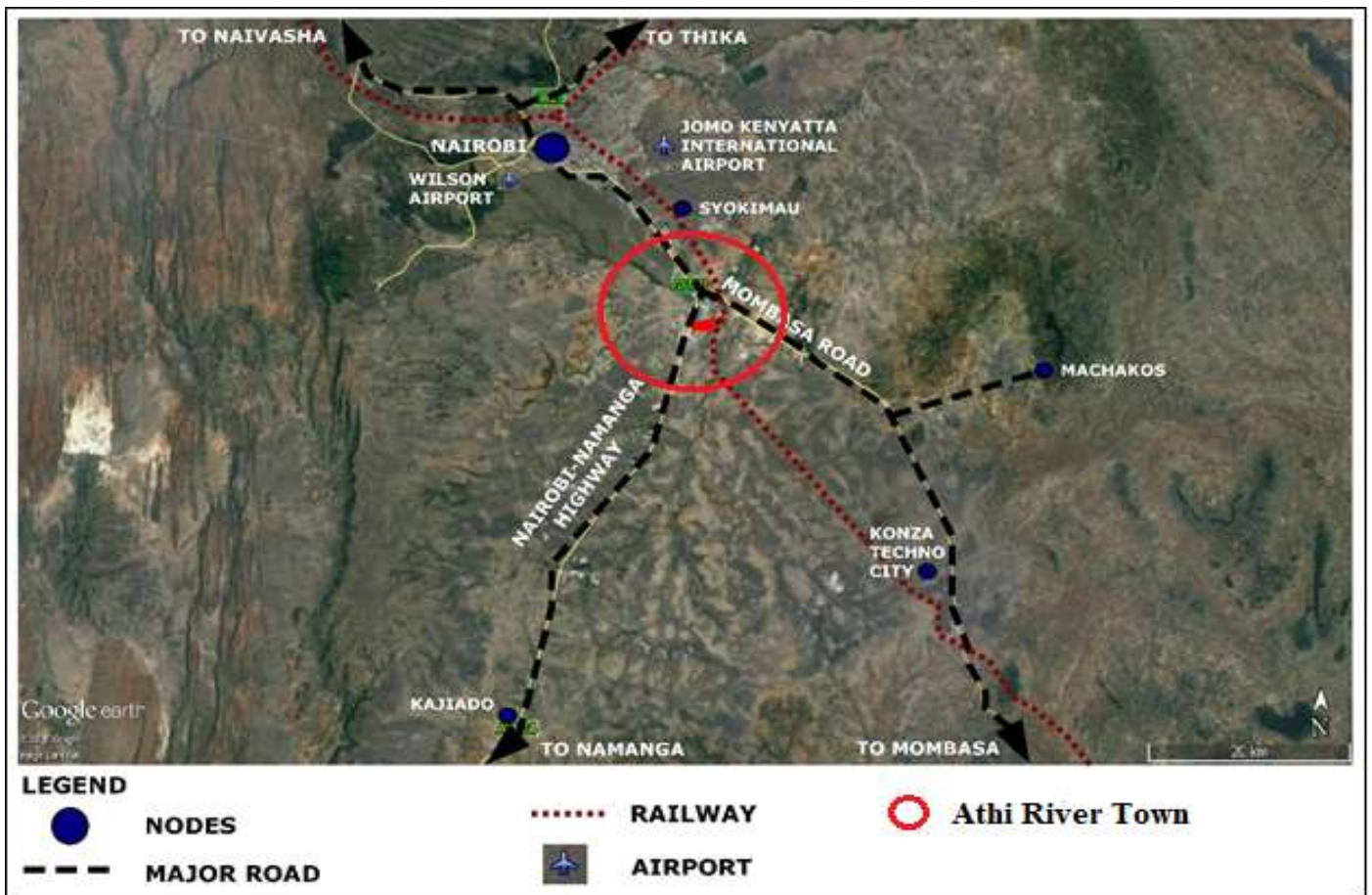
**Plate5: Industries behind the SGR Railway Station at Syokimau**



**Source: Field Study, 2017**

Appendix E: Google Map for the study area

Map 2: Map showing Athi River Area



Source: Google Map 2020