IMPACT OF INCREMENTAL INFRASTRUCTURE ON ECONOMIC DEVELOPMENT OF COUNTY GOVERNMENTS IN KENYA

BY

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN FINANCE AND ECONOMICS OF KCA UNIVERSITY

NOVEMBER, 2021

DECLARATION AND APPROVAL

This is a result of an independent investigation where it is indebted to others, the contribution has been dully acknowledged. I hereby declare that this study is based on personal achievement, my original wok and it has not been submitted to any other institution for academic qualification.

Signed:  Date: ……3/11/2021

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This I do hereby confirm that I have examined the master's dissertation and have certified that all revision that the dissertation panel and examiners recommended have been adequately addressed. This research project has been submitted for examination with my approval as the University supervisor.

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DEDICATION

I dedicate this work to my friends and family. A heartfelt appreciation to my wife Halima Adan, to my mother, Amina Hassan and my dad, Ibrahim Abdi Your support keeps me going.

AKNOWLEDGEMENT

The success of this study was made possible by the cooperation of various individuals. Foremost, my gratitude goes to Almighty Allah for his immeasurable blessings and care.

I would like to appreciate the following individuals, without whom this study would not have been successful. I am deeply indebted to my supervisor, Dr. Rose W. Gathii, who dedicated her valuable time and provided useful academic guidance towards the finalization of this paper. Her rich knowledge, experience and skills in research work helped immensely in adding value to this paper

My special thanks also go to the KCA University Brotherhood, which includes teaching, library and administrative staff for their support throughout my studies. Special mention goes to Charles Kyengo for his encouragement, support, wise advice, creative and countless suggestions shaped this study.

OPERATIONAL DEFINITIONS

Economic performance is related to economic growth, labor productivity and human well-being (Dedrick et al., 2003).

Infrastructure can be well-defined as capital that caters communal merchandises and amenities. It entails economic and social elements (Yoshino & Nakahigashi, 2000).

Incremental infrastructure: Infrastructure such as electricity connection, new roads, water and sewerage, new hospital and other new social infrastructure that **is** in-the-making, undergoing constant adjustment and intervention, and in a permanent state of flux (Silver, 2013).

Public infrastructure Social overhead capital investments such as roads, bridges and water treatment plants that provides public services (Hirschman, 1958)

Social infrastructure: Facilities and services that help individuals, families, groups, and communities meet their social needs (Fourie, 2006).

ABBREVIATIONS

ANOVA- Analysis of Variance

CBK- Central Bank of Kenya

EPI- Economy Performance Index

GDP- Gross Domestic Product

KNBS- Kenya National Bureau of Statistics

SPSS- Statistical Package of Social Sciences

BBI- Bridging Build Initiative

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ABSTRACT

Investments are essential for the efficient functioning of the economy. The need for a large part of government investment stems from the fact that some goods and services cannot be provided at all by a market economy and some may not be provided adequately. This has aroused the interest of many economists in determining the extent to which infrastructure development affects economic performance. The people of Kenya clamored for a new constitution to promote equitable distribution of national resources and end development inequality between regions of the country. With the onset of devolution in 2013, Counties embarked on infrastructure development of roads, waterworks, public health facilities, affordable housing among other projects to spur pecuniary progress. The aim of the study was to examine the effects of incremental infrastructure on the economic development of County governments in Kenya. The study was based mainly on the fact that huge investments have been made in infrastructure, and it is important to assess the influence of infrastructure investments on the economic advancement of Kenyan Counties. The study's data was collected from the 47 Kenyan between 2015 and 2018. Data was analyzed using descriptive statistical tools statistics, correlation and the Prais-Winsten regression analysis. The findings revealed that transport infrastructure, water and sanitation infrastructure and social infrastructure had significant and positive correlation with economic development of county governments in Kenya. Regression findings revealed that transport infrastructure had a positive (B=0.0276746) but insignificant (P value = 0.707>0.05) relationship with economic development (GCP) county governments in Kenya. The finding also revealed water and sanitation infrastructure had a positive (B=0.0547272) and significant (P-value=0.022<0.05) relationship with economic development (GCP) county governments in Kenya. Lastly, the findings indicate that social infrastructure had a positive (B=0.0877086) and significant (P-value=0.013<0.05) relationship with economic development (GCP) county governments in Kenya. The study concluded that water and sanitation infrastructure and social infrastructure positively and significantly affected economic development (GCP) county governments in Kenya. The study recommended that county governments should allocate more resources to transport, water and sanitation as well as social infrastructures in order to enhance the counties economic development. The study also recommended an additional research on the effect of other type of infrastructures apart from transport, water and sanitation and social infrastructures to determine their effects on counties economic development. But of concern to Kenyans is the issue of overreliance by County government on National government to finance county functions. Despite ICT Policies and other reforms put in place by the Central Government to improve the capability of devolved units to transfer and exchange information, making them more accessible to citizens and to improve service provision, promote productivity among public servants; encourage participation of citizens in government; and to empower all Kenyans in line with development priorities outlined in the Vision 2030. The report for the year 2015 from Commission on Revenue Allocation revealed worrisome trends especially for the marginalized areas. Most of the marginalized counties collected Revenues which was less than four percent of their total budgets hence we may not achieve Vision 2030 priorities. Most of these Counties are facing a number of challenges in realizing their mandate. The challenges included: delivery of infrastructure and health services, financial management, human resource capacity and managing rapid population growth. These

challenges had resulted in poor service provision and management and many analysts had criticized the capacity of Counties to deliver on their mandate. Because of inability of the counties to collect revenues optimally this study recommend that central government increase the county funding to 35% and above.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

It has long been believed that adequate range of infrastructure is an important component of productivity and growth. However, in recent years, the role of infrastructure has become increasingly important as infrastructure contributes to economic development by providing services that increase productivity and improve quality of life. Basic facilities like energy, transport, telecommunications, water supply, sanitation and safe waste management are essential for all types of domestic and economic production. Infrastructure expenditure predominates in public capital investment. Services provided on the basis of an adequate infrastructure base will lead to an increase in overall production, for example to an increase in farmers' agricultural production through improved roads. Investments in public infrastructure are therefore accepted as an essential part of economic development and growth. According to the World Bank (2010), infrastructure-related services in low- and middle-income countries account for seven to nine percent of GDP.

In addition to the direct benefits and problems associated with investing in public infrastructure, it is also important how to finance these investments. Investments in public infrastructure generally require large fiscal commitments, and public finance remains a traditional source of funding investments for infrastructure projects, especially in developing countries. As Jorgenson (1991) noted, the analysis of government investments is optimistic because it does not take into account the total cost of financing. Governments generally fund, own and operate a significant portion of the state's infrastructure due to monopoly holdings and strong, sustained public interests. Investment in infrastructure therefore requires significant and long-term financing, which is difficult for many countries to generate, and governments implement various deficit strategies. Increase taxes and raise money in domestic and foreign financial markets. The decline in public investment was one of the main reasons for the growing infrastructure gap and the associated decline in the average growth rate in certain regions (Calderon & Serven, 2003).

According to the World Bank AICD (2005) report, infrastructure accounts for more than half of recent improvements in Africa, and more could be added in the future. However, the report suggests that Africa's infrastructure network is lagging behind in other

developing countries, often characterized by a lack of regional connectivity and stable homes. Infrastructure services are twice as expensive in other parts of the world. Electricity is considered to be the biggest challenge for infrastructure. 30 countries regularly face power outages and many of them pay high premiums for emergency power. Another advantage is that much of Africa's infrastructure is financed from domestic sources, and the state budget is a major driver of infrastructure investment.

Effective infrastructure supports economic development, improves quality of life and is essential for national security (Baldwin and Dickson, 2008). Researchers analyze the impact of infrastructure from different angles, including regional competitiveness, economic development, income inequalities, production, labor productivity, environmental impact and Welfare (saving time and money). Money, strengthening security and developing information networks) (Bristow and Nalthorp (2000). These investments in infrastructure can catalyze changes in organization and management: the creation of a railway system will lead to the standardization of timetables, leading to increased revenues along with rail transport (Mattoon, 2004). Public infrastructure provides a geographic concentration of economic resources and on a larger scale Deeper labor and production markets (Gu & Macdonald, 2009) influence markets and end products, helping to define patterns of spatial development and providing a broad network of individual users at lower prices. Public infrastructure is widely considered the basis for building an economy (MacDonald, 2008). Rudzkiene (2009) analyzed the implementation of sustainable policy development. He stressed that infrastructure development is one of the most important aspects of the country's strategic plan for sustainable, social and economic development. Eschur (1998) argues that public infrastructure is the basis of quality of life. Good roads reduce accidents and improve public safety, water supply systems reduce disease, and waste management improves health and the beauty of the environment.

Complete and efficient infrastructure is necessary for the proper functioning of the economy and is an important factor in determining the location of economic activity and the types of activities or areas that can be developed (World Economic Forum, 2011). The Easterly (2002) study, among other things, found that developing infrastructure minimizes the impact of interregional distances, consolidates national markets, and economically

connects with markets in other provinces and territories. Good infrastructure is an important variable towards improving productivity and competitiveness which ultimately lead to increased economic growth. In addition, the quality and size of infrastructure networks have a significant impact on economic performance, reducing income inequality and poverty in a number of ways.

1.1.1 Incremental Infrastructure and Development

To quote famous economist Dr. V.K.R.V. Rao, "the link between infrastructure and development is not a once for all affair. It is a continuous process and progress in development has to be preceded accompanied and followed by progress in infrastructure, if we are to fulfill our declared objectives of a self-accelerating process of economic development"

Various authors and reports have defined the term infrastructure differently. First, some seminal work that focused on infrastructure include the World Development Report (1994), which acknowledged that there is no unique definition as it encompasses various activities with related technical and economic features like benefit spill overs from both consumers and non-consumers. The report however notes about 'economic infrastructure', which it defines to include public utilities (such as telecommunications), public works (such as roads and dam works) and other transport sectors (such as airports and water transport). One of the first scientists to write about infrastructure was Ascheur (1988), who did not give a definitive definition but focused on "basic infrastructure", which included, among other things, roads, highways, airports, water systems and sewers.

A new new highway or public transport service increases a community's access to other areas. This increases businesses' labor pool, reduces their costs to obtain input materials and services, and expands their potential market. This may increase "economies of scale" in production processes, which means higher productivity through lower costs per unit of output. Improved accessibility may increase workers' ability to access education and employment opportunities (increasing their productivity and incomes), and increase residents' access to more shopping opportunities (providing financial savings), and increase access to recreation and cultural opportunities (increasing their welfare). Mobility

management strategies, such as more efficient road pricing, can improve travel time reliability, which reduces logistics and scheduling costs beyond just the travel time savings. New transportation links between cities and ports, and new types of inter-modal facilities and services at those locations, make it possible for new patterns of international trade to develop. In some cases, the new links may improve the efficiency of business customer/client visits as well as product deliveries.

Infrastructure development is a key driver within countries for economic growth and poverty reduction (i.e. socio-economic development) (Owusu-Manu et al., 2019). Infrastructure delivery is of real concern in the everyday lives of the people in rural areas (Gnade, Blaauw & Greyling, 2017). Infrastructure services are used as final consumption items by households and as intermediate consumption item for firms. Availability of infrastructure services significantly influences development of regions and countries. It is the reason why level and quality of infrastructure have direct effect on business productivity and growth, and different investments to infrastructure capital form inequality between regions and countries (Snieska & Simkunaite, 2009). The proper quality and adequate infrastructural facilities ensure the high standard of living as well as also helps in improving productivity and efficiency (Kaur & Kaur, 2018).

Infrastructure development plays a crucial role in economic growth and development. In this respect, the sectoral contribution to economic growth and development cannot be overemphasised. Some of the pioneering works include the World Development Report (1994), which sought to link infrastructure and development. This indicates that infrastructure is indeed an essential element in achieving economic development. In the recent past, Alberto et al (2010) defined infrastructure to include two major categories, that is, hard and soft infrastructure1. Kingombe (2014) adopts a similar classification in his paper where he explores hard and soft infrastructure in Africa. The paper adds that soft infrastructure also includes institutions that aid in trade facilitation. For purposes of this study, the term infrastructure will be defined to include four key sectors irrespective of their classification. These include transport, water and sewerage and social infrastructure. Kenya's 2010 Constitution declares equity to be an underlying principle of governance, which is constituent with its provision for devolution which ushered in new 47 counties.

While institutionalization of equity is acknowledged by the previously marginalized, this is often not the case with beneficiaries of the old order. In order to efficaciously implement the letter and spirit of Kenya's constitution devolution, it is important for Kenyans to understand that while nature vastly differentiated their country, successive governments did little to exploit opportunities for providing the scope for nationwide development. This failure inspired the demand for devolution during the two – decade constitutional review saga. The Kenyan constitution (2010) established devolved governance structures called county governments. It is understood that with the new constitutional dispensation, more funds will continue trickling in the rural areas. The National government must be prepared to spend funds on the counties. It is therefore important to know the impacts of infrastructure in devolved units on the counties' growth. It is only by doing so that policy makers can be able to know the 5-percentage change in growth that will be attained because of the government's decision to devolve an extra shilling in these counties. There has been a debate mostly in the political arena as to what fraction of the national revenue is to be devolved in the counties. Although the Kenyan Constitution (2010) fixes it at a minimum of 15%, majority of the county politicians ranging from the governors, senators and even members of parliament have been trying to push it up to a minimum of 40%. The current attempt by Governors to organize a National Referendum duped BBI (bridging build initiative) is a clear manifestation of this. Moreover, the Kenya Vision 2030 envisages a 10% growth rate by 2030.

The promulgation of the new Constitution brought hopes to Kenyans for better service delivery through formation of county governments. A key challenge is the ever growing economic and financial needs of Kenyans coupled with the budget constraints ignited by inability to raise sufficient revenue which has impacted negatively on expectation of Kenyans.

Transport infrastructure is considered essential for increasing economic progress, could contribute to economic growth both directly and indirectly. From the perspective of economies with developing transport infrastructure, indirect effects may support industries that supply goods and services to enable the direct investment (Cigu, Agheorghiesei & Toader, 2019). Transport infrastructure investments constitute important political,

economic, and social processes that increase the riches and power of a country, enlarge markets, and lower trade barriers. This leads to increases in productivity outputs and to improvements in mobility and standard of living for the masses (Agbigbe, 2016).

Water and sanitation infrastructure includes the resident population connected to water supply and sanitation services and systems (Frone & Frone, 2014). Nations make the initial investment required for regulating water resources and water storage, then for water supply for human settlements and industrial production, food and energy, and therefore will invest in associated institutions needed to manage water resources and the related infrastructure in order to reach a perceived level of water security (Frone & Frone, 2012). With proper water and sanitation infrastructure there would be less waterrelated diseases, hence an increase in the attendance at schools.

Social infrastructure is a subset of infrastructure sector and typically includes assets that accommodate social services (Mesagan & Ezeji, 2016). Social infrastructure investment can assist in addressing widespread inequality and divided societies by promoting economic growth and social development (Gnade, Blaauw & Greyling, 2017). Social infrastructure is one of the dominant factors, ensuring the satisfaction of basic human needs, as well as the development of the state and its territory (Frolova et al., 2016). Social infrastructure influence both the gross domestic product and the number of employed population, the rates of profit growth, the volume of capital investments, the level of innovation activity (Biktemirova et al., 2015).

1.1.2 Economic Performance

Economic performance is related to economic growth, labor productivity and human well-being (Dedrick et al., 2003). Economic growth is an increase in the overall performance of the economy, often measured by the rate of GDP growth. Labor productivity is performance per employee. The economy is doing well when there is high economic growth, high factor productivity and better social well-being. Resources are allocated efficiently. An economy can be said to be experiencing economic growth when there is a sustained annual increase in the real national income over a period of time. That is,

economic growth means a rising trend of net national product (Onyimadu, 2015). GDP per capita can measure how well the economy is doing.

In political economy, politicians and even experienced policy advisors often lack the tools to properly assess current macroeconomic developments over the past month, year, or generation. The Economic Performance Index (EPI) aims to address these issues. Despite its structural simplicity, the EPI is a strong macroeconomic indicator that clearly measures the performance of the three main sectors of the economy: households, companies, and governments. The EPI contains variables that simultaneously affect three sectors: inflation as a measure of the monetary policy of the economy. Unemployment as a measure of the position of the economy in production; Budget deficit as a percentage of GDP as a measure of the budgetary position of the economy and changes in real GDP as a measure of total economic production. An easy way to understand economics is to observe GDP or GDP per capita, which is probably the most commonly used indicator to measure economic prosperity in theory and practice. Unfortunately, this only gives a limited picture of the economy.

Despite years of fiscal decentralization, not many countries have been able to quantify the size and structure of the economies at the decentralized units. To our knowledge, only South Africa has done this within the African continent, with Gross Domestic Product (GDP) per region estimates (1995-2006) made available in November 2007.Estimating GDP is a daunting task, and doing so at subnational levels is even tougher in part due to data challenges, prevalence of informalities, and difficulties in attributing economic activity to a specific subnational unit. Nonetheless, as countries decentralize, quantifying subnational economic activity and its relative size is becoming increasingly relevant and a common client-driven request. In a new initiative, the World Bank under the Kenya Accountable Devolution Program (KADP) partnered with the Kenya National Bureau of Statistics (KNBS) to produce the 2017 Gross County Product (GCP). With technical and funding support from the Bank, KNBS embarked on estimation of the net value added at the county level in 2017. After months of work, the estimates were released in February 2019, providing for the first time a credible and official quantification of the relative economic size of Kenya's counties

Among county government in Kenya, the Gross County Product (GCP) is a measure of how much each county contributes to Kenya's Gross Domestic Product (GDP) and may therefore be interpreted as the "County GDP". The GCP measures newly created economic value through production of goods and services in a specific county. The compilation of GCP is in accordance with international guidelines on estimation of regional gross domestic product. The GCP estimates are meant to address increased demand for county economic statistics such as size, growth rates, and structure (sectoral contribution) of the economies. The GCP analytics show that while some counties have a small contribution to the national GDP, they have greater potential for faster rate of growth and potential for catch-up with the dominant contributors (KNBS, 2020).

1.2 Statement of the Problem

Investments are essential for the efficient functioning of the economy. The need for a large part of government investment stems from the fact that some goods and services cannot be provided at all by a market economy and some may not be provided adequately. This has aroused the interest of many economists in determining the extent to which infrastructure development affects economic performance. As such, the link between infrastructure investments and development outcomes is one of the most popular topics for debate in recent scientific literature and economic research.

Kenyans quest for the new constitution and devolution of powers to counties was informed by many factors including dissatisfaction due to inequalities in economic development associated with imbalance in resource allocation. Equitable distribution of resources and infrastructure development were seen to be key drivers for economic growth for the devolved units. With the onset of devolution, Counties received significant resources from the national government enabling them to embark on the meaningful overdue long-term infrastructure project. These were reflected in kilometers of asphalt, construction of medical facilities and water projects. Sustainability and viability These infrastructure projects remain one of the biggest challenges to sustainable economic growth. The economic costs of infrastructure failure, linked to the legacy of past underinvestment in infrastructure, are a heavy burden on the country. The cost of renovating infrastructure is usually much higher than the cost of regular maintenance. The country's competitiveness

on the international stage is not impressive and infrastructure is one of the most important factors that should affect economic development.

Since the advent of devolution, access to improved sources of drinking water has increased by 12 per cent to cover 59 percent of the population. This has also been coupled by investments in sanitation facilities (UNICEF, 2018). According to the World Bank (2016), by December 2015, 1.3 million Kenyans had access to improved water sources while 200,000 others were connected to a sewage network. Moreover, the country's energy generation capacity increased to 2,234 MW against a pick demand of 1,549 MW, resulting in a 30% fall in the cost of power to consumers. Additionally, transportation infrastructure has seen a significant boost with additions of tarmacked artery and feeder roads to the national transportation grid (World Bank, 2016).

Several studies have scrutinized the affiliation amid infrastructure advancement and countries' economic performance. However, the results of these studies were inconclusive. Some studies indicate that infrastructure development has an affirmative validity on pecuniary progress, while other studies indicate a negative relationship between the two variables. De Long and Summers (1991) found that greater investment in equipment allows for faster economic growth. Likewise, the results of Bose and Haque (2005) indicate a one-way cause, ranging from economic growth to capital formation in the form of government investment in transport and communications. However, the results of a study by Easterley and Levin (2001) concluded that capital accumulation does not contribute to faster economic growth. Kenya is in its eighth year of decentralization and no studies have been conducted on how infrastructure development affects economic growth in the regions. The purpose of this study is to contribute to the current economic structure by studying the effects of additional infrastructure on the economic development of the Kenyan regional government.

1.3 Objectives of the study

1.3.1 General Objective

The main objective of the study will be to examine the effect of incremental infrastructure on economic development of County Governments in Kenya.

1.3.2 Specific Objective

i. To examine the effects of incremental transport infrastructure on economic development of County Governments in Kenya.
ii. To assess the effects water and sanitation infrastructure on economic development of County Governments in Kenya.
iii. To examine the effects of social infrastructure on economic development of County Governments in Kenya.

1.4 Research Questions

i. What is the effect of incremental transport infrastructure on economic development of County Governments in Kenya?

ii. What is the effect of water and sanitation infrastructure on economic development of County Governments in Kenya?

iv. What is the effect of social infrastructure on economic development of County Governments in Kenya?

1.5 Significance of the study

Financing public infrastructure is a significant challenge, especially in emerging economies where budget surpluses are difficult to obtain and sources of income are less for world powers. Low income in developing countries means less savings and less investment. Adequate public infrastructure is likely to remain a challenge for local governments in Kenya, and academic research is needed to guide policy makers. This research is modern and relevant to decision makers, contributing to the literature through a variety of innovative methods and local applications.

Policy makers especially governors of counties who will be managing resources, will be able to make better policies that will have an impact of the public infrastructure development once they get to know the relationship of these two variables. Policy makers will benefit from the experience gained and will be able to design alternative strategies to help improve infrastructure development. The study provides information that can be used to formulate sustainability strategies for public infrastructure projects in Kenya. The

government can also use the results of this research to support progress projects in bucolic and inner-city areas by making public infrastructure more sustainable. The result is important for pollsters and researchers as a footing for advance research. The research offers basic info to examine institutions and researchers who could conduct further research in this area. Research can make it easier for discrete pollsters to recognize fissures in contemporary study and conduct exploration in those areas. These findings help understand the main drivers of economic growth, explain the infrastructure drivers that enable more successful income levels, and provide policymakers and leaders with an vital instrument for originating rallied money-spinning policies and institutional ameliorates.

1.6 Scope of the study

This study examined the impact of infrastructure development on the economic growth of district governments in Kenya through empirical studies and quantitative analyzes. The study's population was made of the 47 counties in Kenya. This study therefore carried out a census of the 47 counties in Kenya. Census was an appropriate data collection design used for small heterogeneous population. Secondary data was collected from the 47 counties for a period of 4 years between 2015 and 2018.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter contains appropriate prose info on the general and specific objectives of the study. The chapter reviews and criticizes the available literature on the topic and identifies gaps in research in terms of context, concepts and methodology to improve knowledge. This chapter deals mainly with a theoretical overview, an empirical overview and finally a sum-up of the literature.

2.2 Theoretical Review

2.2.1 Keynesian Investment Theory

Keynes (1936) called for government spending to create jobs and use unused capital when the economy is in recession with rising employment and capital unemployment. Keynes' theory assumes that government spending is necessary to support economic performance and growth. While Stratmann and Okolski (2010) deny that governments have many spending options, they may not know wherever commodities and amenities can be used more gainfully, and in this way consuming cannot drive the desired growth unless it is carefully targeted. This information problem, bewildered by a relentless political process, can hamper economic growth (Stratmann & Okolski, 2010).

The Keynesian approach rests on formal optimization models derived from Neoclassical first principles (Crotty, 1996). This theory follows the neoclassical and classical economic analysis of fiscal policy. Assuming that financial incentives (consumption deficit) could increase production, these schools found no reason to believe that these incentives would offset the negative effects of declining private investment. He claimed that the incentive would increase the demand for labor, increase salaries and harm the company's profitability. Such uncontrolled government spending would also increase government bond holdings and lower market interest rates, which could lead to higher interest rates. Therefore, stabs to intensify the wealth will be self-destructive, as rising interest rates will make it more expensive for companies to finance capital investments.

The American economic crisis shortly after World War II and the economic expansion after the war (1945–1973) were considered manifestations of this line of thought. The decisions of private sector operators with a profit sometimes lead to inefficient macroeconomic results. The Keynesian economist therefore advocates an active fiscal policy on the part of the government in order to stabilize production during the economic cycle. According to Barrow (1990), this can be accomplished through public investment through an income injection, which leads to increased spending in the overall economy. The important effect is that business productivity and investment are stimulated, which includes more income and expenses. Austrian economist Hayek (1989) also criticized

Keynesian economic policy for its fundamentally group approach, saying that such theories support central planning, leading to pseudo-capitalist investment, which can also lead to economic cycles.

2.2.2 Rosenstein Rodan (1943) Big Push Model

The big push model is a concept in development economics or welfare economics developed by Rosenstein Rodan in 1943 that emphasizes on a country's decision whether to industrialize or not depends on its expectation of what other firms will do. The big push theory indicates that infrastructure services have a strong growth-promoting effect through their impact on production costs, the productivity of private inputs, and the rate of return on capital–particularly when, to begin with, stocks of infrastructure assets are relatively low (Agénor, 2010). The model emphasizes that underdeveloped countries require large amounts of investments to embark on the path of economic development from their present state of backwardness. Based on the theory, a big push of aid and the investments following should lead to economic growth and poverty reduction (Lundin & Kilman, 2014).

According to the theory, to alleviate growth constraints and poverty reduction, several observers have advocated a large increase in public investment in infrastructure, in line with the Rosenstein Rodan (1943) Big Push view. Proponents of the Big-Push often refer to the examples of South Korea and Taiwan as great success stories on which to model future Big Pushes. Beginning in the 1950s, aid rose in South Korea to a high of approximately $400 million in 1957 before experiencing a sharp decline in the 1960s followed by a period of more gradual decline in aid as South Korea entered into a period of sustained economic growth that continues to this day. The Big Push, when properly conceived, could successfully stimulate economic growth in many countries in Africa, provided that the Big Push is not merely focused on dispensing resources, but also on how the aid is regulated and toward which programs it is given (Conrad & Kulkarni, 2009).

The theory indicates that infrastructure raises the economy's ability to produce health services; in turn, greater access to health services enhances workers' productivity, and therefore output. Thus, the accumulation of human capital results not from the acquisition of knowledge, but from better quality of effective labor (Agénor, 2010). The theory supports that provided that governance is adequate enough to ensure a sufficient degree of

efficiency of public investment outlays, an increase in the share of spending on infrastructure may facilitate the shift from a low growth equilibrium, characterized by low productivity and low savings, to a high growth steady state.

2.2.3 Frischmann's Transportation Infrastructure Theory

Economist Frischmann (2005) popularized the economic theory of infrastructure and commons management. The Frischmann's (2005) theory of infrastructure and commons management provides a theoretical foundation for analyzing the contribution of a country's road network to economic growth and development and the resulting social implications in developing economies. The theory argues that allowing the public open access to infrastructure, such as a network of roads, would create an economic return for the society and lead to social change. The theory focuses on the demand side of an economy and investigates how transportation infrastructure such as a network of roads can create value for the public (Agbigbe, 2016).

The central premise behind this theory is value creation. The theory proposes that open access to a network of roads for the public, can create significant positive results for the society (Frischmann, 2005). Since analysis of transportation infrastructure investment and its relationship to economic growth is multidimensional, many researchers have posited that such an analysis must encompass many components including GDP, population size, and degree of urbanization, traffic density, and level of economic development.

2.3 Empirical Literature Review

2.3.1 Transport Infrastructure

Poverty, inequality and social-economic and political exclusion present real impediments to the realization of development as well as the realization of basic human rights in many less developed countries (LDCs). Citizens who are excluded from participation in such a society where there is a crisis of resource distribution and allocation are usually denied capabilities, assets and thus the opportunity they need to realize basic rights such as food, shelter, security and health and are left poor, miserable and dejected (Gituto 2007).

Thus, poverty, inequality and social-economic and political exclusion constitute gross violations of the basic rights and entitlements of these citizens. As such, these conditions present a moral, ethical, legal and programmatic challenge that all of society, and especially its leadership, should rise up to. Being some of the poorest and most unequal societies coupled by the fact that it is one of the most socio-economically exclusivist states globally, countries in the Global South makes the need for the reorganization of the whole socio-economic and political architecture important (Gituto 2007).

According to Rostow (2017), infrastructural initiatives are critical in development in that they help a society to midwife the take off stage which entails the process of overcoming the old blocks and structures. At this juncture, the manufacturing sector lifts away from the economic base and growth becomes the new normal coupled by the doubling of the national income as well as the growth of the investment rate. Additionally, society is characterized by the growth of major industries (Rostow 2017).

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Infrastructural development have been touted as salient to economic growth. Such initiatives include the 21st century Silk Road at the global level. The silk road initiative proffers a new pathway not only development of China but also for the economies of the countries and regions targeted in this ambitious infrastructural project. Studies on the impact of this infrastructural endeavor however remain inconclusive of the impact of the project on the productivity of input factors for small and medium enterprises in countries in the Global South such as Kenya.

Related studies give varying insights. According to Haggai (2016) who examined the vision, scope and the goals of the ambitious infrastructural project and the associated impacts on economic development in the concerning countries, the initiative has huge potential in promoting economic development in the participating regions. This is largely

hinged upon what he refers to as the process of tapping from the proceeds of globalization through better and apt policy coordination, facilities, connectivity, unimpeded trade, financial integration, increased economic performance and productivity and people-to-people bonds (Haggai 2016).

On the other hand, Zhao, et al. (2021) study the economy of the countries along the maritime silk road and how will contribute to sustainable development. Zhao, et al. (2021) found out that the overall economic efficiency of countries along the silk road trended upward from 2007 to 2017 (Zhao, Hu and Sun 2021). However, Zhao, et al. (2021) put a caveat arguing that country specific industrial structures may hinder the benefits of the economic development derived from the maritime silk road. In lieu of the foregoing, this necessitates a need to nuance how country specific factors may hinder or aid the absorption of benefits derived from the maritime silk road.

Putting a related caveat, Ehizuelen (2017) argues that for businesses operating in countries in sub-Saharan Africa to tap into the benefits to be accrued from the 21st century silk road, there is a need for African governments to do more to foster an enabling environment for projects to succeed. Additionally, Ehizuelen (2017) further posits, there is a need to improve the investment climate from what it is nowadays in the continent can help begin the snowballing effect and stimulate economic growth in Africa (Ehizuelen 2017).

On the other hand, Khin, et al. (2019) examine the factors of the successful implementation of Belt and Road Initiative (BRI) on small-medium enterprises (SMEs) in Malaysia. The choice of Malaysia was informed by the fact that it is one of the Southeast Asia countries that actively participated in BRI. Secondly, based on statistics from international financial institutions, SMEs constitute over ninety-eight per cent of business establishments in Malaysia. In concluding their study, Khin, et al. (2019) found out that the infrastructural project led to business and investment opportunity creations, connectivity and cooperation enhancement, trade and export boosting, geographic location and enhancement of e-commerce for SMEs in Malaysia (Khin, Chiun and Seong 2019).

According to Li, et al. (2019), China's Belt and Road Initiative (BRI) has provided Chinese firms with significant incentives to speed up the pace of internationalization. However, he

points that the cultural friction that results from the process of internationalization will negatively affect the export performance prompted by the BRI (Li, Liu and Qian 2019).

In examining the influence of the silk road on the resilience of SMEs, Butt and Shah (2020) for instance explore the potential opportunities and challenges that Belt and Road Initiative (BRI) may bring for resilient supply chains using firms operating between Pakistan, Sri Lanka, Bangladesh, Mainland China and India. The two scholars found out that there are both challenges and opportunities for supply chain resilience within the context of BRI. In particular, Butt and Shah (2020) find that the belt and road initiative can improve quality infrastructure, greater connectivity for logistics firms and enhance consumer markets. Conversely, the belt and road initiative also poses challenges to supply chain resilience in managing large-scale logistics infrastructure and the potential conflicts between countries participating in the belt and road initiative (Butt and Shah 2020).

On the other hand, for Altnaa and Iván (2021) who investigate country specific barriers to the internationalization process in SMEs in developing countries, the internationalization which the silk road will bring about may be problematic for SMEs in the developing world. This is due to the fact that SMEs in the global south are bedeviled with a number of challenges during their internationalization. To Altnaa and Iván (2021), unlike SMEs in the developed countries already have a good knowledge and experience of their domestic markets as well resources and capabilities that are essential to overcome potential barriers in a new foreign market distorted information channels, fragile market structures, imperfect property rights conditions, and unstable institutional environments (Altnaa and Iván 2021).

The reviewed literature shows that the 21st century Silk Road (MSR) initiative proffers a new pathway not only development of China but also for the marine economy and the economies of the countries and regions targeted in this ambitious infrastructural project. With regard to the impact of the project on the productivity of input factors for small and medium enterprises in countries in the Global South such as Kenya, the reviewed literature shows that the initiative has huge potential in promoting economic development in the participating regions. This is largely hinged upon the ability of the project to help SMEs to tap the proceeds of globalization through better and apt policy coordination, facilities,

connectivity, unimpeded trade, financial integration, increased economic performance and productivity and people-to-people bonds.

However, a number of scholars pointed out that there are certain conditions necessary for the realization of these benefits. For Wu, et al. (2020), a positive impact of China's ODI on the silk road is pegged on the need for better institutional qualities of the countries participating in the initiative. For Zhao, et al. (2021), country specific industrial structures may hinder the benefits of the economic development derived from the silk road. These sentiments were also echoed by Ehizuelen (2017) who pointed out that for SMEs operating in countries in sub-Saharan Africa to tap into the benefits to be accrued from the 21st century silk road, there is a need for African governments to do more to foster an enabling environment for projects to succeed. Additionally, Ehizuelen (2017) called for the improvement the investment climate in sub-Saharan African countries. To Huang, et al. (2021), there was a need to enhance the efficiency of maritime ports.

With regard to the influence of the silk road on the ease of doing business for SMEs, the reviewed studies show that the infrastructural project would lead to business and investment opportunity creations, connectivity and cooperation enhancement, trade and export boosting, geographic location and enhancement of e-commerce for SMEs. However, scholars such as Wang, et al. (2019) put a caveat arguing that these benefits were largely pegged on post-initiative infrastructure expansion and logistics performance improvements. This was further reiterated by Li, et al. (2019) who pointed out that cultural friction may be a potential hindrance.

In reviewing studies on the influence of the silk road on the resilience of SMEs, it was found that this has mixed implications. For Butt and Shah (2020) for instance, while the belt and road initiative can improve quality infrastructure and bring about greater connectivity for logistics firms and enhance consumer markets, managing large-scale logistics infrastructure and the potential conflicts between countries participating in the initiative is problematic. However, to Altnaa and Iván (2021), the challenges will be largely felt by countries in the global South who face many barriers in the internationalization process of their SMEs.

According to Madrick (2012), it is generally believed that transport infrastructure supports growth. Many countries continue to invest heavily in infrastructure based on the logic that people need access to benefit from ideas and markets. However, the causal effects of transport infrastructure investments are controversial. Some experts, especially Savage, consider this essential. While others feel that this should not be a political goal, it should be left to market forces to develop infrastructure if demand so requires. Clear estimates of the extent and direction of the impact could have an impact on the policy.

Transportation is important for understanding and managing many different systems at different levels and embodies the complex relationships that exist Between the physical environment, social and political activity patterns and economic development levels (Hoyle & Knowles) 2011. Numerous aspects play a role in the multifaceted liaison amid transportation and improvement. These factors affect the transport system in a number of ways, interact, and directly or indirectly affect the transport system.

The relationship between investment in transport or roads and financially viable expansion has far-reaching consequences that go further than the prime intent of transport, i.e. the movement of merchandises and persons from one place to another. There is no doubt that roads are at the heart of economic work, but you need to understand how an efficient road network can improve the productivity of an economy. Capital expansion is an appropriate form of investment for this study as it focuses on the economic return of investment in road infrastructure. When considering road investment, it is important to determine whether infrastructure investment has a positive or negative impact on economic development. American studies show that effects can work in both directions (Madrick, 2012).

Monel (2008) found that the contentious issue for many years was that building infrastructure leads to economic development or that economic development leads to investment in infrastructure. However, much research has been done on the responsibility of public services investment in economic advancement. When implementing a transportation infrastructure project, various economic impacts arise, either directly or indirectly. Better transportation infrastructure can increase the region's ability to attract local and foreign investment. This has proven to be a major boost to the economy and foreign trade of developing countries. For example, in rural areas, various production plants

could be set up to improve infrastructure with the financial support of foreign investors. As transport infrastructure improves, the availability and movement of labor for the region increases and, in general, the time required for users decreases. On the other hand, users' infrastructure costs are reduced in the long run thanks to improved infrastructure (Barro, 1990).

Improved road infrastructure systems can facilitate the formation and integration of the internal market, resulting in the long-term expansion of the region's productive capacity through more resources and increasing the productivity of the existing resources. Transportation shortage also negatively affects supplies of raw materials and energy, which is also important for economic growth (Pereira & Andraz, 2015). Under these circumstances, improvements in the provision of transportation services are likely to have a large and small impact on production. As an important part of the resource, the value of land in the region will increase with the construction of new conveyance infrastructure. The influence of infrastructure advancement on lucrative augmentation is customarily greater when there is a problem in the economy due to underdeveloped infrastructure (Zhou, Yang & Liu, 2007). Although infrastructure in Kenya has developed rapidly in recent years, it has not been possible to adequately cover economic growth. As transport infrastructure improves in developing regions, it will be possible to increase production technology relatively quickly, either by relocating them from industrial areas or developing them in this area.

A study by Owusu-Manu et al (2019) assess the impact of infrastructure development on Ghana's economic growth. Using data obtained from the World Bank's World Development Indicators, the United States' (US) International Energy Statistics and the Central Intelligence Agency's (CIA) Factbooks from 1980 to 2016, an autoregressive distributed lag (ARDL) framework was used to determine the long and short run impact of the selected infrastructure stock and quality indices on Ghana's economic growth. The findings established a statistically significant relationship between infrastructure development and economic growth. Additionally, electricity generating capacity is identified as the infrastructure stock index that has the greatest positive impact on Ghana's

economic growth. The study reveals that transport infrastructure had a significant negative effect over both long- and short-run periods.

In their study, Cigu, Agheorghiesei and Toader (2019) examined the link between the transport infrastructure and the economic performance in the EU-28 countries, over the period of time 2000–2014, using panel data methods. The results showed significant effects from transport infrastructure components even after institutional and other factors are controlled for. The study also found a unidirectional long-run causality relationship between growth, transport infrastructure and public sector performance. The study found that transport infrastructure status (measured thought index of transport) has significant impact on economic development with coefficient estimate.

Mohmand, Wang and Saeed (2017) investigated the impact of transportation infrastructure on economic growth: empirical evidence from Pakistan. The study adopted the unit root, cointegration, and Granger Causality (GC) model to test whether causal linkages between economic growth and transportation infrastructure exist at national and provincial level. The findings suggest that in the short run, there is no causality between the two variables at the national level, however, a unidirectional causality from economic development to infrastructure investment exists in the long run. At the provincial level, bidirectional causality in the rich and much developed provinces exists, whereas a unidirectional GC exists from economic growth to transportation infrastructure in the underdeveloped provinces.

Banerjee, Duflo and Qian (2012) examined the effect of access to transportation networks on regional economic outcomes in China over a twenty-period of rapid income growth. It addresses the problem of the endogenous placement of networks by exploiting the fact that these networks tend to connect historical cities. The study results showed that proximity to transportation networks had a moderate positive causal effect on per capita GDP levels across sectors, but no effect on per capita GDP growth.

2.3.2 Water and Sanitation Infrastructure

According to the World Water Council (2013), water security has an impact on both developed and developing countries, with the main threat to water risk coming mainly from

developing countries. Many poor countries face unreliable water supply and therefore need more investment to achieve water security. Most developed countries are relatively water safe, but in the face of climate change, infrastructure deterioration, economic development, demographic changes, and increasing environmental quality expectations, they must constantly adapt and invest to maintain water safety. Investments in improving water safety can protect society and industry from certain water risks and have a positive impact on economic growth, inclusion and economic structure (Graham, 2012). Improving water security can, for example, reduce basic food prices and instability, which is a top priority of the global economy.

With regard to social infrastructure, studies have examined the impact of improved water supply and sanitation facilities on water-borne diseases which are a drain on economic development as they bedevil a community with ailments such as ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. Calculating disease-specific median reduction levels for these studies, Esrey, et al. (1991) found out that there was a morbidity reduction of 26% in the case of diarrhea when safe and adequate provision of drinking water, sanitation and hygiene facilities was enhanced while trachoma and ascariasis were reduced by 27%, and 29%, respectively. In the case of schistosomiasis and dracunculiasis, the median reduction was higher, at 77% and 78%, respectively. Furthermore, in all the cases, there was a significant reduction in disease severity (Esrey, et al. 1991).

With regard to water infrastructure, scholarship is largely pegged on its impact to household income. There is a significant impact of water source on household income as households seek to source for water from improved sources at considerable costs. According to the Society for International Development (2013), while the use of improved water sources in urban areas is more than double that of rural areas in both male and female headed households, a sizeable proportion of the population spends money and assumes the risk of potentially lower quality water (Society for International Development, 2013).

To Hailu, et al. (2011), sourcing water from water vendors who are a common source of water in countries in the Global South significantly raises the cost of water access and has an impact on household income. While water vendors are viewed as pioneers and gap-

fillers, supplying water where utilities are not providing it adequately, they charge high prices and supply poor quality water. However, water vendors and especially small scale providers increase water supply coverage and reduce time poverty. Water from water vendors is also exposed to contamination by external toxic residuals, mainly during transportation and as a result of pipe leakages. Given their inability to store water, low-income households suffer disproportionally in times of scarcity and rationing significantly increasing the costs of water sourcing and access and thus impacting on household income (Hailu, Rendtorff-Smith, & Tsukada, 2011).

According to Tucker (2009), the water source type will impact on household income. Drawing on micro and macro-level studies of the economic impacts of access to water in Ethiopia, Tucker (2009) is of the view that investments in water offer economic and livelihood benefits to households, increasing their income and resilience while the reverse is also true (Tucker, 2009). However, to Evans, et al. (2013), the relationship between water source, water usage and health and social outcomes is complex and mitigated by a range of contextual and intermediate factors. As such, a fundamental challenge in comparing outcomes of at-house supplies with shared supplies lies with wealth as a confounder (Evans, et al., 2013).

According to Pories (2016), opportunity cost in sourcing water may serve as a pointer to the impact access to water has on household income. To Pories (2016), while not every person with access to improved water and/or sanitation ultimately opts to use this extra time to earn additional income, many people (predominantly women) who took loans in order to construct household water and/or sanitation facilities directed their newly-freed time towards income-generating activities. As such, Pories (2016) argues, the household economic benefits of enhancing access to water by reducing distance and improving quality include averted health related costs and time savings associated with having water and sanitation facilities closer to home. Furthermore, time saved due to less illness and closer access to facilities translates into higher productivity and higher school attendance (Pories, 2016).

As economies and populations grow, assets, economic activities and residents are also exposed to water risks. Therefore, investments must be designed to handle uncertainties.

Promote adaptive management as changing social risks, opportunities and preferences. Wealth provides an important means of reducing water risks. The richer the land, the cheaper the reduction in water risks. Thus, economic growth can promote policy reform, strengthening water institutions, and opportunities for financing investments in water-related technologies, infrastructure and information systems (Maingei, 2010).

Gray and Sadov (2007) reported the impact of water and sanitation on the economic impact, saying there is a link between investment in water management and economic development. As a concept of water security, they hypothesized that countries must achieve water security before economic growth, and to achieve water security certain investments must be made in the water sector (whether water infrastructure or water management). This is supported by a study by the Stockholm International Water Research Institute (SIWI) (2005), which improves water management (in terms of investment in infrastructure or water facilities), making the national economy more resilient to fluctuations in rainfall, agriculture and fishing Shows that it is more resilient.

The balance between investment in hydraulic infrastructure and water management depends on the socio-economic status of the country. Grai and Sadov (2007) point out that developing countries need more investment in water infrastructure than developed ones, while developed countries need more investment in institutional and water management. water compared to developing countries. Climate variability is one of the determinants of water safety. Based on climate variability, Gray and Sadov (2007) selected countries with small or difficult hydrological heritage. This will determine the amount of investment required to achieve economic development. They assumed that countries with difficult hydrological heritage would have to invest more than countries with minor hydrological heritage to achieve the same level of economic development. Countries with a difficult hydrological heritage are among the poorest in the world (Gray & Sadoff, 2007).

In their study, Frone and Frone (2012) examined the relationship between water infrastructure and socio-economic development issues in Romania. The study developed a simple regression and correlation analysis of these issues, to conceptually assist the supposed large investment effort. The study tried to capture the correlation between

economic development (represented by variable GDP/capita at purchasing power parity PPP) and the development of infrastructure of water/wastewater (represented by different proxy variables, depending on data availability) fo Romania. The study found a positive correlation between access to public sewerage network and the economic development indicator. The study also found that GDP/capita was inversely correlated with water consumption from the public water supply.

Meeks (2017) examined the economic impact of water infrastructure. The study exploited the differences in the timing of shared public water tap construction across Kyrgyz villages to provide evidence on the extent to which such changes in time allocation are aided by access to better water infrastructure, a technology that decreases the labor intensity of home production. Households in villages that receive this labor-saving technological improvement are, on average, 15% more likely to be within 200 meters of their water source. This, in turn, reduced the time intensity of home production activities that are impacted by water, such as bathing, going to the doctor, and caring for children.

A study by Musouwir (2010) examined the correlation between investment in the water sector and economic growth in developing countries. The study conducted a time series of rainfall deviation from the mean (%), national budget on water supply and sanitation (million USD per year) and per capita Gross Domestic Product (GDP) (USD per year) of 22 developing countries in Africa. The analysis reveals unexpectedly that there is no statistically significant relationship between rainfall deviation from the mean and GDP per capita. The study found a statistically significant relationship between national budget on water supply and sanitation and GDP per capita, and also between ODA in all sectors and GDP per capita. The study concluded that national budgets on water supply and sanitation in all 22 African countries have a much larger multiplier effect on GDP per capita compared to ODA in all sectors in those countries. The study recommended that governments of developing countries to spend more of their annual budgets on the water sector.

2.3.3 Social Infrastructure

Today's social infrastructure sector affects GDP, number of workers, income growth, capital investment and level of innovation (Kokurin & Nazin, 2011). However, little is known about the impact of social infrastructure on the parameters of business growth, industry and regional economies as a whole. There is no official way to estimate the impact of social spending on the dynamics of economic growth (Buzmakova, 2010). All of these requirements call for the concept and implementation of institutional measures concerning the development of national, regional and community infrastructure development concepts, the development of national institutions for monitoring and monitoring social infrastructure, the development and preparation of partnership tools between the public and private sectors. Special legislation regulating public social activities as economic activity and implementing state aid measures for small social enterprises (Palchintseva, 2004). Of course, the development and implementation of infrastructure institutionalization will involve economic reforms in the region and promote competition among infrastructure sectors. Design measures to increase the competitive advantage of social infrastructure and investment environments will lead to social spending on the development and application of tools to increase capitalization of public social spending (Smolyakov, Medvedeva, 2008).

Maingi (2010) steered a study on the effect of government expenditure on financial growth in Kenya. He found that better government spending on infrastructure and education would support economic growth, while government consumption, public order and security spending, wages and allowances could not support economic growth. The study has shortcomings because none of the diagnostic tests were performed. Ighodaro and Okiakhi (2010) examined government spending broken down by public authorities, social and welfare services in Nigeria using time series data from 46 to 2007 and using Granger's causal test. The results showed that public spending had a negative impact on economic growth.

Extensive academic research on social equality has shown that poor countries still fail to make room in sound infrastructure to support the development of their entire population. For example, Cibitusi and Pillay (2005) argue that poverty is "the result of the unproductive

use of human resources in most societies" (Cibitusi & Pillay, 2005). Researchers argue that the economy is in transition and that politicians cannot enthusiastically involve everyone in economic activity. In many cases, funding financially unsustainable social programs has had little impact on social security for the nation's population (Sebitosi & Pillay, 2005).

Social factors to sustain economic growth are often overlooked in science. Instead, researchers focus on more specific variables, modeling economic growth with pure economic variables and ignoring social factors. Chow (2006) shows that social capital as a strategic resource can have a measurable and long-term impact on a country's economic growth and development. As decision makers provide resources to develop and expand social capital, the infrastructure also expands to enable more efficient and productive use of the skills developed by individuals. Chu (2006) suggests that enabling technology and government policy in the long run will lead the country to sustainable economic growth and strong social infrastructure.

A study by Gnade, Blaauw and Greyling (2017) on whether basic and social infrastructure investment differently affect economic growth and social development indicators of urban and rural municipalities. The study used a balanced panel dataset-containing infrastructure, economic, demographic and social indicators for rural and urban municipalities for the period from 1996 to 2012. Principal component analysis was used to construct synthetic indices of basic and social infrastructure. Restricted within least squares dummy variable estimation techniques were used to evaluate the differences between urban and rural municipalities. The study found that the elasticities of basic and social infrastructure investment generally are more pronounced for economic growth and social development indicators in rural municipalities.

Kularatne (2006) examined the social and economic infrastructure impacts on economic growth in South Africa. The paper tests for the possibility of a non-linear relationship existing between per capita output and economic infrastructure expenditure likely for South Africa. A principle component analysis is conducted on various measures of physical infrastructure to draw a picture of actual physical infrastructure created over the years. The study findings found the possibility of a non-linear relationship existing between per capita output and social infrastructure investment.

In their study, Kaur and Kaur (2018) examined the role of social and economic infrastructure in economic development of Punjab from 2001-2016. The paper used multiple regression model for finding the impact of social infrastructure viz. education and health and economic infrastructure on the NSDP per capita. The study found that there exists a significant impact of the social infrastructure index and the economic infrastructure index on economic development; however insignificant impact of education infrastructure index on the economic development of Punjab.

A study by More and Aye (2017) investigated the effect of social infrastructure on economic growth and inequality in South Africa using a SEM approach. The study used growth as the mediating variable while controlling for production factors, urbanization and globalization. The results showed a positive and significant relationship between education expenditure and growth. However, there is a negative but insignificant relationship between health expenditure and growth. The study further found a negative but insignificant relationship between education and inequality and a significant negative relationship between health and inequality.

Sabir and Shamshir (2020) explored the effect of social infrastructure on long-run economic growth of Pakistan for the time period 1971–2014 using Autoregressive Distributed Lag (ARDL) method. Infrastructure is disaggregated into economic and social infrastructure to analyze its impact on economic growth. Results reveal that road infrastructure has negative influence on per capita GDP. However, energy consumption, electricity consumption, secondary school enrollment and life expectancy positively and statistically significantly impact per capita GDP. Similarly, composite social infrastructure index and human capital index have positive impact on GDP per capita.

Mesagan and Ezeji (2016) examined the role of economic and social infrastructure in manufacturing sector performance in Nigeria. The main concern of the study was to ascertain the degree of impact of economic and social infrastructure variables on manufacturing sector performances in Nigeria and to know if inflation and lending rates are responsible for the depression in the manufacturing sector. Government expenditures on capital, education and health, as well as electricity generation and consumption, and teledensity, inflation rate and prime lending rate were considered variables of analytical

relevance in the paper. The results showed that teledensity had positive impact on manufacturing performance in Nigeria. In addition, growth of government capital expenditure and growth of government expenditure on education positively and significantly enhanced the manufacturing value added while growth of government expenditure on health, electricity generation, electricity consumption, inflation rate and prime lending rate had insignificant negative effects on manufacturing value added.

Kumari and Sharma (2017) examined the relationship between infrastructure (physical & social) and economic development in India. The study's time period covered 1995 and 2013. The study used Augmented Dickey-Fuller test and Phillips Perron unit root tests to observe the stationary nature of the data series. Unrestricted VAR (vector auto regression) and Granger causality models were employed for checking the causal relationship between social, physical infrastructure and economic growth. Results show that both economic and social infrastructure had positive linkages with economic growth in India.

2.4 Summary of Literature

Most of the literature on the impact of infrastructure growth focuses on one aspect of infrastructure. Some studies serve a purpose, others look broadly at the infrastructure, but use one indicator to analyze the performance of the experiment. The main reason for this simplification is the large correlation between metrics for different types of communication infrastructure, energy capacity, road and rail networks, water supply and sanitation and social infrastructure. In retrospect, this close relationship between different infrastructure classes makes it difficult to obtain reliable estimates of parallel individuals representing variables representing different types of infrastructure sources.

The literature shows that infrastructure investment contributes to economic performance by expanding the production capacity of a region, region, country or country. The economic performance of your infrastructure can vary depending on how your investments grow. However, most of the review literature comes from Kenya and other developed countries whose strategic and economic bases are different. Hence, in the Kenyan situation, there is a literary gap on the topic. Therefore, this study will attempt to bridge this gap by establishing a link between the development of infrastructure and the economic performance of County governments in Kenya.

Conceptual Framework

Independent variables **Dependent variable**

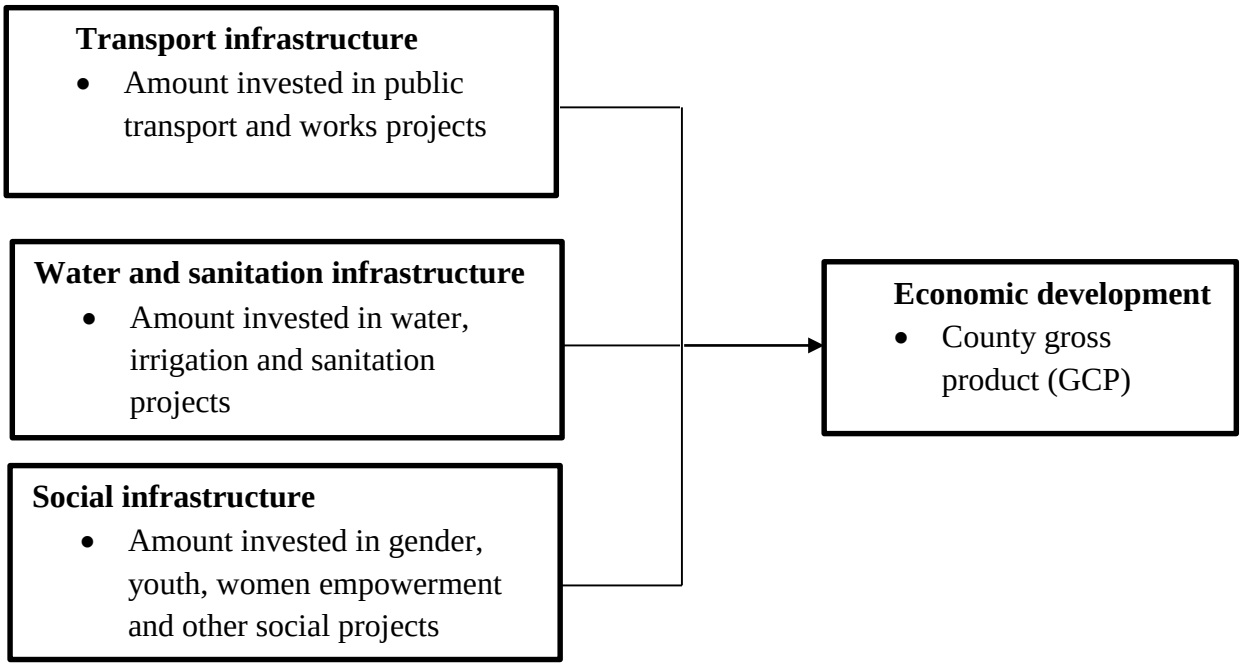

Figure 2.1: Conceptual Framework

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This section designates the proposed approach to this study. The way to collect, measure and analyze data. Therefore, the chapter consists of the following sections: research design, data collection techniques, and data analysis.

3.2 Research design

The study adopted a longitudinal research design. A longitudinal research design is employed in correlational studies where the researcher observes and collects data on a number of variables of a given phenomenon over a period of time. The longitudinal research design allowed the researcher to obtain a broader coverage and a comprehensive description and analysis of the observed traits and relationships of the phenomenon under observation across a four-year period. The design allows the researcher to collect original data to describe and measure the characteristics of a population that would otherwise be difficult to observe directly.

3.3 Population of the Study

Population refers to a set of items, persons or things that are related from which a sample is derived from for determination (Gay, 1976). Population also refers to the unit's creation from which samples are obtained from (Mugenda & Mugenda, 1992). The study population was made of the 47 counties in Kenya. This study therefore carried out a census of the 47 counties in Kenya. Census an appropriate data collection design used for small heterogeneous population.

3.4 Sample Size

The study relied on data from the Kenya National Statistics Office, the Commission for Revenue Allocation and the Kenya National Bureau of Statistics as its primary data for analysis and synthesis of findings. As such, there was no sample size of the respondents for the study.

3.5 Data collection

This study used secondary data on infrastructure development expenditures from all Kenyan Counties. Data on county infrastructure developments was obtained from the Kenya National Statistics Office as well as the Commission for Revenue Allocation (CRA). The data includes county investment in infrastructure in for a period of 4 years. In addition, economic growth data was obtained the Kenya National Bureau of Statistics for 4 years period between 2015 and 2018.

3.6 Data Analysis

The study used both descriptive statistics and inferential statistics for data analysis. The analysis was conducted by the use of STATA. First, the collected data was filtered and sorted. The data was then exported into the STATA statistical software and analyzed. Descriptive statistics, such as the mean, standard deviation, maximum and minimum values were calculated to summarize the study's data. Inferential statistics entailed correlation and panel regression analysis. Correlation was undertaken to determine the strength and direction of the variables association. Panel regression analysis was undertaken to determine the interrelationship between the dependent and the independent variables.

3.6.1 Panel Regression Methodology

Panel data analysis is a method of studying a particular subject within multiple sites, periodically observed over a defined time frame (Baltagi, 2008). Panel data entails a combination of cross section data and time series, where the same unit cross section is measured at different times. Therefore, panel data is data from some of the same individuals observed in a certain period of time (McManus, 2015). The combination of time series with cross-sections can enhance the quality and quantity of data in ways that would be impossible using only one of these two dimensions (Yaffee, 2003). In the method

of estimating the regression model using panel data can be done through two common approaches which are the fixed effect model and panel effects model.

The fixed effect (FE) model assumes that the coefficients are the change among the units or among units and time. This model assumes that differences between individuals can be accommodated from different intercept (Zulfikar, 2019). Fixed effects assume that differences between individuals (cross section) can be accommodated from different intercept. The fixed effects (FE) allow for correlation between the unobserved effects (or heterogeneity) and the explanatory variables of interest while random effects (RE) do not. The fixed effect takes the following form

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \mu_i + \lambda_t + \varepsilon_{it}$$

The random effects (RE) model assumes that the constant is determined randomly to obtain unconsidered independent variables or the error (McManus, 2015). This model estimates panel data where interference variables may be interconnected between time and between individuals (Zulfikar, 2019). The random effect takes the following form

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \omega_{it}$$

Where;

Y_{it} = Economic development measured by Log of annual Gross County Product (GCP) per county.

β_0 = Constant

β_1- β_3 = regression coefficients

X_1 = Transportation infrastructure measured by the log of the annual amount invested in transportation infrastructure development

X_2 = Water and sanitation infrastructure measured by the log of the annual amount invested in water and sanitation infrastructure development

X_3 = Social infrastructure measured by the log of the annual amount invested in social infrastructure development

it = County and time indexes

μ_i = observable individual dummy

λ_t= observable time dummy

ω_{it} =$\varepsilon_i - \varepsilon_{it}$, = unobserved dummy

ε_{it} = error term

3.7 Diagnostic Tests

Regression diagnostics are used after fitting to check if a fitted mean function and assumptions are consistent with observed data (Das & Imon, 2016). Inferences based on a fitted statistical model often may be criticized because the features of the data are not in congruence with the model assumptions. Diagnostic techniques are procedures that examine this congruence (Frees, 2004). Diagnostic tests are critical in statistics because if the underlying assumptions are not valid, then the process is unreliable, unpredictable, and out of the researcher's control. This study thus undertook the normality test, multicollinearity test, homoscedasticity test, test for autocorrelation and the Hausman test.

3.7.1 Normality Test

Regression assumes that variables have normal distributions. Non-normally distributed variables (highly skewed or kurtotic variables, or variables with substantial outliers) can distort relationships and significance tests (Osborne & Waters, 2002). It is essential to assess normality of a data before any formal statistical analysis. Otherwise, we might draw erroneous inference and wrong conclusions. Normality can be assessed both visually and through normality tests. Various types of descriptive measures like moments, coefficients of skewness and kurtosis, mean deviation, range of the sample etc. and empirical distribution function have been proposed for use in tests for normality (Das & Imon, 2016). This study used the Shapiro Wilk to test for normality of study residuals. The Shapiro-Wilk test is one of the most popular tests for normality assumption diagnostics, which has good properties of power, and it based on correlation within given observations and associated normal scores.

3.7.2 Multicollinearity Test

Regression also assumes that there is little or no multicollinearity in the data. Multicollinearity occurs when several independent variables correlate at high levels with one another, or when one independent variable is a near linear combination of other independent variables (Osborne & Waters, 2002). Multicollinearity can result in misleading and unusual results, inflated standard errors, reduced power of the regression coefficients that create a need for larger sample sizes (Daoud, 2017; Frees, 2004). The variance inflation factors (VIF) and a correlation matrix were used to assess for multicollinearity.

3.7.3 Test for Homogeneity of Variances

Homoscedasticity means that the variance of errors is the same across all levels of the independent variables. When the variance of errors differs at different values of the independent variables, heteroscedasticity is indicated (Osborne & Waters, 2002). Heteroscedasticity affects the efficiency of the regression coefficient estimators although these estimators remain unbiased even in the presence of heteroscedasticity (Frees, 2004). For OLS to be properly used, the errors have to be independent and homoscedastic. A common approach for handling heteroscedasticity involves computing standard errors that are robust to the homoscedasticity specification. Heteroscedasticity can be assessed with a White or a Breusch-Pagan test (Yaffee, 2003). The Breusch-Pagan / Cook-Weisberg test was used to assess homoscedasticity in this study.

3.7.4 Test for Autocorrelation

Autocorrelation occurs when the residuals are not independent from each other. In other words when the value of y(x+1) is not independent from the value of y(x) (Yaffee, 2003). The autocorrelation assumption explains that errors are independent of one another, implying that subjects are responding independently. In longitudinal data, subjects are measured repeatedly over time and repeated measurements of a subject tend to be related to one another (Frees, 2004). The study used the Wooldridge test for serial correlation in panel data to tests for autocorrelation.

3.7.5 Hausman Test

The Hausman test is a statistical test to select whether the most appropriate model between the fixed and the random effect models (Zulfikar, 2019). In determining which of these two models would apply in analyzing panel datasets, the commonly used specification test (Hausman, 1978) is used. This test is intended to assess how parameter estimates differ across the methods, based on the understanding of the trade-off between bias and variance in the two estimators.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the results of the analysed data as well as the interpretation of the findings as per the study objectives. The chapter thus entails the response rate results, descriptive statistics and the exploratory data analysis results. In addition, the chapter entails the correlation results, test of assumptions under diagnostic tests and the panel regression results.

4.1.1 Response Rate

The study targeted all the 47 counties in Kenya. This study therefore carried out a census of the 47 counties in Kenyan and collected data for a period of 4 years between 2015 and 2018. The study thus managed to collect data for the four years thus coming up with 188 data points which were adequate for regression analysis. Data for the year 2019 had not be published by the Kenya National Bureau of Statistics hence the year was not incorporated.

4.2 Descriptive Statistical Analysis

In descriptive statistical analysis the aim is to summarize data. The basic features of the data are being described with descriptive statistics, such as mean, median, mode and standard deviation among others. Descriptive statistics are recommended when the objective is to describe and discuss a data set more generally and conveniently than would be possible using raw data alone. They are routinely used in reports which contain a significant amount of qualitative or quantitative data. Descriptive statistics help summarize and support assertions of fact. Table 4.1 show the descriptive statistical analysis results.

Table 4.1: Descriptive Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
GCP	188	4.93822	.3628818	4.066848	6.173863
Transporti~e	188	8.758221	.3403965	7.307496	9.510696
Waterandsa~u	188	8.381974	.4404362	6.255273	9.350184
Socialinfr~e	188	8.171051	.4416473	6.671173	9.244421

Source: Research Data (2020)

Table 4.1 shows that the county gross product (CGP) had a mean value of 4.93822(SD=0.3628818) with a minimum value of 4.066848 and a maximum value of 6.172863 thus indicating that the average CGP for the 4 years was 4.93822. Transport infrastructure had an average value of 8.758221 (SD=0.3403965) with a minimum value of 7.307496 and a maximum value of 9.510696 respectively. Water and sanitation infrastructure had a mean value of 8.381974 (SD=0.3403965) with a minimum value of 6.255273 and a maximum value of 9.350184 respectively. Lastly, social infrastructure had an average value of 8.171051 (SD=0.4416473) with a minimum value of 6.671173 and a maximum value of 9.244421 respectively.

4.3 Exploratory Data Analysis

Data exploration provides hints of the appropriate model. By data exploration, we mean summarizing the data, either numerically or graphically, without reference to a model. To draw reliable inferences from the modeling procedure, it is important that the data be congruent with the model. Further, exploring the data also alerts us to any unusual observations or subjects. In addition, data exploration also provides an important communication device (Frees, 2004). The exploratory data analysis results were as follows

4.3.1 Panel Plots for County Gross Product

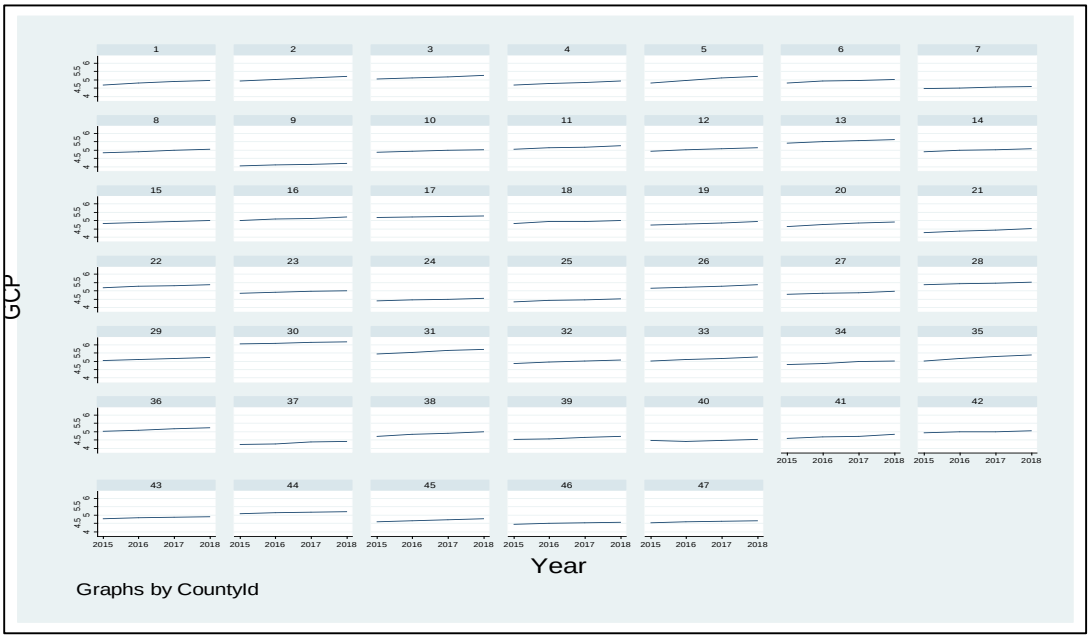

Figure 4.1: Panel Plots for County Gross Product

Source: Research Data (2020)

Figure 4.1 indicates panel plots for county gross product (GCP) of the 47 counties. The results indicate that the 47 counties exhibited a similar GCP trend over the four years period. A similar trend indicates that the data is normally distributed as well as linear hence indicating the data was suitable for panel data analysis

4.3.2 Panel Plots for Transport Infrastructure

Figure 4.2 show the panel plots for transport infrastructure over the 4 years period between 2015 and 2018.

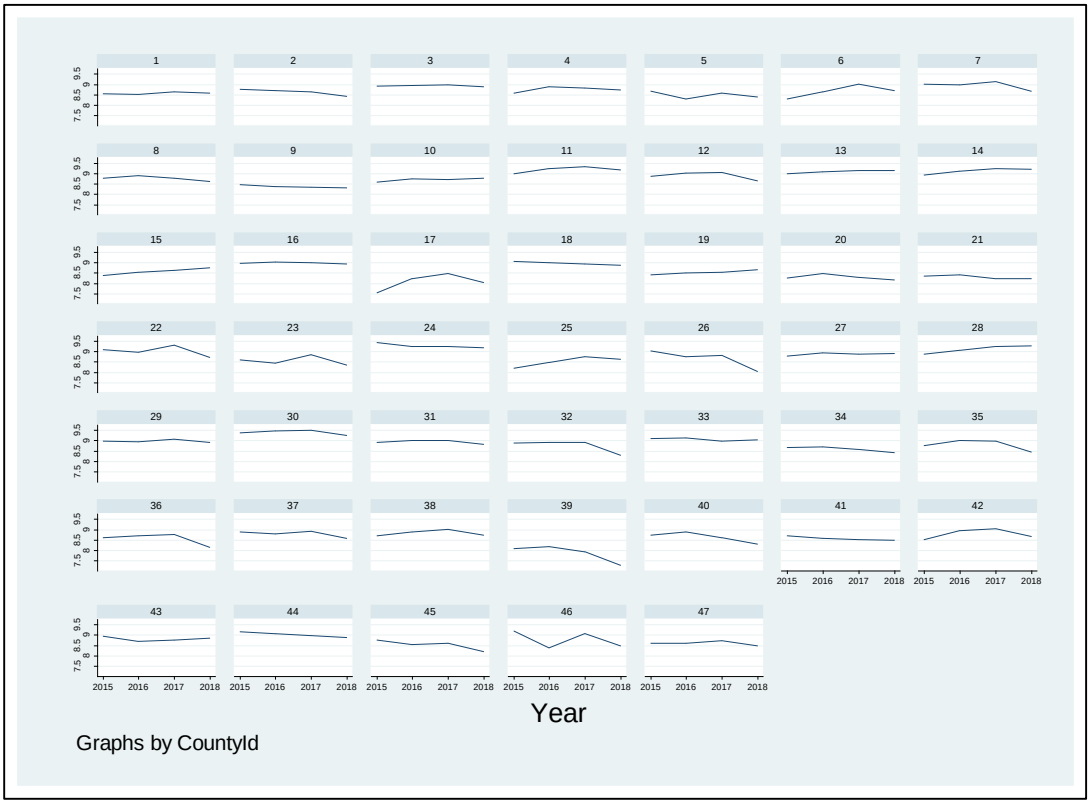

Figure 4.2: Panel Plots for Transport Infrastructure

Source: Research Data (2020)

The transport infrastructure panel plots on figure 4.2 indicate that the amounts invested in transport infrastructure changed significantly in across all the counties apart from county 46, which had slumps and humps. The slumps and humps indicates that the county varied the amounts invested in transport infrastructure over the study period with drop in the amounts being experienced in some of the years.

4.3.3 Panel Plots for Water and Sanitation Infrastructure

Figure 4.3 shows the panel plot for the amounts of water and sanitation infrastructure in the considered study period.

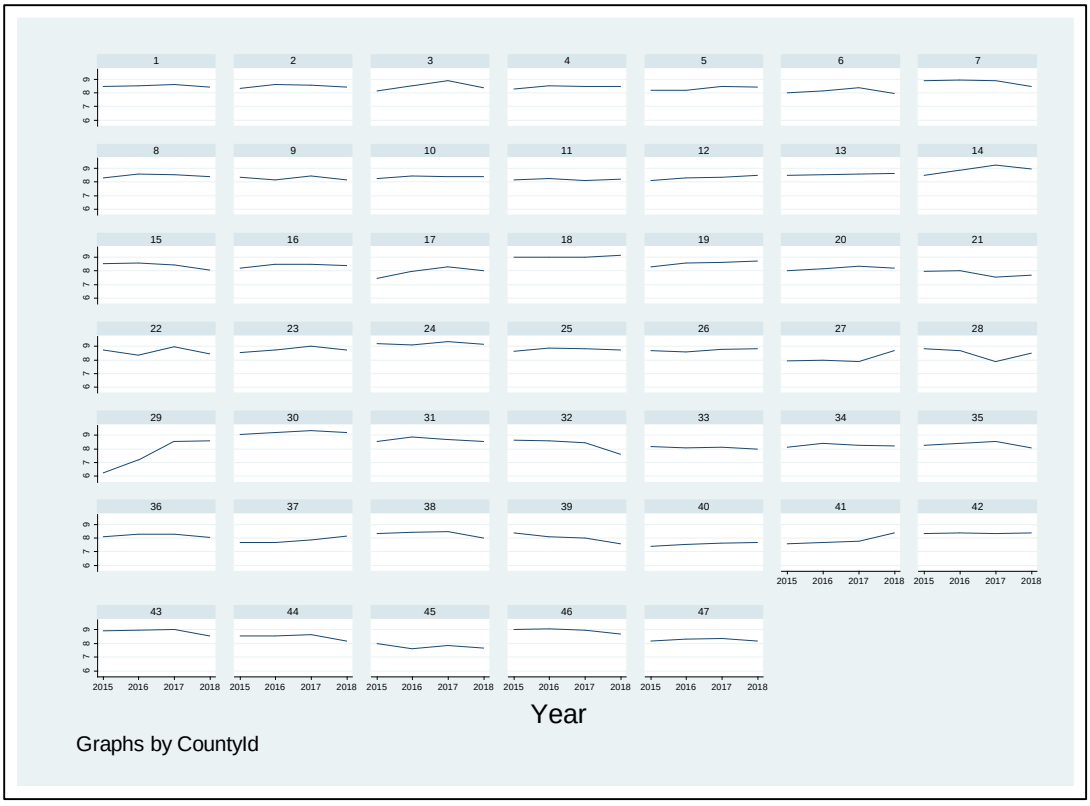

Figure 4.3: Panel Plots for Water and Sanitation Infrastructure

Source: Research Data (2020)

Figure 4.3 shows that data from the 47 counties exhibited a similar water and sanitation infrastructure trend over the four years period with exception to county 29 which recorded a gradual increase in the first two years then a constant amount over the remaining two years. County 42 also had a constant trend of the four years period indicating that the county had allocated constant amounts towards water and sanitation infrastructure for the four years period.

4.3.4 Panel Plots for Social Infrastructure

Figure 4.4 shows the panel plot for the amounts allocated to social infrastructure by the 47 counties in the considered study period.

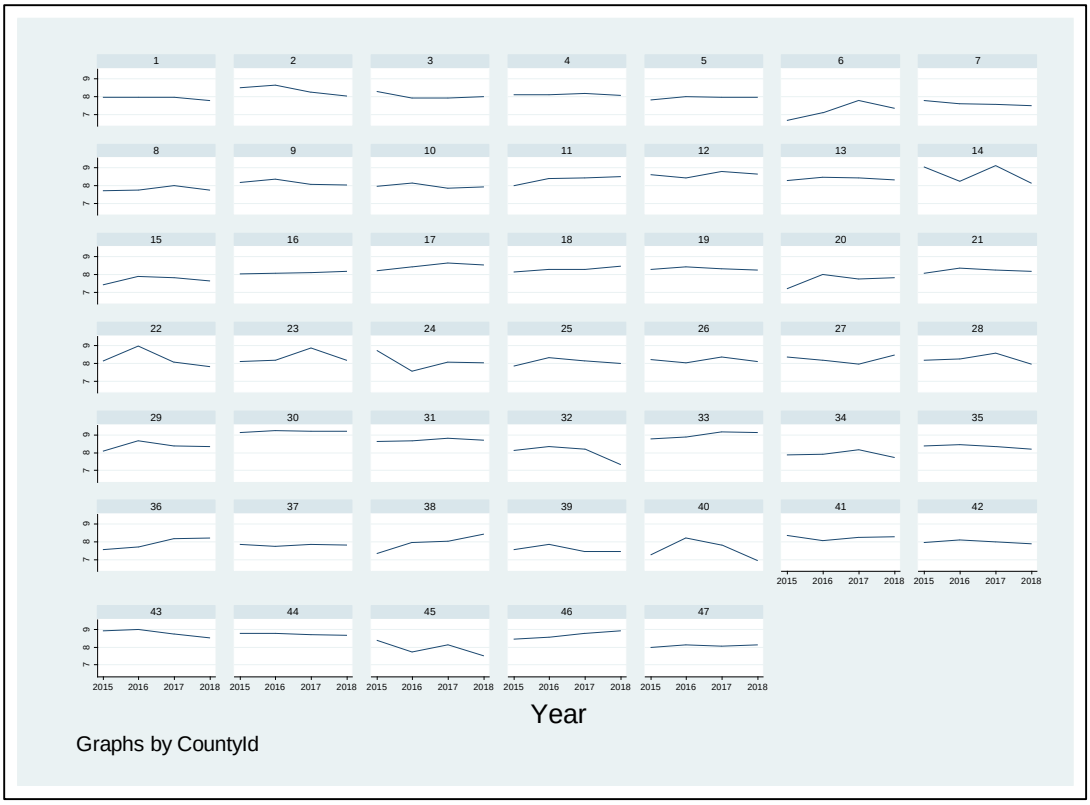

Figure 4.4: Panel Plots for Social Infrastructure

Source: Research Data (2020)

The social infrastructure panel plots on figure 4.4 indicate that the amounts allocated to social infrastructure had changed significantly in across all the 47 counties apart from county 40 which experienced a significant drop from the year 2016 and county 6 which recorded a gradually increase over the years the a constant trend from the year 2017. County 14 also experienced slumps and humps which indicates that the county kept changing its allocations in social infrastructure.

4.4 Diagnostic Tests

Diagnostic tests are critical in statistics because if the underlying assumptions are not valid, then the process is unreliable, unpredictable, and out of the researcher's control (Frees, 2004). This could lead the researcher to draw conclusions that are not valid or scientifically unsupported by the data. The study thus carried out tests for normality, multicollinearity, heteroscedasticity, autocorrelation and finally the Hausman test.

4.4.1 Normality Test

Non-normal distributions that are positively or negatively skewed, contain large kurtosis, or have extreme outliers can distort the obtained significance levels of the analysis; resulting in the standard errors becoming biased (Frees, 2004). Table 4.2 shows the normality test results

Table 4.2: Normality Test

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
residuals	188	0.98922	1.524	0.966	0.16711

Source: Research Data (2020)

The Shapiro Wilk normality test of residual on table 4.3 indicates that the p value was 0.16711>0.05 and the Z value of 0.966 was also less than the critical Z value of 1.96 respectively. The finding leads to the rejection of the null hypothesis that the data was not normally distributed since the p value was greater than 0.05 thus the adoption of alternative hypothesis that the data is distributed normally and is significant for the study.

4.4.2 Test for Multicollinearity

Multicollinearity appears when two or more independent variables in the regression model are correlated. When two or more predictors are highly correlated, the relationship between the independent variables and the dependent variables is distorted by the very strong relationship between the independent variables, leading to the likelihood that our interpretation of relationships will be incorrect (Daoud, 2017). The VIF is a tool to measure and quantify how much the variance is inflated.

Table 4.3: Test for Multicollinearity

Variable	VIF	1/VIF
Transporti~e	1.38	0.724920
Socialinfr~e	1.27	0.784731
Waterandsa~u	1.26	0.790731
Mean VIF	1.31	

Source: Research Data (2020)

The multicollinearity test on table 4.3 shows that transport infrastructure had a VIF value of 1.38 while social infrastructure had a VIF value of 1.27 both of which were less than the VIF threshold of 10. Further, water and sanitation infrastructure had a VIF value of 1.26 which was also less than 10 whereas the overall mean VIF was 1.31<10. The results indicate all the VIF values were below the cut off VIF value of 10 hence in indication that the independent variables were not highly correlated with the dependent variable thus the assumption of multicollinearity was not violated.

4.4.3 Test for Homogeneity of Variances

The assumption of homoscedasticity indicates that the variance of errors is equal and constant across all levels of the variables. Heteroscedasticity occurs when the variance of errors differs at different values of the independent variables (Yaffee, 2003). Slight heteroscedasticity has little effect on significance tests; however when heteroscedasticity is marked it can lead to serious distortions of findings and seriously weaken the analysis thus increasing the possibility of a Type 1 error for small sample size (Frees, 2004). The study used the Breusch-pagan/cook-Weisberg test for heteroscedasticity to asses for homogeneity of variances.

Table 4.4: Test for Homogeneity of Variances

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of GCP

         chi2(1)      =     7.48
         Prob > chi2  =   0.0062
```

Source: Research Data (2020)

The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity test results on table 4.5 shows that the chi squares value of 7.48 had a P value of 0.0062<0.05 respectively. This leads to the rejection of alternative hypothesis the data is not homoscedastic. The findings thus shows the data is was heteroscedastic. To take care of the heteroscedasticity problem the study adopted the Prais-Winsten regression which incorporates the AR (1) disturbances.

4.4.4 Autocorrelation Test

Autocorrelation is the problem where the disturbances in a regression model are not independent of one another from observation to observation (it is mainly a problem for models estimated using time series data). Multiple regression assumes that the errors, which are the residuals between the actual score and the estimated score obtained through the regression equation, are independent and there is no serial correlation (Das & Imon, 2016). Having no serial correlation between the residuals implies that the size of the residual for one variable has no impact on the size of the residual for another variable. This assumption was assessed using the Wooldridge test for autocorrelation in panel data as indicated in table 4.5

Table 4.5: Autocorrelation Test

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      46) =    759.023
           Prob > F =      0.0000
```

Source: Research Data (2020)

The Wooldridge test for autocorrelation in table 4.6 indicates that F value was 759.023 whose P value was 0.000<0.05 respectively. This leads to the rejection of the alternative hypothesis that the data is serially correlated hence indication of the presence of autocorrelation in the data set. To take care of the autocorrelation problem the study adopted the Prais-Winsten regression will panel corrected standard errors.

4.4.5 Hausman Test

The Hausman test is the standard procedure used in empirical panel data analysis in order to discriminate between the fixed effects and random effects model (Zulfikar, 2019). Table 4.6 shows the Hausman test results

Table 4.6: Hausman Test

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Transporti~e	-.1386401	-.1113961	-.0272439	.
Waterandsa~u	.071144	.0725407	-.0013968	.
Socialinfr~e	.0361994	.05187	-.0156706	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= -40.34 chi2<0 ==> model fitted on these data fails to meet the asymptotic assumptions of the Hausman test; see suest for a generalized test

Source: Research Data (2020)

The Hausman test helps to decide the appropriate model between the fixed or random effects. The null hypothesis for the Hausman test is that the random effects model is preferred to fixed effect model and if the p value not more than 5% (Green, 2010). The findings in table 4.6 indicates that the study's data set failed to meet the asymptotic assumptions of the Hausman test hence the data did not have both the fixed and random effects. If a data set fails the Hausman Test then the generalized linear models are always

recommended. However, this study's data set suffered from heteroscedasticity and autocorrelation the study adopted the Prais-Winsten regression.

4.5 Correlation Analysis

Correlation describes the strength of linear relationship between two random variables in terms of a single unit less value (denoted as r; the correlation coefficient) between −1 and 1. If r= 0, then there is no relationship between the two variables (they are independent); if it is positive, then as one variable trends upward, so does the other; if it is negative, then as one variable trends up, the other trends down. Table 4.7 shows the study's correlation results.

Table 4.7: Correlation Matrix

	GCP	Transp~e	Watera~u	Social~e
GCP	1.0000			
Transporti~e	0.3787 0.0000	1.0000		
Waterandsa~u	0.2391 0.0010	0.4250 0.0000	1.0000	
Socialinfr~e	0.4128 0.0000	0.4323 0.0000	0.3363 0.0000	1.0000

Source: Research Data (2020)

The correlation results on table 4.7 shows that the correlation between transport infrastructure and the county's gross product (GCP) was weak and positive (r=0.3787) as well as significant (P value = 0.000<0.05) respectively. Water and sanitation infrastructure had a weak positive (r=0.2391) and significant (P value=0.0010<0.05) correlation with GCP. Social infrastructure had a weak positive (r=0.4128) and significant (P value=0.000<0.05) correlation with the county's gross product (GCP) respectively. The table shows that all the correlation coefficients were less than 0.7 hence an indication that there was no multicollinearity among the study variables.

4.6 Regression Analysis

Regression analysis is a statistical tool used to predict a dependent variable from multiple independent variables (Yaffee, 2003). The focus of regression is to investigate which, if any, of these predictor variables can significantly predict the dependent variable. Due to autocorrelation and heteroscedasticity problems in the study's data set, the study adopted the Prais-Winsten regression. The Prais-Winsten estimator takes into account AR(1) serial correlation of the errors in a linear regression model. The procedure recursively estimates the coefficients and the error autocorrelation of the specified model until sufficient convergence of the AR(1) coefficient is reached. In addition, the Prais-Winsten estimator uses panel corrected standard errors which take care of the heteroscedasticity problem. Table 4.8 show the Prais-Winsten regression analysis.

Table 4.8: Regression Analysis

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	CountyId	Number of obs	= 188
Time variable:	Year	Number of groups	= 47
Panels:	correlated (balanced)	Obs per group: min	= 4
Autocorrelation:	common AR(1)	avg	= 4
		max	= 4
Estimated covariances	= 1128	R-squared	= 0.9670
Estimated autocorrelations	= 1	Wald chi2(3)	= 11.38
Estimated coefficients	= 4	Prob > chi2	= 0.0098

GCP	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Transportinfrastructure	.0276746	.073729	0.38	0.707	-.1168315	.1721807
Waterandsanitationinfrastructu	.0547272	.0238328	2.30	0.022	.0080158	.1014386
Socialinfrastructure	.0877086	.0354311	2.48	0.013	.0182649	.1571523
_cons	3.524898	.9219813	3.82	0.000	1.717848	5.331948
rho	.7362215					

Source: Research Data (2020)

The results in table 4.8 indicates that the overall r square (coefficient of determination) was 0.9670 thus indicating that the independent variables (transport infrastructure, water and sanitation infrastructure and social infrastructure) explained 96.70% of the variation in

economic development (GCP) of counties in Kenya. The Wald Chi Square value of 11.38 was also significant as indicated by a p value of 0.0098<0.05 thus an indication that the overall model was suitable to explain the relationship between incremental infrastructure and economic development (GCP) of counties in Kenya.

From the results, the following regression model was developed

$$Y = 3.524898 + 0.0276746X_1 + 0.0547272X_2 + 0.0877086X_3$$

Thus, the results interpretation based on equation indicate that if transport infrastructure, water and sanitation infrastructure as well as social infrastructure of the counties remain unchanged or has the value of 0, economic development (GCP) of the Counties would be 3.524898. In addition, if transport infrastructure increases by 1 unit and water and sanitation infrastructure as well as social infrastructure remain constant the GCP of the Counties would increase by 0.0276746. Further, if water and sanitation infrastructure of the counties increase by 1 unit and transport and social infrastructures remain constant the Counties GCP would increase by 0.0547272. Lastly, if social infrastructure increase by 1 unit and transport, water and sanitation infrastructures remain constant the Counties GCP would increase by 0.0877086. The test of significance was conducted at 95 % confidence level thus where the P-value was 0.05 or below, the impact of that independent variables was statistically significant. In this regard, water and sanitation infrastructure as well as social infrastructure had a significant effect on economic development of Counties in Kenya.

CHAPTER FIVE: SUMMARY, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter sought to determine the effect of effect of incremental infrastructure on economic development of County Governments in Kenya. To achieve this objective the study collected data for period of 4 years between 2015 and 2018 on transport infrastructure, water and sanitation infrastructure, social infrastructure and gross county product (GCP). This chapter summarizes the findings of the study and makes conclusions upon which recommendations were drawn. The study limitation and suggestions for further study are also presented.

5.2 Discussions

The study specific objectives were examine the effects of transport infrastructure on economic development of County Governments in Kenya, to assess the effects water and sanitation infrastructure on economic development of County Governments in Kenya and the effects of social infrastructure on economic development of County Governments in Kenya. The findings on these objectives are discussed as follows

5.2.1 Transport Infrastructure and Economic Development of County Governments

The correlation analysis results found that transport infrastructure had a significant weak positive association with economic development of county governments in Kenya. The regression results revealed that transport infrastructure had a positive (B=0.0276746) but insignificant (P value = 0.707>0.05) relationship with economic development (GCP) county governments in Kenya. The finding thus indicates that a unit increase in counties transport infrastructure insignificantly affects the counties economic development (GCP). Similar findings were documented by Mohmand, Wang and Saeed (2017) found that infrastructure investment per se is not sufficient to boost the economic activity in the underdeveloped regions of Pakistan. Similarly, Banerjee, Duflo and Qian (2012) also that proximity to transportation networks had a moderate positive causal effect on per capita GDP levels across sectors, but no effect on per capita GDP growth. However, a study by Cigu, Agheorghiesei and Toader (2019) found that transport infrastructure status has

significant impact on economic development with coefficient estimate. Owusu-Manu et al (2019) revealed that transport infrastructure had a significant negative effect over both long- and short-run periods and Sabir and Shamshir (2020) revealed that road infrastructure has negative influence on per capita GDP.

5.2.2 Water and Sanitation Infrastructure and Economic Development of County Governments

The correlation analysis results found that water and sanitation infrastructure had a significant weak positive association with economic development of county governments in Kenya. The regression results revealed that water and sanitation infrastructure had a positive (B=0.0547272) and significant (P-value=0.022<0.05) relationship with economic development (GCP) county governments in Kenya. The finding thus indicates that a unit increase in water and sanitation infrastructure significantly affects the counties economic development (GCP). Similar findings were documented by Musouwir (2010) who found a statistically significant relationship between national budget on water supply and sanitation and GDP per capita, and also between ODA in all sectors and GDP per capita. A study by Meeks (2017) documented that Households in villages that receive this labor saving technological improvement are, on average, 15% more likely to be within 200 meters of their water source. However, Frone and Frone (2012) found that GDP/capita was negatively correlated with water consumption from the public water supply.

5.2.3 Social Infrastructure and Economic Development of County Governments

Correlation analysis findings found that water and sanitation infrastructure had a significant weak positive association with economic development of county governments in Kenya. The regression results revealed that social infrastructure had a positive (B=0.0877086) and significant (P-value=0.013<0.05) relationship with economic development (GCP) county governments in Kenya. The finding thus indicates that a unit increase in social infrastructure significantly affects the counties economic development (GCP). Similar findings were documented by Kaur and Kaur (2018) who found that found that there exists a significant impact of the social infrastructure index and the economic infrastructure index on economic development. More and Aye (2017) found a positive and significant relationship between social infrastructure and economic growth. Gnade, Blaauw and

Greyling (2017) documented that the elasticities of basic and social infrastructure investment were generally more pronounced for economic growth and social development indicators in rural municipalities. Sabir and Shamshir (2020) also found that social infrastructure index and human capital index had a positive impact on GDP per capita. However, Kularatne (2006) found a non-linear relationship existing between per capita output and social infrastructure investment

5.3 Conclusions

The study findings documented that transport infrastructure positively but insignificantly affected the economic development (GCP) county governments in Kenya. Based on the finding, study concludes that transport infrastructure positively but insignificantly affects the Kenyan counties economic development (GCP) thus an increase in transport and public works investments positively enhances Counties economic development though the insignificance may be attributed to the poor and inadequate transport network existing across all the counties in Kenya.

Secondly, the study results documented that water and sanitation infrastructure positively and significantly affected the economic development (GCP) county governments in Kenya. Based on the finding, the study concludes that water and sanitation infrastructure positively and significantly affects the economic development (GCP) counties in Kenya hence an increase in water and sanitation investments positively enhances the economic development county governments in Kenya.

Finally, the findings of the study found that social infrastructure positively and significantly affected the economic development (GCP) county governments in Kenya. As per the finding, the study concludes that social infrastructure positively and significantly affects the economic development (GCP) of Kenyan counties hence an increase in social investments positively enhances the economic development county governments in Kenya.

5.4 Recommendations

The study's first conclusion was that transport infrastructure positively but insignificantly affected the Kenyan counties economic development. The study however recommends that the administration of county governments in Kenya should invest more resources in

transport and public works investments so as to enhance movement across the counties and transport of goods and services from the counties to major towns and other counties in Kenya. Such movements will in the long run enhance the counties economic development.

The study's second conclusion was that water and sanitation infrastructure positively and significantly affects the economic development counties in Kenya. The study thus based on this conclusion recommend that the administration of county governments in Kenya should invest more resource in water and irrigation programs as this would enhance food security across the counties as well as agricultural production across and the counties may sell the surplus agricultural production to other counties.

The study's final conclusion was that social infrastructure positively and significantly affects the economic development (GCP) of Kenyan counties. The study thus recommend that county governments should invest more resources in social activities like women and gender employment, youths and others social activities as such activities positively enhance the county economic growth. Investments in social activities sends a positive signal that the county takes care of it population welfare which in turn enhance the county's reputation thus attracting investors and other economic activities.

5.5 Limitations of the Study

The study relied on secondary data which was obtained for a period of 4 years between 2015 and 2019. However, secondary data is lagged and historic in nature and may not capture the current situation or county's administrators views. In addition, secondary data does not incorporate the views of the counties dweller on whether incremental infrastructure affects counties economic growth.

Additionally, this study was carried among all counties governments in Kenya. Thus, the findings are not specific to a particular county but based on all the counties in Kenya. The findings may thus not be generalized to a single county within Kenya. The study was also carried out in Kenya hence the findings may not be generalized to other countries with administrative counties.

5.6 Suggestions for Further Research

The study was limited to transport, water and sanitation as well as social infrastructures by county governments in Kenya. However, counties invest in other form of infrastructures including health, education, environment and natural resources as well as housing development. Thus, the study recommends an additional research on the effect of other type of infrastructures apart from transport, water and sanitation and social infrastructures to determine their effects on counties economic development. Secondly, the study used secondary data which is historic in nature and fails to incorporate the views and perception of the county's administrators. Thus, a similar study can be carried out suing primary data as opposed to secondary data.

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Appendix I: Data collection Form

YEAR	Transport infrastructure development expenditure	Water and sanitation infrastructure development expenditure	Social infrastructure development expenditure	Annual Gross Count Product per county
	Kshs " Millions"	Kshs " Millions"	Kshs " Millions"	Kshs " Millions"
2013/14				

2014/15				
2015/16				
2016/17				
2017/18				

Appendix II: Raw Data

County	Year	Gross County Product	Transport infrastructure	Water and sanitation infrastructure	Social infrastructure
Baringo	2018	92,866.00	387,790,000.00	266,430,000.00	61,420,000.00
	2017	77,905.00	437,390,000.00	406,150,000.00	89,930,000.00
	2016	65,837.00	328,980,000.00	338,170,000.00	88,810,000.00
	2015	49,474.00	362,890,000.00	299,450,000.00	93,220,000.00
Bomet	2018	159,569.00	275,170,000.00	258,340,000.00	106,240,000.00
	2017	131,746.00	460,390,000.00	364,300,000.00	175,470,000.00
	2016	103,106.00	509,620,000.00	393,300,000.00	427,330,000.00
	2015	82,807.00	584,520,000.00	221,710,000.00	301,340,000.00
Bungoma	2018	183,509.00	768,140,000.00	233,790,000.00	94,670,000.00
	2017	152,657.00	1,002,410,000.00	775,550,000.00	85,990,000.00
	2016	131,289.00	937,260,000.00	315,730,000.00	82,450,000.00
	2015	115,101.00	849,650,000.00	141,830,000.00	193,830,000.00
Busia	2018	86,712.00	563,400,000.00	297,060,000.00	114,710,000.00
	2017	68,215.00	705,470,000.00	292,530,000.00	145,660,000.00
	2016	59,147.00	794,270,000.00	308,170,000.00	125,560,000.00
	2015	48,356.00	398,180,000.00	185,730,000.00	120,520,000.00
Elgeyo	2018	159,531.00	250,160,000.00	268,020,000.00	88,060,000.00
	2017	126,950.00	381,670,000.00	278,090,000.00	88,000,000.00
	2016	92,266.00	204,550,000.00	152,930,000.00	99,030,000.00
	2015	65,504.00	466,800,000.00	148,800,000.00	66,700,000.00

Embu	2018	103,734.00	518,070,000.00	90,200,000.00	22,540,000.00
	2017	89,067.00	1,053,520,000.00	241,660,000.00	59,030,000.00
	2016	84,545.00	442,100,000.00	143,580,000.00	11,970,000.00
	2015	66,911.00	207,810,000.00	98,450,000.00	4,690,000.00
Garisa	2018	39,394.00	480,600,000.00	297,400,000.00	31,560,000.00
	2017	36,706.00	1,373,000,000.00	740,000,000.00	37,200,000.00
	2016	32,919.00	1,000,100,000.00	864,400,000.00	38,900,000.00
	2015	29,872.00	1,021,200,000.00	756,600,000.00	57,300,000.00
Homabay	2018	114,198.00	409,930,000.00	234,160,000.00	57,900,000.00
	2017	96,781.00	599,770,000.00	322,710,000.00	95,940,000.00
	2016	81,548.00	812,130,000.00	365,970,000.00	56,350,000.00
	2015	70,049.00	604,480,000.00	194,580,000.00	52,220,000.00
Isiolo	2018	15,850.00	205,740,000.00	139,260,000.00	107,470,000.00
	2017	14,262.00	230,710,000.00	273,200,000.00	117,500,000.00
	2016	13,020.00	234,870,000.00	139,620,000.00	229,650,000.00
	2015	11,664.00	288,650,000.00	212,810,000.00	147,680,000.00
Kajiado	2018	107,805.00	590,930,000.00	247,440,000.00	82,020,000.00
	2017	100,041.00	506,690,000.00	241,680,000.00	73,940,000.00
	2016	85,848.00	577,990,000.00	268,470,000.00	132,990,000.00
	2015	75,667.00	398,260,000.00	178,470,000.00	89,480,000.00
kakamega	2018	182,563.00	1,498,670,000.00	157,580,000.00	303,330,000.00
	2017	156,444.00	2,086,200,000.00	129,440,000.00	268,240,000.00
	2016	141,457.00	1,715,120,000.00	167,490,000.00	246,520,000.00

	2015	117,996.00	958,430,000.00	134,090,000.00	97,190,000.00
Kericho	2018	136,799.00	464,860,000.00	308,430,000.00	452,540,000.00
	2017	120,356.00	1,170,950,000.00	214,460,000.00	594,510,000.00
	2016	106,916.00	1,079,370,000.00	195,120,000.00	278,220,000.00
	2015	89,549.00	758,190,000.00	131,500,000.00	394,320,000.00
Kiambu	2018	421,918.00	1,388,670,000.00	432,420,000.00	205,020,000.00
	2017	367,137.00	1,387,180,000.00	384,800,000.00	272,180,000.00
	2016	316,725.00	1,217,100,000.00	331,400,000.00	284,760,000.00
	2015	263,706.00	1,005,100,000.00	297,660,000.00	188,780,000.00
Kilifi	2018	119,295.00	1,634,910,000.00	880,860,000.00	137,850,000.00
	2017	105,456.00	1,728,700,000.00	1,728,700,000.00	1,303,300,000
	2016	97,614.00	1,295,990,000.00	736,910,000.00	178,870,000.00
	2015	80,431.00	853,830,000.00	301,330,000.00	1,103,290,000
Kirinyaga	2018	100,836.00	569,830,000.00	118,850,000.00	44,570,000.00
	2017	88,055.00	433,120,000.00	259,990,000.00	67,280,000.00
	2016	78,491.00	350,890,000.00	379,270,000.00	77,130,000.00
	2015	68,332.00	240,710,000.00	342,220,000.00	26,150,000.00
Kisii	2018	163,546.00	891,670,000.00	234,400,000.00	146,860,000.00
	2017	134,892.00	980,580,000.00	297,560,000.00	132,350,000.00
	2016	122,771.00	1,097,830,000.00	303,010,000.00	114,440,000.00
	2015	100,668.00	932,830,000.00	165,570,000.00	114,170,000.00
Kisumu	2018	194,489.00	112,640,000.00	102,590,000.00	354,810,000.00
	2017	181,161.00	312,100,000.00	204,960,000.00	433,270,000.00

	2016	165,503.00	172,310,000.00	97,780,000.00	272,380,000.00
	2015	152,655.00	35,580,000.00	28,140,000.00	160,930,000.00
Kitui	2018	101,560.00	777,930,000.00	1,357,010,000.00	284,180,000.00
	2017	86,041.00	868,740,000.00	1,013,430,000.00	188,210,000.00
	2016	87,749.00	996,030,000.00	1,010,720,000.00	189,490,000.00
	2015	65,254.00	1,161,820,000.00	977,690,000.00	146,020,000.00
Kwale	2018	86,278.00	465,800,000.00	494,720,000.00	175,260,000.00
	2017	72,335.00	342,430,000.00	421,880,000.00	218,420,000.00
	2016	63,569.00	331,110,000.00	382,560,000.00	261,780,000.00
	2015	54,583.00	253,160,000.00	190,770,000.00	194,250,000.00
Laikipia	2018	81,095.00	147,540,000.00	154,470,000.00	66,240,000.00
	2017	72,890.00	199,430,000.00	228,100,000.00	55,910,000.00
	2016	56,623.00	292,040,000.00	136,070,000.00	98,990,000.00
	2015	44,345.00	185,210,000.00	108,730,000.00	17,070,000.00
Lamu	2018	32,386.00	173,600,000.00	49,190,000.00	146,400,000.00
	2017	26,579.00	177,160,000.00	35,440,000.00	173,000,000.00
	2016	23,149.00	263,800,000.00	109,310,000.00	227,200,000.00
	2015	18,834.00	227,150,000.00	93,810,000.00	119,680,000.00
Machakos	2018	232,860.00	551,500,000.00	265,620,000.00	67,130,000.00
	2017	208,178.00	2,015,920,000.00	894,870,000.00	119,340,000.00
	2016	190,166.00	963,030,000.00	229,430,000.00	980,940,000.00
	2015	157,703.00	1,224,330,000.00	504,160,000.00	137,310,000.00
Makueni	2018	100,924.00	235,970,000.00	526,680,000.00	158,820,000.00

	2017	92,746.00	731,250,000.00	1,011,630,000.00	753,260,000.00
	2016	85,224.00	281,510,000.00	539,630,000.00	161,230,000.00
	2015	70,170.00	400,540,000.00	343,420,000.00	127,550,000.00
Mandera	2018	35,101.00	1,613,930,000.00	1,387,050,000.00	114,380,000.00
	2017	31,721.00	1,822,220,000.00	2,239,670,000.00	122,760,000.00
	2016	28,495.00	1,861,640,000.00	1,224,390,000.00	39,550,000.00
	2015	25,684.00	2,823,540,000.00	1,574,470,000.00	547,350,000.00
Marsabit	2018	34,073.00	428,790,000.00	557,710,000.00	105,520,000.00
	2017	30,144.00	564,000,000.00	630,660,000.00	139,250,000.00
	2016	27,058.00	305,200,000.00	728,110,000.00	218,680,000.00
	2015	22,703.00	157,270,000.00	441,630,000.00	71,230,000.00
Meru	2018	229,646.00	117,080,000.00	634,130,000.00	131,800,000.00
	2017	196,488.00	651,950,000.00	585,100,000.00	240,890,000.00
	2016	171,009.00	587,370,000.00	379,340,000.00	109,270,000.00
	2015	141,079.00	1,093,310,000.00	462,000,000.00	167,510,000.00
Migori	2018	96,337.00	833,640,000.00	460,200,000.00	290,200,000.00
	2017	78,998.00	776,220,000.00	78,260,000.00	93,960,000.00
	2016	71,360.00	898,800,000.00	97,100,000.00	149,200,000.00
	2015	62,035.00	624,090,000.00	89,690,000.00	240,150,000.00
Mombasa	2018	332,122.00	1,871,520,000.00	323,760,000.00	95,070,000.00
	2017	301,070.00	1,731,840,000.00	73,450,000.00	369,710,000.00
	2016	263,925.00	1,175,520,000.00	492,270,000.00	189,020,000.00
	2015	239,680.00	771,820,000.00	672,960,000.00	152,010,000.00

Muranga	2018	173,018.00	863,650,000.00	407,520,000.00	224,900,000.00
	2017	149,154.00	1,184,800,000.00	361,420,000.00	230,270,000.00
	2016	129,173.00	924,100,000.00	15,330,000.00	455,360,000.00
	2015	109,739.00	955,500,000.00	1,800,000.00	123,800,000.00
Nairobi	2018	1,492,323.00	1,855,830,000.00	1,629,230,000.00	1,537,250,000
	2017	1,379,459.00	3,241,130,000.00	2,154,210,000.00	1,647,720,000
	2016	1,230,361.00	3,011,320,000.00	1,613,630,000.00	1,755,580,000
	2015	1,107,647.00	2,341,880,000.00	1,174,750,000.00	1,319,500,000
Nakuru	2018	517,462.00	683,090,000.00	365,020,000.00	502,500,000.00
	2017	436,088.00	1,035,740,000.00	492,070,000.00	656,410,000.00
	2016	343,665.00	1,005,880,000.00	717,820,000.00	456,420,000.00
	2015	278,971.00	856,240,000.00	353,800,000.00	425,930,000.00
Nandi	2018	119,691.00	202,100,000.00	40,530,000.00	21,760,000.00
	2017	104,412.00	823,280,000.00	281,100,000.00	163,840,000.00
	2016	92,634.00	838,970,000.00	383,640,000.00	218,450,000.00
	2015	75,817.00	791,100,000.00	422,900,000.00	131,700,000.00
Narok	2018	179,226.00	1,102,850,000.00	96,480,000.00	1,343,210,000
	2017	149,722.00	954,100,000.00	133,750,000.00	1,427,460,000
	2016	125,659.00	1,334,050,000.00	127,260,000.00	755,410,000.00
	2015	104,696.00	1,309,970,000.00	141,870,000.00	576,580,000.00
Nyamira	2018	103,239.00	278,240,000.00	167,560,000.00	51,720,000.00
	2017	95,786.00	391,850,000.00	192,130,000.00	144,510,000.00
	2016	74,112.00	507,820,000.00	268,140,000.00	81,870,000.00

	2015	65,643.00	480,650,000.00	135,310,000.00	77,540,000.00
Nyandarua	2018	245,203.00	293,440,000.00	116,050,000.00	156,370,000.00
	2017	196,770.00	957,130,000.00	372,380,000.00	216,120,000.00
	2016	148,139.00	1,029,950,000.00	267,180,000.00	273,700,000.00
	2015	106,482.00	594,710,000.00	185,640,000.00	235,650,000.00
Nyeri	2018	174,961.00	140,310,000.00	114,590,000.00	164,370,000.00
	2017	145,775.00	611,220,000.00	188,770,000.00	150,550,000.00
	2016	120,875.00	522,680,000.00	188,680,000.00	52,150,000.00
	2015	104,583.00	430,310,000.00	125,390,000.00	35,421,000.00
Samburu	2018	26,503.00	401,900,000.00	132,110,000.00	62,270,000.00
	2017	23,498.00	875,160,000.00	70,060,000.00	72,490,000.00
	2016	18,401.00	659,970,000.00	47,980,000.00	52,810,000.00
	2015	17,076.00	788,380,000.00	46,110,000.00	71,610,000.00
Siaya	2018	95,265.00	558,890,000.00	102,920,000.00	267,440,000.00
	2017	82,200.00	1,053,790,000.00	282,900,000.00	108,130,000.00
	2016	68,208.00	797,630,000.00	266,800,000.00	87,950,000.00
	2015	53,482.00	521,890,000.00	221,420,000.00	21,390,000.00
Taita	2018	51,381.00	20,300,000.00	37,770,000.00	28,540,000.00
	2017	45,313.00	86,750,000.00	98,900,000.00	28,890,000.00
	2016	37,710.00	150,200,000.00	126,880,000.00	71,620,000.00
	2015	33,660.00	121,750,000.00	225,350,000.00	37,450,000.00
Tana river	2018	33,498.00	205,440,000.00	46,680,000.00	9,030,000.00
	2017	30,280.00	431,790,000.00	40,130,000.00	65,980,000.00

	2016	25,474.00	787,860,000.00	34,850,000.00	161,050,000.00
	2015	29,620.00	564,170,000.00	25,470,000.00	18,580,000.00
Tharaka Nithi	2018	67,692.00	324,100,000.00	231,780,000.00	189,520,000.00
	2017	53,129.00	331,900,000.00	57,540,000.00	167,110,000.00
	2016	47,286.00	385,730,000.00	49,160,000.00	119,160,000.00
	2015	39,592.00	500,700,000.00	37,700,000.00	216,810,000.00
Transnzoia	2018	116,683.00	473,740,000.00	244,800,000.00	74,170,000.00
	2017	99,005.00	1,150,680,000.00	202,740,000.00	98,360,000.00
	2016	97,622.00	889,500,000.00	236,590,000.00	124,050,000.00
	2015	85,468.00	338,490,000.00	212,440,000.00	92,060,000.00
Turkana	2018	78,301.00	727,640,000.00	371,610,000.00	332,260,000.00
	2017	73,761.00	589,420,000.00	1,043,670,000.00	537,780,000.00
	2016	67,910.00	529,110,000.00	978,390,000.00	967,830,000.00
	2015	58,064.00	917,000,000.00	859,000,000.00	859,000,000.00
Uasin Gishu	2018	162,273.00	770,020,000.00	149,250,000.00	454,060,000.00
	2017	148,668.00	938,240,000.00	465,570,000.00	506,400,000.00
	2016	135,521.00	1,198,610,000.00	345,510,000.00	573,180,000.00
	2015	121,836.00	1,532,870,000.00	354,390,000.00	590,870,000.00
Vihiga	2018	59,050.00	164,770,000.00	44,640,000.00	32,980,000.00
	2017	51,001.00	414,270,000.00	73,310,000.00	137,910,000.00
	2016	46,163.00	360,680,000.00	43,440,000.00	56,430,000.00
	2015	38,586.00	588,100,000.00	97,940,000.00	250,130,000.00
Wajir	2018	37,159.00	302,100,000.00	472,180,000.00	832,930,000.00

	2017	33,526.00	1,225,240,000.00	941,850,000.00	611,280,000.00
	2016	30,907.00	251,810,000.00	1,133,110,000.00	377,900,000.00
	2015	27,772.00	1,572,270,000.00	1,092,300,000.00	286,760,000.00
West pokot	2018	46,785.00	322,670,000.00	151,780,000.00	133,950,000.00
	2017	43,093.00	552,500,000.00	240,860,000.00	113,170,000.00
	2016	38,432.00	423,230,000.00	210,730,000.00	137,720,000.00
	2015	33,226.00	403,140,000.00	158,480,000.00	99,550,000.00

Sources: KNBS and CRA

Appendix II1: Data(log Transfored)

County	CountyId	Year	GCP	Transport infrastructure	Water and sanitation infrastructure	Social infrastructure
Baringo	1.00	2018	4.967857	8.588597	8.425583	7.78831
Baringo	1.00	2017	4.891565	8.640869	8.608686	7.953905
Baringo	1.00	2016	4.81847	8.517169	8.529135	7.948462
Baringo	1.00	2015	4.694377	8.559775	8.476324	7.969509
Bomet	2.00	2018	5.202949	8.439601	8.412192	8.026288
Bomet	2.00	2017	5.119737	8.663126	8.561459	8.244203
Bomet	2.00	2016	5.013284	8.707246	8.594724	8.630763
Bomet	2.00	2015	4.918067	8.766799	8.345785	8.479057
Bungoma	3.00	2018	5.263657	8.88544	8.368826	7.976212
Bungoma	3.00	2017	5.183717	9.001045	8.88961	7.934448
Bungoma	3.00	2016	5.118228	8.97186	8.499316	7.916191

Bungoma	3.00	2015	5.061079	8.92924	8.151768	8.287421
Busia	4.00	2018	4.938079	8.750817	8.472844	8.059601
Busia	4.00	2017	4.83388	8.848479	8.46617	8.16334
Busia	4.00	2016	4.771933	8.899968	8.48879	8.098851
Busia	4.00	2015	4.68445	8.600079	8.268882	8.081059
Elgeyo/marakwet	5.00	2018	5.202845	8.398218	8.428167	7.944779
Elgeyo/marakwet	5.00	2017	5.103633	8.581688	8.444185	7.944483
Elgeyo/marakwet	5.00	2016	4.965042	8.310799	8.184493	7.995767
Elgeyo/marakwet	5.00	2015	4.816268	8.669131	8.172603	7.824126
Embu	6.00	2018	5.015921	8.714388	7.955207	7.352954
Embu	6.00	2017	4.949717	9.022643	8.383205	7.771073
Embu	6.00	2016	4.927088	8.645521	8.157094	7.078094
Embu	6.00	2015	4.825498	8.317666	7.993216	6.671173
Garisa	7.00	2018	4.59543	8.681784	8.473341	7.499137
Garisa	7.00	2017	4.564737	9.137671	8.869232	7.570543
Garisa	7.00	2016	4.517447	9.000043	8.936715	7.58995
Garisa	7.00	2015	4.475264	9.009111	8.878866	7.758155
Homa bay	8.00	2018	5.057658	8.61271	8.369513	7.762679
Homa bay	8.00	2017	4.98579	8.777985	8.508812	7.982
Homa bay	8.00	2016	4.911413	8.909626	8.563445	7.750894
Homa bay	8.00	2015	4.845402	8.781382	8.289098	7.717837
Isiolo	9.00	2018	4.200029	8.313319	8.143826	8.031287
Isiolo	9.00	2017	4.15418	8.363066	8.436481	8.070038
Isiolo	9.00	2016	4.114611	8.370828	8.144948	8.361066
Isiolo	9.00	2015	4.066848	8.460372	8.327992	8.169322

Kajiado	10.00	2018	5.032639	8.771536	8.39347	7.91392
Kajiado	10.00	2017	5.000178	8.704742	8.383241	7.868879
Kajiado	10.00	2016	4.93373	8.76192	8.428896	8.123819
Kajiado	10.00	2015	4.878907	8.600167	8.251565	7.951726
kakamega	11.00	2018	5.261413	9.175706	8.197501	8.481915
kakamega	11.00	2017	5.194359	9.319356	8.112069	8.428524
kakamega	11.00	2016	5.150624	9.234295	8.223989	8.391852
kakamega	11.00	2015	5.071867	8.98156	8.127396	7.987622
Kericho	12.00	2018	5.136083	8.667322	8.489157	8.655657
Kericho	12.00	2017	5.080468	9.068538	8.331346	8.774159
Kericho	12.00	2016	5.029043	9.03317	8.290302	8.444388
Kericho	12.00	2015	4.952061	8.879778	8.118926	8.595849
Kiambu	13.00	2018	5.625228	9.142599	8.635906	8.311796
Kiambu	13.00	2017	5.564828	9.142133	8.585235	8.434856
Kiambu	13.00	2016	5.500682	9.085326	8.520353	8.454479
Kiambu	13.00	2015	5.42112	9.002209	8.47372	8.275956
Kilifi	14.00	2018	5.076622	9.213494	8.944907	8.139407
Kilifi	14.00	2017	5.023071	9.23772	9.23772	9.115044
Kilifi	14.00	2016	4.989512	9.112602	8.867414	8.252538
Kilifi	14.00	2015	4.905423	8.931371	8.479042	9.04269
Kirinyaga	15.00	2018	5.003616	8.755745	8.074999	7.649043
Kirinyaga	15.00	2017	4.944754	8.636608	8.414957	7.827886
Kirinyaga	15.00	2016	4.89482	8.545171	8.578948	7.887223
Kirinyaga	15.00	2015	4.834624	8.381494	8.534305	7.417472

Kisii	16.00	2018	5.21364	8.950204	8.369958	8.166904
Kisii	16.00	2017	5.129986	8.991483	8.473575	8.121724
Kisii	16.00	2016	5.089096	9.040535	8.481457	8.058578
Kisii	16.00	2015	5.002891	8.969803	8.218982	8.057552
Kisumu	17.00	2018	5.288895	8.051693	8.011105	8.549996
Kisumu	17.00	2017	5.258065	8.494294	8.311669	8.636759
Kisumu	17.00	2016	5.218806	8.23631	7.99025	8.435175
Kisumu	17.00	2015	5.183711	7.551206	7.449324	8.206637
Kitui	18.00	2018	5.006723	8.890941	9.132583	8.453594
Kitui	18.00	2017	4.934705	8.93889	9.005794	8.274643
Kitui	18.00	2016	4.943242	8.998272	9.004631	8.277586
Kitui	18.00	2015	4.814607	9.065139	8.990201	8.164412
Kwale	19.00	2018	4.9359	8.668199	8.694359	8.243683
Kwale	19.00	2017	4.859348	8.534572	8.625189	8.339292
Kwale	19.00	2016	4.803245	8.519972	8.5827	8.417936
Kwale	19.00	2015	4.737057	8.403395	8.28051	8.288361
Laikipia	20.00	2018	4.908994	8.16891	8.188844	7.82112
Laikipia	20.00	2017	4.862668	8.29979	8.358125	7.747489
Laikipia	20.00	2016	4.752993	8.465442	8.133762	7.995591
Laikipia	20.00	2015	4.646845	8.267664	8.036349	7.232234
Lamu	21.00	2018	4.510357	8.23955	7.691877	8.165541
Lamu	21.00	2017	4.424539	8.248366	7.549494	8.238046
Lamu	21.00	2016	4.364532	8.421275	8.03866	8.356408

Lamu	21.00	2015	4.274943	8.356313	7.972249	8.078022
Machakos	22.00	2018	5.367095	8.741546	8.424261	7.826917
Machakos	22.00	2017	5.318435	9.304473	8.95176	8.076786
Machakos	22.00	2016	5.279133	8.98364	8.36065	8.991642
Machakos	22.00	2015	5.19784	9.087898	8.702568	8.137702
Makueni	23.00	2018	5.003994	8.372857	8.721547	8.200905
Makueni	23.00	2017	4.967295	8.864066	9.005022	8.876945
Makueni	23.00	2016	4.930562	8.449494	8.732096	8.207446
Makueni	23.00	2015	4.846151	8.602646	8.535826	8.10568
Mandera	24.00	2018	4.545319	9.207885	9.142092	8.05835
Mandera	24.00	2017	4.501347	9.260601	9.350184	8.089057
Mandera	24.00	2016	4.454769	9.269896	9.08792	7.597146
Mandera	24.00	2015	4.409663	9.450794	9.197134	8.738265
Marsabit	25.00	2018	4.53241	8.632245	8.746408	8.023335
Marsabit	25.00	2017	4.479201	8.751279	8.799795	8.143795
Marsabit	25.00	2016	4.432296	8.484585	8.862197	8.339809
Marsabit	25.00	2015	4.356083	8.196646	8.645059	7.852663
Meru	26.00	2018	5.361059	8.068483	8.802178	8.119915
Meru	26.00	2017	5.293336	8.814214	8.76723	8.381819
Meru	26.00	2016	5.233019	8.768912	8.579029	8.038501
Meru	26.00	2015	5.149462	9.038743	8.664642	8.224041
Migori	27.00	2018	4.983793	8.920979	8.662947	8.462697
Migori	27.00	2017	4.897616	8.889985	7.89354	7.972943

Migori	27.00	2016	4.853455	8.953663	7.987219	8.173769
Migori	27.00	2015	4.792637	8.795247	7.952744	8.380483
Mombasa	28.00	2018	5.521298	9.272194	8.510223	7.978043
Mombasa	28.00	2017	5.478667	9.238508	7.865992	8.567861
Mombasa	28.00	2016	5.421481	9.07023	8.692203	8.276508
Mombasa	28.00	2015	5.379632	8.887516	8.827989	8.181872
Murang'a	29.00	2018	5.238091	8.936338	8.610149	8.351989
Murang'a	29.00	2017	5.173635	9.073645	8.558012	8.362237
Murang'a	29.00	2016	5.111172	8.965719	7.185542	8.658355
Murang'a	29.00	2015	5.040361	8.980231	6.255273	8.092721
Nairobi	30.00	2018	6.173863	9.268538	9.211982	9.186745
Nairobi	30.00	2017	6.139709	9.510696	9.333288	9.216883
Nairobi	30.00	2016	6.090033	9.478757	9.207804	9.244421
Nairobi	30.00	2015	6.044401	9.369565	9.069945	9.120409
Nakuru	31.00	2018	5.713878	8.834478	8.562317	8.701136
Nakuru	31.00	2017	5.639574	9.015251	8.692027	8.817175
Nakuru	31.00	2016	5.536135	9.002546	8.856016	8.659365
Nakuru	31.00	2015	5.445559	8.932596	8.548758	8.629338
Nandi	32.00	2018	5.078061	8.305566	7.607777	7.337659
Nandi	32.00	2017	5.01875	8.915548	8.448861	8.21442
Nandi	32.00	2016	4.96677	8.923746	8.583924	8.339352
Nandi	32.00	2015	4.879767	8.898231	8.626238	8.119586
Narok	33.00	2018	5.253401	9.042516	7.984437	9.128144

Narok	33.00	2017	5.175286	8.979594	8.126294	9.154564
Narok	33.00	2016	5.099194	9.125172	8.104692	8.878183
Narok	33.00	2015	5.01993	9.117261	8.151891	8.76086
Nyamira	34.00	2018	5.013844	8.44442	8.22417	7.713659
Nyamira	34.00	2017	4.981302	8.59312	8.283595	8.159898
Nyamira	34.00	2016	4.869889	8.70571	8.428362	7.913125
Nyamira	34.00	2015	4.817188	8.681829	8.13133	7.889526
Nyandarua	35.00	2018	5.389526	8.467519	8.064645	8.194153
Nyandarua	35.00	2017	5.293959	8.980971	8.570986	8.334695
Nyandarua	35.00	2016	5.170669	9.012816	8.426804	8.437275
Nyandarua	35.00	2015	5.027276	8.774305	8.268672	8.372267
Nyeri	36.00	2018	5.242941	8.147089	8.059147	8.215823
Nyeri	36.00	2017	5.163683	8.786198	8.275933	8.177681
Nyeri	36.00	2016	5.082336	8.718236	8.275726	7.717254
Nyeri	36.00	2015	5.019461	8.633781	8.098263	7.549261
Samburu	37.00	2018	4.423295	8.604118	8.120936	7.794279
Samburu	37.00	2017	4.371031	8.942087	7.84547	7.860278
Samburu	37.00	2016	4.264841	8.819524	7.68106	7.722716
Samburu	37.00	2015	4.232386	8.896736	7.663795	7.854974
Siaya	38.00	2018	4.978933	8.747326	8.0125	8.427226
Siaya	38.00	2017	4.914872	9.022754	8.451633	8.033946
Siaya	38.00	2016	4.833835	8.901801	8.426186	7.944236
Siaya	38.00	2015	4.728208	8.717579	8.345217	7.330211

Taita	39.00	2018	4.710803	7.307496	7.577147	7.455454
Taita	39.00	2017	4.656223	7.938269	7.995196	7.460748
Taita	39.00	2016	4.576457	8.17667	8.103393	7.855034
Taita	39.00	2015	4.527114	8.085469	8.352858	7.573452
Tana river	40.00	2018	4.525019	8.312685	7.669131	6.955688
Tana river	40.00	2017	4.481156	8.635273	7.603469	7.819412
Tana river	40.00	2016	4.406097	8.896449	7.542203	8.206961
Tana river	40.00	2015	4.471585	8.75141	7.406029	7.269046
Tharaka Nithi	41.00	2018	4.830537	8.510679	8.365076	8.277655
Tharaka Nithi	41.00	2017	4.725332	8.521007	7.75997	8.223002
Tharaka Nithi	41.00	2016	4.674733	8.586283	7.691612	8.07613
Tharaka Nithi	41.00	2015	4.597607	8.699578	7.576341	8.336079
Transnzoia	42.00	2018	5.067008	8.67554	8.388811	7.870228
Transnzoia	42.00	2017	4.995657	9.060955	8.306939	7.992819
Transnzoia	42.00	2016	4.989548	8.949146	8.373996	8.093597
Transnzoia	42.00	2015	4.931804	8.529546	8.327236	7.964071
Turkana	43.00	2018	4.893767	8.861917	8.570087	8.521478
Turkana	43.00	2017	4.867827	8.770425	9.018563	8.730605
Turkana	43.00	2016	4.831934	8.723546	8.990512	8.985799
Turkana	43.00	2015	4.763907	8.962369	8.933993	8.933993
Uasin Gishu	44.00	2018	5.210246	8.886502	8.173914	8.657113
Uasin Gishu	44.00	2017	5.172217	8.972314	8.667985	8.704494
Uasin Gishu	44.00	2016	5.132007	9.078678	8.538461	8.758291

Uasin Gishu	44.00	2015	5.085776	9.185505	8.549481	8.771492
Vihiga	45.00	2018	4.77122	8.216878	7.649724	7.518251
Vihiga	45.00	2017	4.707579	8.617283	7.865163	8.139596
Vihiga	45.00	2016	4.664294	8.557122	7.63789	7.75151
Vihiga	45.00	2015	4.58643	8.769451	7.99096	8.398166
Wajir	46.00	2018	4.570064	8.480151	8.674108	8.920609
Wajir	46.00	2017	4.525382	9.088221	8.973982	8.78624
Wajir	46.00	2016	4.490057	8.401073	9.054272	8.577377
Wajir	46.00	2015	4.443607	9.196527	9.038342	8.457519
West pokot	47.00	2018	4.670107	8.508759	8.181215	8.126943
West pokot	47.00	2017	4.634407	8.742332	8.381765	8.053731
West pokot	47.00	2016	4.584693	8.626576	8.323726	8.138997
West pokot	47.00	2015	4.521478	8.605456	8.199974	7.998041