

**ROADS INFRASTRUCTURE INVESTMENT AND ECONOMIC GROWTH IN
KENYA: THE ROLE OF PRIVATE AND PUBLIC SECTORS**

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DECLARATION

This project is my original work and has not been presented for an academic award in any other institution.

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I thank God for giving me strength and resources to complete this project.

Special thanks to my supervisors Prof. Mureithi and Mr. Kabando for their unwavering support and brilliant ideas that enabled me to fulfill this task.

DEDICATION

I dedicate this work to my son Mwiti, my wife Mercy, my parents Mr. & Mrs. Kiramana, my parents in law Mr. & Mrs. Muriithi and my late sister Lydia.

ABBREVIATIONS AND ACRONYMS

AERC	African Economic Research Consortium
AFDB	African Development Bank
AICD	Africa Infrastructure Country Diagnostic
AU	African Union
COMESA	Common Market for Eastern and Southern Africa
GoK	Government of Kenya
EAC	East African Community
EIB	European Investment Bank
EU	European Union
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GMM	Generalized Method of Moments
GNP	Gross National Product
IEA	Institute of Economic Affairs
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
KENHA	Kenya National Highways Authority
KERRA	Kenya Rural Roads Authority
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KRB	Kenya Roads Board
KURA	Kenya Urban Roads Authority
KWS	Kenya Wildlife Service
MDGs	Millennium Development Goals
NGO	Non-governmental Organization
NTSA	National Transport and Safety Authority
OECD	Organization for Economic Cooperation and Development
PPIs	Public Private Initiatives
PPPs	Public Private Partnerships
RoK	Republic of Kenya
UNECA	United Nations Economic Commission for Africa

OPERATIONAL DEFINITION OF TERMS

BOT (Build–Operate–Transfer) Refers to a form of business venture for new projects whereby a group of investors settles to fund, build, manage, and maintain a project for an indicated duration of time and thereafter handover the facility to the state or public agencies.

Concessioneing refers to a contract among the government and private sector for the purpose of pooling of funds for investment in public development projects. The private company retains the right to manage the project under the government authority (Institute of Economic Affairs, 2006).

Economic infrastructure refers to resources for production and trade such as shipping lines for transportation including supply networks (Chan et al. 2009).

Financing refers to the mobilization of funds for venture in capital investments.

Infrastructure: The Organization for Economic Cooperation and Development (OECD 2002), defines infrastructure as a structure of public facilities in a nation or state, together with roads, national buildings and power lines. The investment industry emphasizes on the economic and financial characteristics of infrastructure assets.

Class A roads encompass transnational highways connecting townships of international significance, ports and linking international borders (Republic of Kenya, 2012).

Class B roads are countrywide highways that connect centres of national importance (RoK 2012).

A class C road refers to major highways which connect regional towns or link to super highways.

Public road is defined as a highway, traffic lane, path, alleyway or route or ground held in reserve for use mode of right of entry to two or multiple premises (RoK 2012).

Private finance entails funding by the commercial entities, Public-Private Partnerships (PPPs) and Private Non-PPP project investment (Wagenvoort et al. 2010).

Social infrastructure refers to amenities that accommodate public social development comprising of hospitals, schools, prisons and universities (Chan et al. 2009).

DATA NOTES

Billion is equals to one thousand million.

Trillion is equals to one thousand billion.

Metric tonne is equivalent to 1,000 kilograms.

Dollars refers to U.S. dollars.

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ABSTRACT

The research project explored the correlation among road infrastructure investment and economic development in Kenya with special reference to the role of private and public sectors for a period of 35 years from 1980 to 2014. Time series data was used and was mainly sourced from the Central Bank of Kenya (CBK), World Bank, Economic surveys and Statistical abstracts from the Kenya National Bureau of Statistics (KNBS). The study sought to achieve two main objectives namely: to examine the correlation between government expenditure on roads infrastructure and economic development in Kenya and to examine the relationship between the amounts that private sector is investing on roads infrastructure and economic progress in Kenya. This was achieved by running a simple linear regression model where GDP growth was regressed on public spending on road infrastructure, private expenditure in roads infrastructure and labour force. The findings of the study were that for every one billion Kenya shilling spent on road infrastructure by the government, GDP growth increases by 4.5 percent holding other factors constant. This implies that public expenditure in road infrastructure impacts on the economic growth positively. For the private spending in the road infrastructure, the finding is that for every one billion shillings invested on road infrastructure GDP growth increases by 1.4 percent *ceteris paribus*. Therefore the study recommends for more sensitization of the PPPs programme now that a legal framework has been enacted through the PPP Act of 2013. In so doing the government can leverage on this to mobilize more financial resources from the private sector which will be more cost effective thus avoiding high costs of loans that come from borrowing from international financial lenders. In addition, the government needs to fast track the annuity financing programme given that private sector mainly the banks and other financiers are to be involved from the onset of the project, this will enhance timely completion of the project. In addition it fosters efficiency given that all the private stakeholders involved in the project are enjoined together as a consortium.

CHAPTER ONE

INTRODUCTION

1.1 Background

Definition and overview on the status of infrastructure in Kenya

The Organization for Economic Cooperation and Development (OECD 2002), defines infrastructure as a structure of public facilities in a nation or state, together with roads, national buildings and power lines. The investment industry emphasizes on the economic and financial characteristics of infrastructure assets. In his study of the infrastructure as an asset, Inderst (2010) categorizes economic infrastructure to include transportation and energy. The public infrastructure includes educational institutions, and health care amenities. Chan et al. (2009) defines infrastructure as a varied word, including physical buildings of various types used by many factories as inputs to the formation of chattels and services. This illustration encompasses “social infrastructure” (for instance schools, hospitals and universities) and “economic infrastructure” (for example energy, water, transport, and digital communication).

Kenya’s infrastructure networks follow population density. The World Bank (2010) report notes that the national agro economic activity and population density are skewed towards the southern half part of state alongside the transport corridor connecting Mombasa to Nairobi, Nairobi to Kisumu, Kisumu to Busia and the areas around Mt. Kenya region. The national road infrastructure, key power lines and optic fiber cables have charted similar pathway. In contrast, the northern part is arid and semi-arid, characterized by sporadic weather, sparse population and dilapidated infrastructure network.

In Kenya, the road transport system is used to move people and goods and it is vital in interconnection of other modes of transport as well as acting a vital linkage in access to basic social services. The road transport system accounts for approximately 93% of all the cargo shipment and passenger travel in the country. Roads networks are pillars for “economic, social and political” progress (RoK 2012). The road transport sector in Kenya represented 34% of the total transport industry in 1998. Air transport represented 25%,

while the water ways transport represented 16% (Ikiara et al. 2000). This had been attained during the time of poor road repairs and therefore the sector and by extension the road infrastructure plan has the ability to influence speedy economic development and lower the level of poverty using its effects on lowering of production costs, increased job opportunities, increased trades as a result of widening markets and increased foreign and domestic ventures (Howe & Richards (1984), & RoK (2000a)).

The World Development Report (WDR) 1994 notes that developing countries channel \$200 billion annually to the new infrastructural projects which represents 4 percent of their Gross National Product. This occupies a fifth of their total investment in their economies. This has led to increased infrastructural services in their following sectors transportation, energy, drainage systems and telephone cell network. For the last fifteen years, the sanitary conditions for the families have improved by half; the electricity connectivity and cell phone coverage have also doubled. This has converted into improved quality of life and increased productivity. However, (WDR) of 1994 concludes that that nearly one billion persons in third world countries are without access to sanitary amenities and closely to 2 billion people are still living in squalor conditions. The countryside women and children spend most of their time fetching water from distant rivers and boreholes. Due to lack of rehabilitation activities, the transport systems are in bad condition with erratic power supply and roads riddled with potholes. In developing countries, nearly 2 billion people are yet to be connected to stable power supply.

In their study on infrastructure and growth, Bottini, Coelho, & Kao (2013) concludes that infrastructure may affect output by being an augment in the manufacturing process and increasing formation of the GDP. Good infrastructure also lowers the cost of doing business with reduced transport costs thus raising total factor productivity. As a result, infrastructure can be viewed as an augmenting element for the economic development (Bottini, Coelho & Kao, 2013).

According to World Bank (1994), effective infrastructure promotes production with decreasing overheads. However, it has to grow to in line with the development to

accommodate growth. The links among infrastructure expenditure and its impact on economic development is still an area of further exploration according to (WDR) of 1994.

According to (WDR) of 1994, infrastructure symbolizes the engine of economic activity. People require better infrastructural facilities to improve sanitary conditions and reduce time and cost for procuring clean water in addition to cutting down on the cost attributed to moving the goods to the market and movement to work. Infrastructure also has an effect on production costs. Infrastructure considerably reduced production costs of Manufacturing in Germany, Japan, Mexico, Sweden, and United States of America (Aschauer, 1993).

The level of infrastructure development dictates the access to new export markets (OECD, 1991). WDR of 1994 notes that the development of transportation, storage facilities and telecommunications has resulted into widened globalization of trade and liberalization of world trade during the last two decades. This progress is based on better planning for logistics and response to customer demand which is attributable to lesser cost in inventory and working capital.

Infrastructure development is crucial to aligning economic growth to reducing levels of poverty (WDR, 1990). The level of welfare is gauged according to the accessibility of the infrastructure. The poor can be classified as those who have no access to clean water and live in unhygienic slum dwellings with no proper road access. Consequently, they have poor health and minimal job prospects. The expanding slums which generally have temporary structures in most unindustrialized countries lack proper infrastructure network (WDR, 1994). Various types of infrastructural systems have wide ranging effects on standards of living and decreasing poverty levels. The supply of clean piped water and proper public health systems has the greatest impact in reducing deaths and diseases. The advantage of the proper transport and communication systems is the links they offer for the supply of additional goods and services particularly in urban areas. The poor populace mainly dwells in the outskirts of the cities and the costs and accessibility of the transport is vital in determining their chances of securing a job. Infrastructural activities such as

rehabilitation and construction of new roads offer employment opportunities which can directly contribute to reduction of poverty levels (WDR, 1994).

In their study on sources of infrastructure finance, Sehrawat & Mor (2006) noted that previously the governments used to finance solely the infrastructure projects besides taking charge for the “implementation, operations and maintenance”. The study concludes that there is an acknowledgement it is not a plausible method of funding these infrastructural ventures. According to the India Infrastructure Report (2003), this acknowledgment is centered on concerns such as: cost effectiveness; private sector has the capacity to deliver affordable amenities with better quality. The report indicates that India’s economic development would have increased by 2.5% were it not for public inefficiencies and cost overruns. The second consideration is the equity factor which can be applied to impose costs to the beneficiaries of a particular project. This is vital while commercializing a particular infrastructure project in any region with the government playing an enabling function. The third consideration is the allocation efficiency; this ensures that the infrastructure projects have been prioritized in the areas where they are mandatory. Private involvement and risk yield organization has the additional value that the scarce funds are channeled in the regions where they are most needed. The final consideration is the fiscal prudence consideration ensures that the proposed projects are feasible within our budgets without resulting into uncontrolled budgetary deficits.

The Kenyan road subsector

Kenya has a land area covering 582,646 km² or 225,000 sq. Miles. The country is in East Africa and borders to Ethiopia, Tanzania, South Sudan, Somalia and Uganda. The population is 44 million people as of July 2013 with 3.4 million people living in Nairobi the capital city. The official languages are English and Kiswahili. The economy recorded a 5.3 percent growth rate in 2014 in comparison to 5.7 percent in 2013. In 2014, the Gross Domestic Product (GDP) was Kshs.5, 357.7 billion compared to Kshs.4, 730.8 billion in 2013 which reflects a growth of 13.3 percent at market prices (RoK 2014).

According to the Road Inventory and Condition Survey (RICS) 2009 report, the size of the total Road system in Kenya is 160,886 km as tabulated in table 2. The length of the

road network before the survey was 63,292 km as per the break down which is given in table 1.

Tables 1: Road network classification before 2009 RICS survey

Class	Roads Description	Length (Kilometres)			Total
		Bitumen	Gravel	Earth	
A	International Trunk roads	2,886	717	152	3,755
B	National Trunk Roads	1,433	815	524	2,799
C	Primary Roads	2,487	3,209	1,972	7,686
D	Secondary roads	1,167	6,484	3,565	11,217
E	Minor Roads	751	7,206	18,592	26,549
SP	Special Purpose	214	8,724	2,366	11,304
Total		8,938	27,155	27,171	63,292

Source: Road Inventory and condition survey, Republic of Kenya (2009).

Tables 2: Road network after 2009 RICS survey

Class	Roads Description	Length (Kilometres)		
		Paved	Unpaved	Total
A	International Trunk roads	2,772	816	3,588
B	National Trunk Roads	1,489	1,156	2,645
C	Primary Roads	2,693	5,164	7,857
D	Secondary roads	1,238	9,483	10,721
E	Minor Roads	577	126,071	26,649
SP	Special Purpose	110	10,376	10,486
Total classified network		8,879	53,066	61,945
Unclassified network		2,318	96,623	98,941
Total National Network		11,197	149,689	160,886

Source: Road Inventory and condition survey, Republic of Kenya (2009).

Kenya has a thriving functional road system, but most of the roads are in pitiable state and limited roads have been tarred. The deterioration in the road quality is also as a result of dilapidated railway network which leading to most of freight transport to be moved by road. According to World Bank 2010 report, Kenya's rail track is vital to the East African

community. It connects the port of Mombasa to Nairobi and continues straight on into Uganda. The poor state of infrastructure is a key limitation on transport costs in the region. The condition of the Kenyan roads is as illustrated in table 3 below.

Table 3: Combined condition of the road network

Surface Condition	Paved		Unpaved		Total	
	Km	%	Km	%	Km	%
Good	4,697.2	42	12,582.4	8	17,279.59	11
Fair	4,150.3	37	48,665.4	33	52,815.67	33
Poor	2,350.4	21	88,439.9	59	90,790.26	56
Totals	11,197.9		149,687.7	100	160,885.52	100

Source: Road Inventory and condition survey, Republic of Kenya (2009).

In his study on road infrastructure policies in Kenya, Wasike (2000) points out that the lack of credible statistical data impedes precise evaluation of the status of the road networks in African states. Therefore, for analysis, proxy measures for areas covered are graded while considering operating environment instead of ordinary measures such as ‘per tonne kilometer or passenger per kilometer are used for evaluation (Wasike, 2000). According to the data available, African countries had nearly 311,184 km of tarmacked roads network in 1996 which were partially in dilapidated state. On the other hand, Mauritius and the some of the countries in North Africa such as Algeria, Egypt, Morocco, and Tunisia had road networks which were in good condition. Tarmacked roads form lesser than 17 percentage of the total road network in Sub-Saharan Africa with many countries having a coverage which is less than the seventeen percentage average. The approximate percentage of the roads paved in North Africa is 57 percent compared to 25 percent in South Africa while in Central Africa it averages at 10.2 percent. The Road concentration per square kilometer is by and large very low in comparison to that of the Asian tigers and the Latin America (AFDB, 1999).

The state of Kenyan roads in comparison to other African countries is as tabulated in table 4 below.

Table 4: Kenya's road indicators benchmarked against Africa's low –and middle-income countries

	Unit	Low-income countries	Kenya	Middle Income Countries
Paved road density	Km/1000 km ² of arable land	86.6	152	507.4
Unpaved road density	Km/1000 km ² of arable land	504.7	930	1,038.3
GIS rural accessibility	% of rural population within 2 km of all-season road	21.7	32	59.9
Paved road traffic	Average annual daily traffic	1,049.6	1,108	2,786.0
Unpaved road traffic	Average annual daily traffic	62.6	62.6	12.0
Paved network condition	% in good or fair condition	80.0	80.0	79.0
Unpaved network condition	% in good or fair condition	57.6	57.6	58.3
Perceived transport quality	% firms identifying roads as major business constraint	23.0	63	10.7

Source: Gwilliam and others (2009).

The road sector in Kenya has faced the following challenges: huge cost of road building, insufficient equipment for road repairs; poor implementation of axle weight guidelines and rules; an enormous Roads rehabilitation backlog; lack of particular standards and capability for decentralized county roads; little regulation and contractual ability; infringement on road reserves; heavy traffic jams and overpopulation in urban areas; overloading; insufficient research on other affordable materials for building roads, lack of unpredictable cross-border transportation rules and operating processes, (RoK 2008) & (RoK 2013).

According to the first Medium Term Plan (2008-2012) by Government of Kenya, the contribution of physical infrastructure to the GDP growth was at 2.6 percent. The amount

invested in infrastructure represented 13.4 percent of total government expenditure. The yearly budgetary disbursement in the Roads sector was tremendously increased to Kshs.78.8 billion in 2007/08 financial year compared to a moderate allocation of Kshs.24 billion in 2002/03. Recurrent spending used to account for about 55 percent of the total roads sector allocations. The trend has been gradually reversed with the recurring spending being reduced from 57 percentages in 2004/05 financial year to 47 percent in 2005/06. The development spending increased from 45 percentages in 2004/05 to 53 percent in 2005/06 financial year. This disbursement configuration is aligned to the government strategy of diverting budgetary funds from recurring spending to development expenditure (World Bank, 2010).

Financing Kenya’s infrastructure

Kenya needs to spend \$4 billion per year on infrastructure (World Bank, 2010). Capital spending is estimated to be around seventy two percent of this spending constraint. In a study on Kenya’s infrastructure, World Bank (2010) notes that the country will be required to invest \$1 billion annually in order to install “1,000 megawatts” of clean power production and “270 megawatts” of inter-country interconnections. The report further notes that \$2 billion will be required to be invested in the water and sanitation area annually to attain part of the seventeen “Sustainable Development Goals (SDGs)”. The capital investment spending will account for three quarters of the entire budget.

Table 5: Infrastructure spending needs in Kenya for 2006 to 2015

US\$ millions per year			
Sector	Capital expenditure	Operation and maintenance	Total needs
ICT	485	44	529
Irrigation	13	2	16
Power (trade)	745	274	1,019
Transport (basic)	232	242	474
Water supply and sanitation	1,375	555	1,930
Total	2,850	1,118	3,968

Sources: Mayer et al. (2009). Rosnes & Vennemo (2009). Carruthers et al. (2009), You et al. (2007).

Kenya commits 9 percent of her GDP on investment in which is rather considerable as a share of the GDP (World Bank, 2010). This signifies a considerable investment in infrastructure but it translates into \$22 per capita annually on infrastructure spending. Kenya’s pattern of infrastructure investment is unique in comparison to other unindustrialized countries. The World Bank (2010) study notes that the Kenyan government invests significantly more in power in comparison to telecommunications and sewerage facilities. The funding model applied in energy projects, transportation, water supply and sanitation, is that of combining government and donor funding whereas the ICT sector is mainly funded by the private sector.

Table 6: Finance flows to Kenyan infrastructure on average from 2001 to 2006

US\$ millions	O & M		Capital expenditure				Total spending
	Public sector	Private sector	ODA	Non-OECD financiers	PPI	Total CAPEX	
Information and communication	44	36	0	0	449	485	529
Irrigation	2	0	0	0	0	0	3
Power (trade)	274	125	59	0	13	197	471
Transport (basic)	242	84	114	11	22	232	474
Water supply and Sanitation	12	34	97	2	23	155	167
Total	575	278	271	13	507	1,069	1,644

Source: Derived from Foster & Briceno-Garmendia (2010).

O & M = operations and maintenance; ODA = official development assistance; PPI = private participation in infrastructure; CAPEX= capital expenditure; OECD = Organization for Economic Co-operation and Development.

The Kenyan government secured USD 336 million in form of loan and grants from the African Development Bank (AFDB) for investment in sustainable energy projects and road infrastructural development projects in the country (AFDB, 2012). Some of the projects envisaged in this financing arrangement include USD 186.7 million financing for the “Mombasa-Nairobi-Addis Ababa” highway and a USD 149.5 million loans and donations for funding of the “Menengai Geothermal Development” venture. The

financing arrangement also funds the third segment of “Mombasa-Nairobi-Addis Ababa” highway including the “Turbi-Moyale” unit. This infrastructure is segment of the larger “Trans-Africa Highway” set-up. The third and last segment of the project encompasses tarmacking of approximately 320km of the highway, with the 122km ”Turbi-Moyale” part in Kenya and the other 198km “Hawassa-Ageremariam” segment on the Ethiopian side.

The other source of finance is the Kenya Road Board Fund which collects the funds from the agricultural maintenance cess, transportation fees and road maintenance toll. The fuel duty was made applicable in 1993 by the establishment of Road Maintenance Levy Act. The fuel duty is billed at the ratio of Kshs.9 per litre of gasoline. The disbursement for KRB FY 2012/2013 report is as follows:

Table 7: 2012/2013 KRB fund allocation

% of allocation	Roads funded	Allocation	Agency
40	Class A, B and C	9,992,000,000	KENHA
22	Constituency roads	5,280,000,000	KERRA
10	Critical links - rural roads	2,400,000,000	KERRA
15	Urban roads	3,600,000,000	KURA
1	National parks/ reserves	240,000,000	Kenya Wildlife Service
2	Administration	488,000,000	KRB/Minister for Roads

Source: Kenya Roads Board (2012)

Policies and institutional arrangements in the road sub-sector

According to a study by Wasike (2000) on road infrastructure policies in Kenya, the Kenyan government adopted public policies which are found in the “sessional papers” and “development plans “generated over the years. The republic of Kenya generated the first nationwide development plan spanning from 1964 to 1970, including the “sessional

paper“ number ten of 1965 on the “African Socialism” and its relevance to development in Kenya in addition to the budget statement of 1964 (RoK 1964) & (RoK 1965). The country’s economic development policies prior and subsequent to end of colonial rule had been founded on the doctrines contained in “sessional paper” number ten of 1965 which were basically the “political impartiality”, “social justice”, “human decorum”, and equivalent opportunity for all the citizens (RoK 1965).

The Kenyan government has been executing wide ranging reforms in the roads sector. The national assembly ratified sessional paper number five of 2006 on the administration of the roads infrastructure sector for long term economic development in October 2006 (RoK 2012).The parliament also formulated the Kenya Roads Act 2007 thereunder which effectively led to the creation of the following additional administrative organizations to be in charge of growth and rehabilitation of the roads:

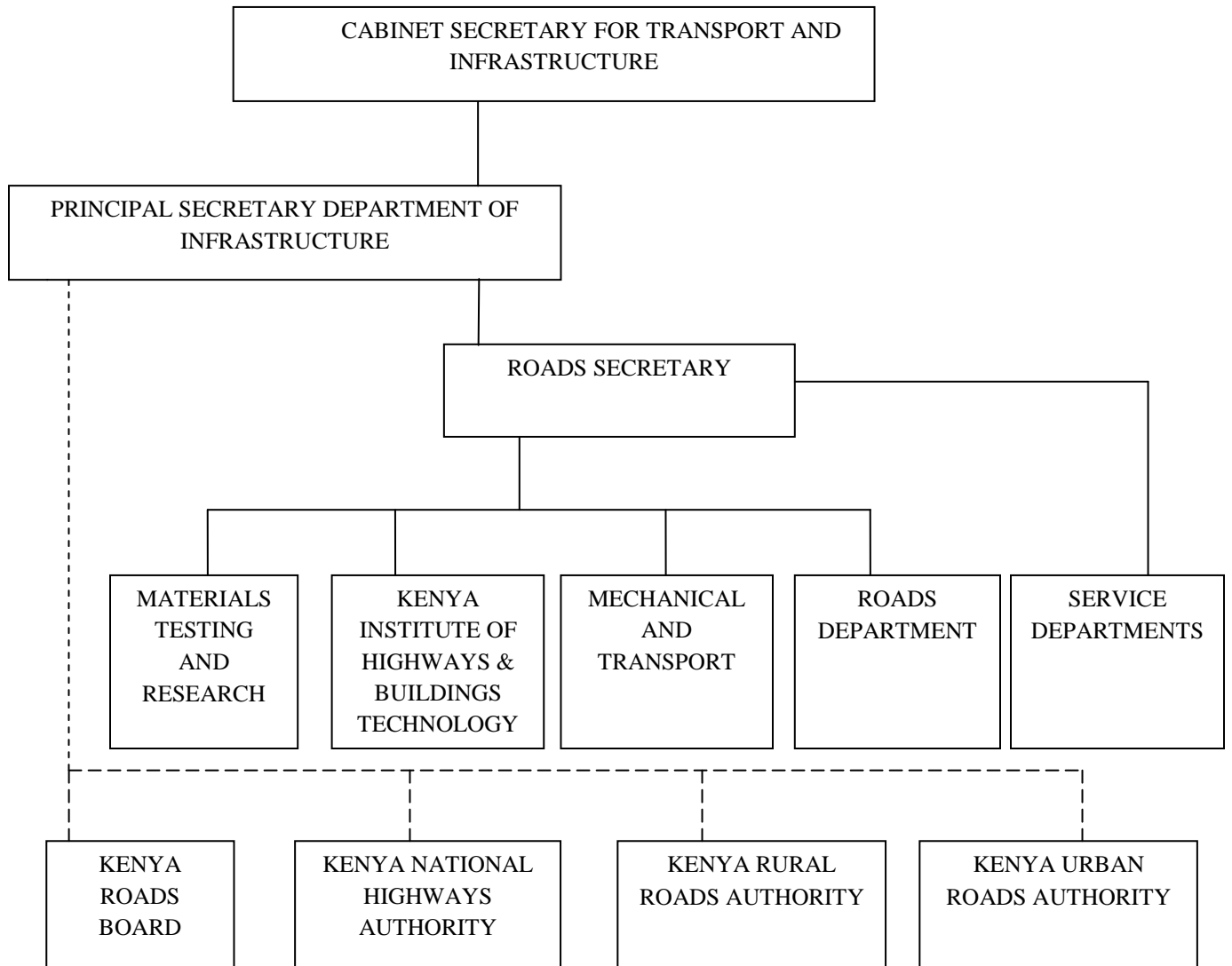
- (i) The “Kenya National Highways Authority” (KENHA) which is mandated to oversee and rehabilitate all road networks of classes A, B, C.
- (ii) The “Kenya Rural Roads Authority” (KERRA) which has mandate for countryside and minor town roads, special purpose roads, unclassified roads and all the other roads in class D and below. KERRA is also in charge of roads under Forest department and roads in the Game Reserves.
- (ii) The “Kenya Urban Roads Authority” (KURA).This is the body which has the responsibility for administration and rehabilitation of roads in big towns and cities.

The first Medium Term Plan (2008-2012) aimed to undertake the following: fully implement the Sessional PAPER No.5 of 2006 on the administration of the Roads sector for viable economic growth; formation and operationalization of the three independent road sector organizations (KURA, KeNHA and KeRRA) by end of 2008 to improve and repair the road system countrywide. The plan also aimed at establishment and enactment of the Roads Investment Plan (2008-2018) in addition to the complete harmonization of statutory structure for administration of roads (RoK 2008)

The second Medium Term Plan (2013-2017) aims to evaluate and operationalize the Sessional Paper No.2 on the Integrated Countrywide Transport plan, formation of

Comprehensive Maritime Policy, finalization and ratification of the Roads sector rules alongside the Kenya Roads Bill 2013, establishment of the LAPSSSET project Implementation Fund and formation of Nairobi Metropolitan Transport Authority (RoK 2013)

Figure 1: Institutional framework of the roads sub-sector



Source: Republic of Kenya (2012). Ministry of Roads; Policy on aligning the roads sub-sector with the constitution.

Roads infrastructure under Kenya Vision 2030

Vision 2030 was formulated by the government of Kenya in the year 2007. The strategy aims at elevating the country into an internationally “competitive and prosperous middle income” country by way of improved standards of living by 2030. The Vision 2030 is anchored on the following three foundations; social, economic, and the political pillar (GoK 2007).

The economic pillar aims at improving the quality of life for Kenyans by implementing a model of economic growth, extending to all the corners of the country with an objective of realizing regular GDP growth rate of 10% per annum commencing 2012 over the next 25 years (RoK 2007). Six areas of importance were identified to propel the economic foundation and those are: manufacturing, Business Process Outsourcing (BPO), wholesale and retail trade, financial services, tourism, and agriculture. The strategic projects for implementation under this pillar include the following: expansion of Small and Medium Enterprise (SME) business parks, formulation of plan for creation of Business Process Outsourcing (BPO) parks with the aim of attracting overseas businesses; construction of a free port to attend to the needs of the regional market; reforms to banking sector under the regulation of the Central Bank of Kenya (CBK) and restructuring of the pension schemes; formation of the resort towns in strategic areas and upgrading of the arid areas with steppe climate through irrigation and land reclamation to boost agricultural production and food security according to Ndung’u, Thugge & Otieno (2009)

The social institution seeks to form “unbiased, unified and equitable social progress in a hygienic and safe environment” (RoK 2007). The six general sections of social involvements consist of healthcare, education, decent housing and controlled urbanization, environmental matters, water and sanitation systems and gender, minorities, vulnerable communities and youth. Vital programs for this pillar include: curriculum appraisal to emphasize on Science, Technology and Innovation (STI) along with entrepreneurship, and conversion of the Higher Education Loans Board (HELB) into an education bank, equipping of all health facilities to healthcare standards, creation of

efficient referral structures at all echelons, conservation of the catchment areas in Mau, Mount Kenya and Aberdares regions, establishment of the countrywide land management policies, slum improvement projects, rehabilitation of 600 hydro meteorological centres, formation of the Women Enterprise Fund, Sports Fund and establishment Youth Enterprise Fund with respective statutory fund management boards.

Political establishment strives for “an ideological, public-focused, keen on results, and responsible independent political structure” (RoK 2007). Crucial programs for this foundation include: loyalty to the constitution and observation of civil liberties, reasonable and dynamic politics with focus on people and politically transformative culture, transparent, answerable and upright public bodies, observance of procedures in government institutes and security for public and assets countrywide. According to Ndung’u, Thugge & Otieno (2009), the main programs include promulgation of the new constitution, justice, governance and legal transformations, restructuring of the security apparatus and construction of an unbiased legislative research institution.

The First Medium Term Plan (2008-2012) strives for acceleration and amalgamation of achievements made from the Economic Recovery Strategy (ERS) on infrastructure improvement, centering on value, aesthetics and effectiveness of the system of infrastructure facilities. The first MTP aims at bigger financing in the road systems, sanitation and water facilities, energy supply and power lines, sea, air and railway transportation systems (RoK 2008). In the MTP strategy, the government targeted to build 1,950 kilometers of additional highways by 2012 by formulating and meritoriously running strong roads networks that will entail least repairs. The MTP blueprint correspondingly strived to perform 20 viability and project studies; establishment of 1,950 kilometers of road systems to the key manufacturing, consumption and market regions; setting up of legitimate structure to reclaim the land acquired unlawfully on road reserves, and the development of 1,103 kilometers of road width to arrange for Non-Motorized-Transport (NMT) systems.

The Second Medium Term Plan (2013-2017) targets to steadily reduce the “infrastructure shortfall “in Kenya as well prolonging the gains realized from first MTP. The strategy

targets to augment national and international business by improvement of the countrywide road systems. The main objective is to build and repair nearly 5, 500 kilometers of roads incorporating 3,825 kilometers of national highways and 1,675 kilometers of devolved county road systems. Approximately 1,700 kilometers of Non-Motorized Transport (NMT) network which constitutes pavements and footpaths for pedestrians and cyclists will also be built. Nearly 800 kilometers of road network will be designed and there will be routine maintenances of 4,257 and 1,735 kilometers of national highways and respective county roads (RoK 2013).

In their report on ‘unlocking the future potential for Kenya the Vision 2030’, Ndung’u, Thugge & Otieno (2009) argues that the new roads needs to be constructed to link the new resort cities and tourist destinations for the vision to be executed effectively .The plan also emphasizes on the need to have competitive energy costs especially in manufacturing economic zones. The areas around flagship projects need to have developed transportation; construction and telecom networks. According to Ndung’u, Thugge & Otieno (2009), the Kenya Vision 2030 identifies the following key roads infrastructural projects for implementation:

- The construction of countrywide transport spatial plan to boost activities in key sectors such as manufacturing and agricultural production.
- The mapping and linking of the main national transport plan to the country’s transport spatial plan.
- The development of Mombasa port to allow for the anchoring of large cargo ships and other sea cruise vessels.
- The development of the Nairobi metropolitan rapid bus transport system. This is expected to cover the southern by-pass from Athi River to Kikuyu town; it also covers the Nairobi Central Business District (CBD) to Thika town and with the other link from Jomo Kenyatta International Airport to CBD.
- Upgrading the rail system and linking Nairobi and its metropolitan towns to the railway line.

- The Lamu Port and Lamu-Southern Sudan-Ethiopia (LAPSSET) transportation passageway will link the neighboring countries and open the remote areas in northern Kenya.

The role of Public Private Partnerships (PPP) in road sector

The Public Private Partnership (PPP) refers to a long-term business project between the private sector and government bodies, whereby the private party finances and operates the public project or provision of services. The historical perspectives of the PPPs indicate that they were started in Europe focusing mainly on transport and urban water supply sectors. In those sectors, consumers or the beneficiaries of those facilities were readily identifiable and the returns on those projects could sufficiently support the investments (Institute of Economic Affairs [IEA], 2006). The Republic of Ireland adopted the PPP models used by the European and British and incorporated it as a policy. The advantage of the PPP model was timely execution of projects and overcoming economic bottlenecks in the economy in relation to labour skills and the infrastructure gap (IEA 2006). The budgetary policy in the republic of Ireland allows for the provision of the wide ranging infrastructure projects in comparison to Britain and other countries. In the United States of America (USA), the implementation of the PPPs for infrastructural projects is highly impeded by the Federal Taxation Law and State regulations. The primary goal of the policy agenda is to pursue validation of the statutory and governing laws.

In Australia, they adopted a modified PPPs model similar to the one applied in the UK and this started in Victoria. IEA (2006) report notes that most of the countries use the “Build Own Operate Transfer” (BOOT) or concession models in order to avoid budgetary strain since lesser public funds are committed. Toll roads have been constructed successfully in Malaysia whereas the local communities have opposed the privatization of the water sector. This has led to a varied finding on the success of the PPPs in that country. In Africa, PPPs began in mid-1990s and it has seen the governments increase focus on that financing models in order to expand the infrastructure development at a bigger scale so has to reform and improve provision of amenities to the populations (AFDB, 2002). In comparison to the privatization, PPPs arrangements do not result to set

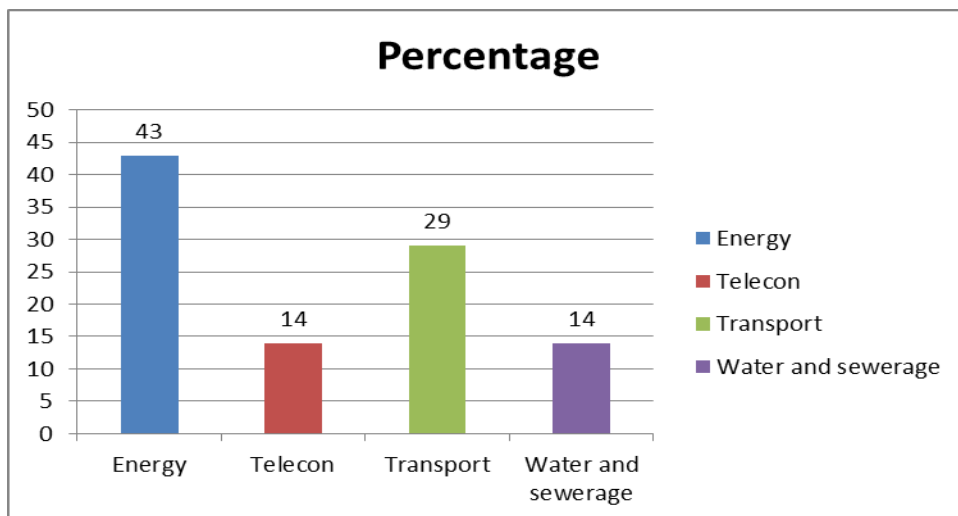
backs such as increase in prices, unemployment and corruption but results into better provision of the services. In PPPs BOOT model, the contracting authority shoulders part of the hazards attributed to the project with the private entity but it has the ultimate control of the project.

In their report titled poverty reduction strategy paper medium term plan (2008-2012) for Kenya vision 2030, World Bank (2010) notes that the Kenyan government is seeking to expand public private partnerships in order to raise more capital for the infrastructure projects. The terms of engagements amongst the private entities and the contracting authorities or the government bodies will be gilded by the public private partnerships policy. Some of the benefits that are expected from this arrangement include increased job opportunities and development of the infrastructure which will lead to the economic growth.

Patterns of PPP activity

In their study entitled “infrastructure PPPs in the developing world: lessons from recent experience”, Trebilcock and Rosenstock (2013) concludes that the role played PPPs in infrastructure development is minimal and it’s attributable to less than 20% of infrastructure projects in developing countries.

Graph 1: PPPs by sector, 1990-2011



Source: Trebilcock & Rosenstock (2013). Infrastructure PPPs in the developing world: Lessons from recent experience. The PPPs are predominant in transport and energy sectors.

According to Trebilcock & Rosenstock (2013), the highest number PPPs funded projects have been successful in developing nations with advanced economies such as China, Chile and Botswana accounting for 59% of those projects. The countries that have low middle income economies such as Morocco, Nigeria and India account for 37% of these projects. Low income developing economies like Bangladesh, Cambodia and Kenya account for a mere 4% of the PPPs projects.

Table 8: Kenya’s pipeline of PPP projects

Project title	Sector
Nyali Bridge, Mombasa	Transport/roads
Nairobi-Thika road (O&M)	Transport /Roads
Two sections of Mombasa – Nairobi-Malala road Mombasa – Mariakani,Naivasha-Mau Summit	Transport
Nairobi commuter Rail	Transport
Kisumu Sea Port	Transport/port
Nairobi Jomo Kenyatta Airport Expansion	Transport/port
2 nd Container Terminal Mombasa	Transport/port
Liquefied natural Gas Plant, Mombasa	Power
560 MW geothermal IPPs, Olkaria	Power
400 Geothermal IPPs, Menengai	Power
800 MW geothermal, Menengai	Power
Shared Government Services Platform (Land Automation)	Education
Housing for Security Forces	Accommodation
Karen Medical Centre	Health
Mombasa Conventional Centre	Tourist

Source: Public Private Partnerships in Kenya, Ministry of Finance 2007.

According to the MTP (2008-2012), the operationalization of the PPP policy will enable private entities to contribute in infrastructural projects and amenities tactically augmented by public segment involvements. The government targets to launch numerous concessions toll roads to be constructed through ventures private entities. The planned new highway connecting South Sudan, Lamu, Somali and Ethiopia, to Lamu port in Kenya will be designed and constructed at a cost ranging from Usd 15 billion to Usd 20 billion through a plan of Build, Own, Operate and Transfer (BOOT) (RoK 2007).

The second MTP (2013-2017) strives to comprehensively make effective the requirements of the PPP Act (2013) in order to boost private ventures in public projects. The PPP ventures by private entities such as, Build, Own Operate Transfer (BOOT) Concessions, Design and Build and Design Build Operate, will be made applicable for roads building and/repairs on Nairobi Bypasses and new highways comprising segments of Nairobi-Thika superhighway Mombasa – Nairobi – Malaba highway and Mau-Summit – Kisumu – Busia highway (RoK 2013).

1.2 Statement of the problem

The public roads system has been recognized as the main public infrastructural advantage in Sub-Saharan nations (Heggie & Vickers, 1998). For the countries in the Sub-Saharan region, the cost of the transport to the transporters and passengers is exorbitant due poor state of the road system which is an impediment to the prospective national economic growth. In Africa, 90 percent of people and 80 percent of the cargo is transported through the road transport making it the key means of transport (United Nations Economic Commission for Africa, 2009). By the year 2005, Africa had nearly 580,066 km of tarmacked road network which represented 22.7 percent of the total road network coverage in the continent (UNECA, 2009).

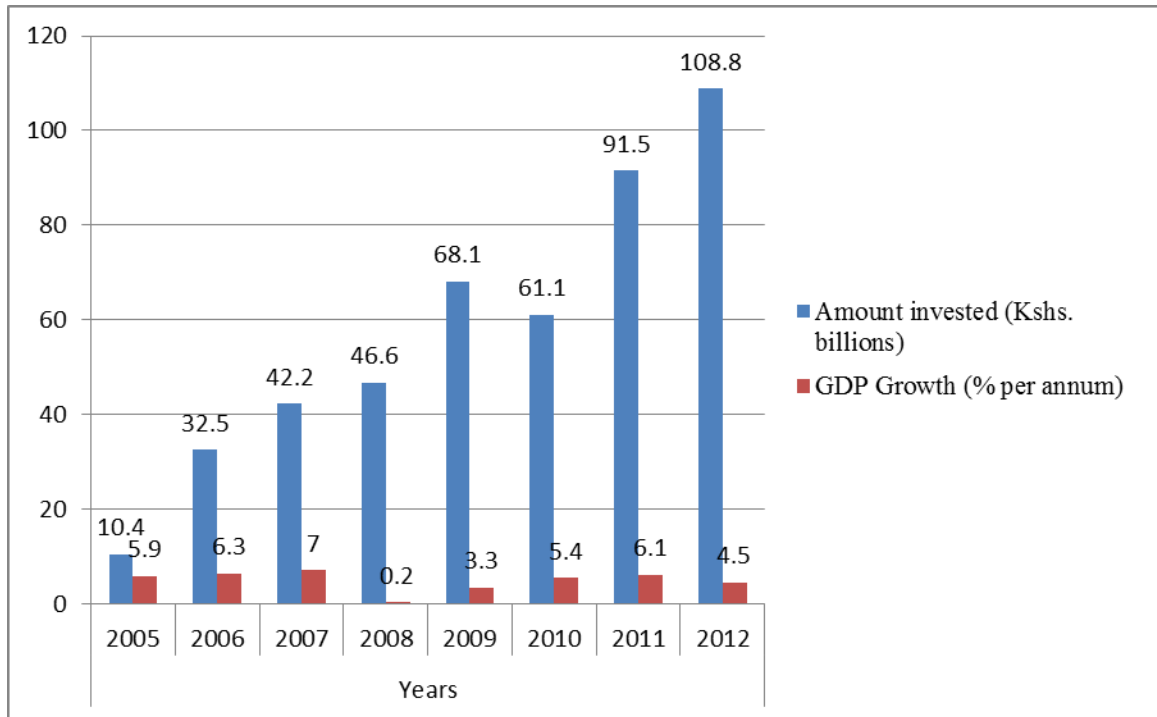
According to Wagenvoort et al. (2010), no nation has continuous swift development without increased high rates of investment in public infrastructure financing. Investment in road infrastructure impacts development in two key means, directly by influencing physical investment growth and indirectly by boosting production. At the microeconomic stage, investments in road infrastructure network augments private sector projects

through decreased cost of transport, gaining coverage to new markets , offering of innovative manufacturing and business prospects. The insufficient and dilapidated roads infrastructural network in Africa is a hindrance to the achievement of full development capacity continentally (World Bank, 1994). Consequently, the productivity of the firms in Africa is slackened by around 40 percent whereas the overall economic growth is impeded at around 2 percent (Foster & Briceno-Garmendia, 2010), Ramachandran, Gelb & Shah (2009).

The indicative infrastructural spending needs in Sub-Saharan Africa is about \$ 93 billion annually while two thirds of these funds is required for capital investments. The real amount that is spent is approximately \$ 45 billion annually and after taking into the account the wastages and administrative expenses, the amount that is channeled into productive use is nearly \$ 17 billion. The Africa's infrastructural financing shortfall is approximated to be \$31 billion annually which constitutes 12 percent of the continental GDP (Foster & Briceno-Garmendia, 2010). Government and development partners in Kenya spend about \$1.6 billion (Sh.134 billion) annually on infrastructure but it requires a sustained expenditure of \$4 billion (Sh336 billion) a year, which is about 20 percent of the Gross Domestic Product (GDP), during the next decade (World Bank, 2010).

Investment in roads infrastructure in Kenya has been on the increase. The recent trend is as indicated in the Graph 1.

Graph 2: Public expenditure on roads and GDP growth in Kenya



Source: Kenya National Bureau of Statistics, various statistical abstracts

NB: The real expenditure values includes operations and maintenance

This led to the question of how road infrastructure investment has impacted on the GDP growth in Kenya.

1.3 Research questions

1. What is the correlation between public spending on roads infrastructure and economic development in Kenya?
2. What is the relationship between private investment on roads infrastructure and economic growth in Kenya?
3. What are suggested policy measures that enable promote economic growth based on this research?

1.4 General objective

The key objective of this research paper was to analyze the impact of the investment in the road sector on economic growth in Kenya.

1.5 Objectives of the study

1. To examine the relationship between public expenditure on roads infrastructure and economic growth in Kenya.
2. To examine the correlation between private spending on roads infrastructure and economic growth in Kenya.
3. To suggest policy measures that can enable promote economic growth in the country derived from the observed results.

1.6 Significance of the study

Infrastructure development can provide key improvements in economic progress and lessening of poverty. In the Economic Recovery Strategy (ERS) spanning from 2003 to 2007, Kenya gained noteworthy advancement in managing macroeconomic instruments and in executing strategic governance, judicial and structural transformations. By the end of the ERS reforms in 2007, the Government launched the medium-term development blueprint, the National Vision 2030, whose main objective is attaining fast and steady economic development and reduction of poverty. Therefore the findings of this study support the Government of Kenya's Vision 2030 on the economic pillar (GoK 2008). The rapid rate of urbanization together with the persistent high overall population growth rate calls for investment in urban infrastructure to provide accommodations for a near doubling up of their population. The studies dealing on the role of private and public expenditure in road infrastructure and its impact economic development have not been extensively studied. The study also attempted to bridge the gap in this area by investigating and concluding that the two have positive impact on the economic growth.

1.7 Scope of the study

The research work covers only the Republic of Kenya. The study focused on the roads sector and government road agencies such as the Kenya Rural Roads Authority (KERRA), Kenya National Highway Authority (KENHA), Kenya Urban Roads Autho-

city (KURA), Ministry of Transport and Infrastructure, Kenya Roads Board (KRB) and Kenya Wildlife Services (KWS). The study also extended to macroeconomic policy makers such as the Treasury, Central Bank of Kenya (CBK) and Ministry of planning and national development. The study also looked into the old ways of financing the infrastructure whereby the government used to bear the burden of infrastructure expenditure solely. The government had the tendency of relying on taxes and government borrowings as the major source of infrastructure funds. Under the modern financing arrangements, the contribution of the entities in private sector to the share of infrastructure finance is on the rise through the Public Private Partnerships. Therefore, the paper has the scope on the joint role of the private and public sectors in roads infrastructure financing and its impact on the economic growth.

CHAPTER TWO

LITERATURE REVIEW

This section has interrogated the strands of the existing theoretical, analytical and empirical findings that explain the links between road infrastructure investment and the economic growth.

2.1 Theoretical literature review

This study is grounded on the production function method adopting the input-output approach. According to Berndt & Hansson (1992), the analysis of productivity effects can be carried out using either the cost or profit functions method. In his study on production and cost functions, Shepard (1953) concludes that the production, cost and profit function methods should yield the same results but the methodologies vary in their empirical application. The production function method treats inputs as given and the output as endogenous i.e. generated within the model. The cost function on the other hand, provides factor prices and output as exogenous while cost and input are assumed to be endogenous. The cost functions also assume that the factor markets are competitive and firms operate in cost minimizing manner producing a certain target of output. The production function is more suitable because it relies on less restrictive assumptions. The assumption that factor inputs are endogenously determined by cost minimization of firms in cost functions is unrealistic in consideration of the high level of aggregation over firms and industries.

The Cobb-Douglas production function ($Y = AL^\beta K^\alpha$) is the main universal formula in theoretic and practical study of productivity and growth (Adams & Felipe, 2005). In their study on theory of production: The Estimation of the Cobb-Douglas function , Adams and Felipe (2005) also found that the approximation of parameters of summative production functions is vital to several of modern research work on labour, technological changes, growth and productivity. Empirical estimations of aggregates production function is critical tool for study in macro-economics and theoretic concepts, such as demand for labour, technical changes and potential outputs, are all centred around those

estimations. In its most typical formula, production of a particular commodity with two inputs is annotated as;

$$Y = AL^{\beta}K^{\alpha}$$

where:

Y = output

L = labor input (labour force)

K = capital inputs (the real worth of all equipment's, building and the machineries)

A = total factors of productivity

β and α and are the elasticities for and labor and capital correspondingly. Those rates are coefficients defined by the existing technologies.

Cobb and Douglas were inspired by the geometric proof that applied to indicate that labour and capital components of entire output remained constant over a period of time in industrialized countries. They described this by statistical fit of least squares regression of their productions function (Gujarati & Sangeetha, 2007).

The Cobb-Douglas production function, in its stochastic form, may be expressed as:

$$Y = AK^{\alpha_1}L^{\alpha_2}e^u$$

Y= output

L= input (labour)

K= input (capital)

u = stochastic error term

e = base of natural logarithm

2.2 Analytical framework

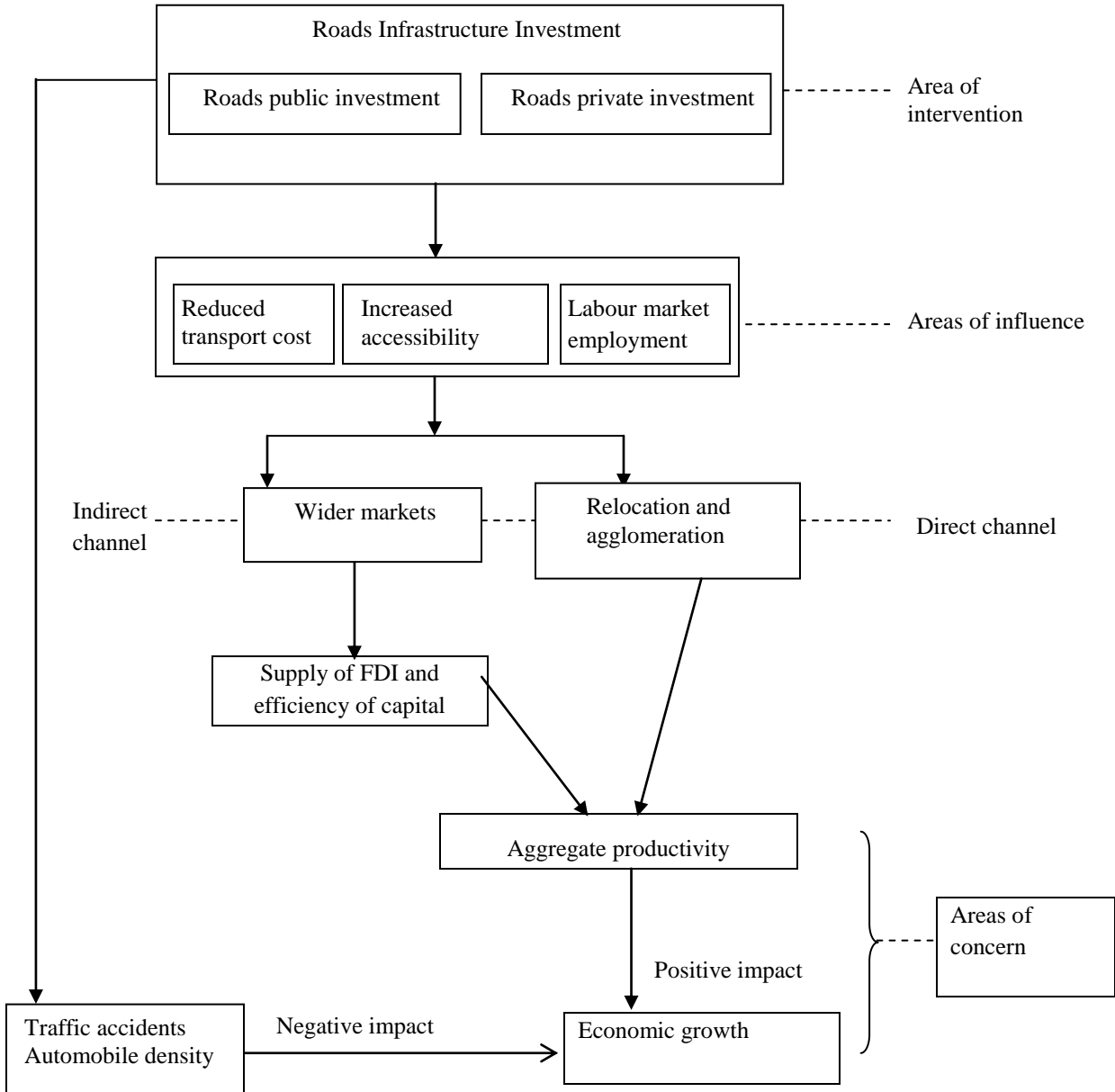
There are two primary benefits an economy can derive from an improved road transportation system. These two main benefits are reduced transportation cost and increased accessibility. From the above, transportation will impact economic growth “directly and indirectly”. The Cost Benefit Analysis (CBA) of transportation investment

are better road safety, low vehicle operating and maintenance cost and reduced travel time (OECD, 2002).

In his study on transport infrastructure and economic growth, Seetanah (2006) notes that the indirect impacts of infrastructure investment include increased productivity, higher direct foreign investments, increased private inwards, widespread markets, economies of scale alongside increased specialization in production. These are also referred to as “socio-economic spill-overs”.

Ali and Pernia (2003) in their study on infrastructure and poverty reduction observed that infrastructure investments impacts on poverty reduction directly and indirectly. Direct channel include income distribution through better job opportunities for the poor in non-agricultural industries. The indirect impact manifests itself through increased economic growth realised through increased productivity in non-agricultural and agricultural segments of the economy. Infrastructure has an effect of making tariffs lower, since it makes it probable to expand the market size, enhanced specialization resulting into economies of scale, greater and efficient labor market and increased competition (Prudhome, 2005).

Figure 2: The analytical framework showing the relationship between road infrastructure investment and its effects on economic growth



Source: Adapted from Ali & Pernia (2003).

2.3 Empirical literature review

In their study on infrastructure and economic growth in Sub-Saharan Africa, Calderon & Serven (2008) concluded that the extent in which infrastructure contributes to GDP varies across studies. According to Romp & de Haan (2007), the modern works lean towards

reduced impacts than those documented in the previous research. This variation is attributable to the enhanced procedural methods that also permit superior estimation of the causative correlation (Bottini et al. 2013). The projected elasticity of GDP in relation to infrastructural capital investment is about 0.15% in a production function setting for advanced nations (Bom & Ligthart, 2009). The implication of this is that if the infrastructure capital is doubled then the GDP increases by around 10%. This reflects merely the direct influence of infrastructural investment on GDP but there could be other indirect effects from variations in the application of the additional inputs that are paired to the infrastructure. Calderon & Serven (2008) also note that the impact of infrastructure on GDP could be higher due to presence of externalities which are associated with infrastructural services.

In their book on infrastructure and economic growth in Asia, Cockburn et al. (2013) concludes that there is a link between indirect and direct effects of road infrastructure to poverty reduction. In Indonesia, Kwon (2005) finds that the levels of poverty declined in that country as a result of accelerated economic development. Specifically there were increased job opportunities for the underprivileged which offered higher wages a result of road infrastructure investment. Kwon (2005) used the country's regional panel data ranging from 1976 to 1996. He analyzed the data by dividing regional trials in order to mark appraisal on the changes among the regions with the developed infrastructure and those with dilapidated infrastructure using the instrumental variable methodology (The developed infrastructure is categorized as areas with high road density and the dilapidated infrastructure is classified as regions where the road density is low and in bad condition). Kwon (2005) noted that road transport infrastructure investment contribute directly to poverty reduction in addition to its effect on economic development in each of the two provinces. Additionally, the study noted that road infrastructure investment has effect on reducing the level of poverty. The increase of infrastructure investment by 1% percent over the five year period leads to reduction of the level of poverty incidences by 0.3%. The job opportunities for the poor increased with better wages in the regions where the new roads had been constructed in Indonesia. The above observations led to a deduction

that investment on road infrastructure can directly lower the level of poverty and the extent of poverty prevalence (Bottini et al. 2013).

In his paper on physical capital and human connections in rural Vietnam, Van de Walle (2000) studied the economic effects of county side road infrastructure rehabilitation venture sponsored by the World Bank from 1997 to 2001. The World Bank had aimed to improve trade and stimulate economic growth by improving road infrastructure for the rural poor communities. Van de Walle (2000) concluded that the communities that region experienced better services and ease with access to markets in comparison to the areas that did not benefit from this project. The communities recorded increased employment in services sector and a shift of the labour force from the farming sector. The number of households depending on the farming as the basis of wages decreased whereas the share of those are dependent on the sector that is based on services got bigger. Moreover, Van de Walle (2000) confirmed that the widening of the market and trade was realized in the areas that had been exemplified by an initial poor market growth. This led to a conclusion that the benefits realized from road infrastructure development correlates to the level of income.

In their study on the impact rural infrastructure rehabilitation in Georgia, Lokshin & Yemtsov (2005) used data collected from households and communities. They used a "propensity score" harmonized disparity assessment method among project benefactors and a "control grouping". The research investigated the effects of improved roads and bridges transportation network in Georgia countryside from 1998 to 2001. They discovered that as a result of developing the roads and bridges network, small and medium firms were able to offer increased employment as a result of expansion of the trade. The importance of the barter trade also diminished. The major conclusion of their research work was that the development of road and bridge infrastructural network project had the varying benefits to the rich and poor. The rich were offered better accessibility to urgent medical services and also secured jobs in industries offering services which are non-agricultural in nature. On the other hand, the poor experienced an upsurge in the total number of women working in off-farm activities and also benefited from increase in trade resulting from the sales of agricultural products.

Khandker et al. (2009) analyzed the effect of investment in rural roads to poverty reduction in Bangladesh. They extended the concept that the effects of roads infrastructural investment on poverty reduction can vary with the household type. They evaluated the effects of multiple road infrastructural projects in that country, applying varying household results from the household level group statistics. The approach they applied is that of a predetermined outcome assessment method to manage the issue of "heterogeneity" amongst the communities and households. Their findings indicate that countryside roads infrastructure investment in Indonesia reduced the level of poverty through increased incomes resulting from higher prices of agricultural products, decreased input costs and lower cost of transportation. The earnings of the men working in agricultural sector went up by 27% in Rural Development Project communities and output from the agriculture activities increased by 30% to 38% (Cockburn et al. 2013).

In their report on economic growth, reduction of poverty and public spending in rural Uganda, Fan & Zhang (2008) analyzed the effect of road infrastructure investment on reducing poverty by assessing the secondary communal benefits from developing various categories of the road network. They discovered that the feeder roads in rural areas have the biggest effect lowering the level of poverty for Ugandans. Further, they noted that at least thirty three people escape poverty wherever an additional million shillings is channeled to construction of "feeder roads" in that country. Moreover, nine people are lifted out of the extreme poverty wherever an additional million shillings is channeled towards construction of murrum and tarmacked roads.

According to Fan et al. (2002), household wages increased by 9-13 Tanzanian shillings whenever one million shillings is invested in road infrastructure. Additionally, an investment of one million shillings in road infrastructure has an impact of lifting 27 people from poverty. The biggest impact in terms of poverty reduction is found in south highlands, the central and western areas of that country. In those regions, 60-75 people are lifted from poverty wherever a million shillings is invested in roads infrastructure. Their approach was based on estimation of marginal returns to public road infrastructure investment using household data.

The paper on infrastructure and economic growth in Sub-Sahara Africa by Calderon & Serven (2008) established that developing countries that can increase economic growth rates by two percentage points through reduction of their infrastructure gap by half. The reduction of this gap is expected to elevate the status of the infrastructure facilities to that of middle income countries. Moreover, if the countries in Sub-Saharan Africa increase their investments in infrastructure to attain the level of Mauritius or countries like South Korea, the resulting impact on economic growth could be 2.3 percent and 2.6 percent respectively.

By using domestic survey statistics in Tanzania, Rao, Nyange & Fan (2005) examined the influence of road infrastructure investments on poverty reduction and the variations in household's income. They concluded that there is a positive impact with a ratio of 1 to 9. Bakht, Khandker & Koolwal (2009) studied the effects of rural road development to poverty reduction in Bangladesh. They used household fixed approach to analyze the effects of two road projects on seven households. They concluded that the two new rural roads resulted to low transport costs and decreased prices for fertilizer inputs.

Walsh et al. (2011) noted that the various studies on effect of infrastructure investment to productivity, economic development and trade have deduced that there is a positive correlation. According to Roller & Waverman (2001), they examined over "21 OECD countries" and found a positive relationship among telecommunication infrastructure investment and economic progress in those countries. Additionally, Donaldson (2010) analyzed the Indian data ranging from 1870 to 1930 and concluded investment in rail and road infrastructure resulted into increased trade volumes, low cost of trade and increased "real income".

Zhu (2010) noted that an assessment of other related research on public infrastructure investment had concluded that there is positive impact on economic growth rate output. For instance, in their study on the effect of infrastructural investment to the long run economic development, Canning & Pedroni (2004) concluded that the impact of investment on paved roads on GDP per capita differs in many nations. They used the number of kilometers of paved roads as the surrogate indicator to study the effect of long

run infrastructural spending on GDP per capita income in a number of developing nations from 1950 to 1992. The approach was based on Barro (1990) growth model. Their findings suggested that there was over investment of infrastructure stock in some of the developing countries. Moreover, Duranton & Turner (2008) investigated the relationship between the major roads and their impact to the evolution of major cities in the United States of America from 1980 to 2000. They concluded that a 10 percent investment in infrastructure results to 2 percentage addition in employment opportunities and population growth and a minor reduction in the number of households living in poverty.

Overview of the literature review

The analysis of the effects of the infrastructural investment to the economic development is challenging. The literature reviewed has produced varying results due to the differing methodological approaches and instruments analyzed. Some of the studies reviewed indicate positive and robust impact on economic growth from increased infrastructure investment. On the other hand, other studies indicate insignificant effects. It is also apparent that most of the studies reviewed above concentrated on the assessment of the output results from public capital in generally. The uniqueness of this paper is that it has attempted to examine the impact of road sector to economic growth in Kenya by incorporating public and private capital.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Research design

The study has used a regression method and a descriptive approach. Descriptive study defines the condition of relationships as they subsist, with description of particulars and features with reference to a specific cluster or condition Kothari (2008) Tromp & Kombo (2006), Correlation study on the other hand involves quantitative analyses of the strength of relationships between two or more variables. Compared to other research plans, this fitted well for this paper and it assisted to analyze and describe the correlation between road infrastructure investment and economic development in Kenya.

3.2 Empirical model

The model was formulated by a logical structure using the formula of an elongated Cobb-Douglas production function and integrating the road transport variables. This approach was also used by (Gentanjali, Ranjau & Pravakar, 2010) (Zhu, 2009) (Yamaguchi, 2008), (Boopen, 2006), (Aschauer, 1989),

Barro (1990) analyzed the effects of infrastructure investment in the framework of a basic "AK" endogenous growth model".

$$Y=AK..... (1)$$

Where $A>0$ is the constant net marginal product of capital.

According to Barro (1990), the theory of constant returns turn out to be increasingly credible where capital is generally considered to include "nonhuman and human capital". Human investments consist of education, training and the everyday expenditure of "rising and having" families (Barro & Becker, 1988). The "human and nonhuman" assets essentially does not require to impeccable substitutes in the process of production. Consequently, production could display almost constant returns to scale if the two forms of capital are engaged collectively but "diminishing returns" if each input is considered independently (Barro, 1990).

Substituting equation (1) into Cobb-Douglas form yields;

$$Y = AK^{\alpha_1} L^{\alpha_2} \dots \dots \dots (2)$$

Barro (1990) presents government or public infrastructural spending as an augment of the production function, and is warranted by his interpretation that private inputs (K) are not near substitutes of government input. Public investment can be measured as an added input factor taking the features of public goods by being not excludable and nonrival. The building block of his method is a production function that integrates public services (an expenditure flows variable) as an input to private production.

Production is presumed to display constant returns to scale in relation to the private stock of capital and the flow of public services granted by the governments. According to Barro (1990), it is assumed theoretically that the government is not involved in production and possesses no capital; instead it purchases a flow of output (e.g. power lines, sewer lines and services of highways and others) from the entities in private sector. Those services are availed to the households and match up to the input G. Furthermore, Barro (1990) clarifies that it is the quantity of governmental procurement per capita that counts as little government amenities are essentially nonrival.

Introducing road expenditure as public spending defined as G yields;

$$Y_t = A_t K_t^{\alpha_1} L_t^{\alpha_2} G_t^{\alpha_3} \dots \dots \dots (3)$$

where:

Y_t = output

A_t = Total Factor Productivity (TFP)

K_t = private capital in millions

Private capital constitutes of funding by the corporate segments, Public-Private Partnerships (PPPs) and Private Non-PPP project finance (Wagenvoort et al. 2010).

Private investment (K) = total investment minus government investment.

The government finance comprises of taxes and borrowing whereas private finance constitutes loans, bonds, and equity according to Wagenvoort et al. (2010). The

segregation of public and private funding is hindered by the financial interpretation of corporations owned by the government accounting. Investments of by corporate bodies which are controlled by the government and are bankrolled to a tune 50 percentage or more by market deals are itemized in the state accounts as an investment by private corporates, thereby exaggerating component of private sector financing in infrastructure projects (Wagenvoort et al. 2010).

L_t = labour force in millions

G_t = public capital in millions

$\alpha_1, \alpha_2, \alpha_3$ are elasticities with respect to K_t, L_t and G_t

The linear equation after taking natural logarithm on the two sides of the equation is generated as below:

$$\ln Y_t = \ln A_t + \alpha_1 \ln K_t + \alpha_2 \ln L_t + \alpha_3 \ln G_t \dots \dots \dots (4)$$

The final empirical model to be predicted indicated below as:

$$\ln Y_t = \alpha_0 + \alpha_1 \ln K_t + \alpha_2 \ln L_t + \alpha_3 \ln G_t + \mu \dots \dots \dots (5)$$

where:

Y_t = output.

K_t = private capital invested in roads.

L_t = labour force.

G_t = public capital invested in roads.

μ represents the stochastic error term.

$\alpha_0, \alpha_1, \alpha_2$ and α_3 are the coefficients to be estimated.

3.3 Acquisition of data

The data was obtained from secondary sources which included: Central Bank of Kenya, Kenya National Bureau of Statistics, Statistical Abstracts, World Bank, International Monetary Fund (IMF) and the data base of the World Bank. The data covered the period from 1980 to 2014.

3.4 Data processing and analysis

Stata version 11 was used for data analysis.

The advantages for using the Stata were as follows:

- (i) Data was easily analysed and new variables were easily generated.
- (ii) Stata has statistical tools of standard univariate, bivariate and multivariate functions other functionalities include descriptive statistics, t-tests and regression.
- (iii) It produced high quality graphics in various forms.

Unit roots test

The Dickey–Fuller test was used to check the presence of unit roots in an autoregressive model. The test for Autocorrelation was carried out using the Augmented Dickey-Fuller test (ADF) and thereafter the test for null hypothesis (H_0) was effected (Dickey & Fuller, 1979).

Granger causality test

The main aim for this statistical test was to verify if a one time series model is suitable in prediction of a new model. That was carried out using the T-tests and F-tests.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

The section covers analysis of data and examination of the results. It gives the summary of descriptive statistics on GDP growth rate, public expenditure on road infrastructure, private investment on road infrastructure and labour force. In addition, the chapter covers the correlation matrix that gives the relationship among the variables, results of unit root tests so as to establish the order of integration for variables, test for heteroskedasticity and finally the regression results for the model.

4.1 Descriptive statistics

The findings of descriptive statistics are formulated in table 9 herein. This comprises of the mean values, minimum and maximum values, variance and standard deviation values, skewness and kurtosis values of the variables.

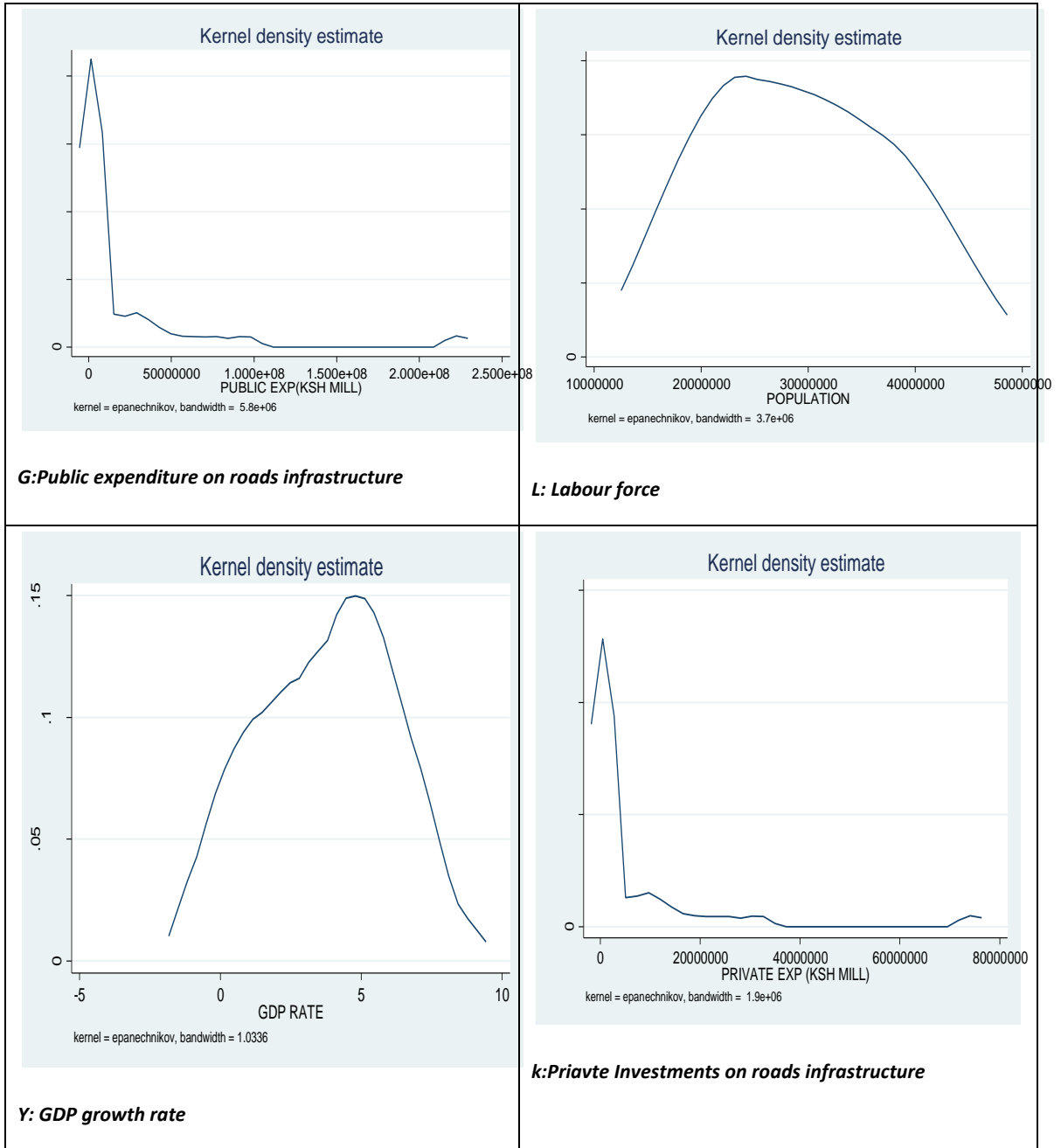
Table 9 : Descriptive statistics

	GDP Growth Rate	Public expenditure	Private Investment	Labour force
Mean	3.728646	1.81e+08	6006722	2.93e+07
Std. Dev.	2.338436	4.22e+07	1.41e+07	8435510
Minimum	-0.799494	321690	105730	1.63e+07
Maximum	7.402277	2.24e+08	7.45e+07	4.49e+07
Variance	5.468285	1.78e+15	1.98e+14	7.12e+13
Skewness	-0.123516	3.668996	3.667269	0.181075
Kurtosis	2.975809	17.46906	17.4552	1.903721
Observations	35	35	35	35

From the descriptive statistics of the model, it is ascertained that public expenditure on road infrastructure has the highest mean value of Kshs. 1.82 billion followed by annual labour force growth rate of 2.92million people. Private expenditure on road comes third. Additionally, the average growth rate for the period under review is 3.73 percent. On the

measures of dispersion as evidenced by standard deviation, public expenditure on road infrastructure has the largest dispersion from their mean value. Looking at the distribution parameters, it is noted that all the variables except gross domestic growth rate are positively skewed meaning that they are skewed to the right. On kurtosis values, it is noted that that all variables have non – normal distribution with only the GDP per capita having a near normal distribution given that its kurtosis values as close to 3.0. The graphical evidence on the distribution of variables is presented in graph 3 below. On the distribution the public expenditure on road infrastructure and the private investment in road infrastructure seem to have almost similar trends over time as revealed in graph 3.

Graph 3: Normality distribution of variables



4.2 Correlation analysis

To ascertain the correlation amongst the variables of the model, a correlation analysis was carried out to compute the correlation coefficient. The outcome of the correlation matrix is as outlined table 10.

Table 10: Correlation matrix

	GDP Growth Rate	Public expenditure	Private Investment	Labour force
GDP Growth Rate	1.0000			
Public expenditure	0.2671	1.0000		
Private Investment	0.1681	0.5999	1.0000	
Work force	0.2450	0.6478	0.6467	1.0000

From the results in Table 10 above, all variables have moderate positive correlation. As such this does not warrant for dropping of any variable from the regression model since the problem of multicollinearity problem upon regression of the empirical model is ruled out. From the results, public expenditure on road infrastructure is positively correlated to GDP growth rate. The private investment on road infrastructure and the labour force are also positively correlated.

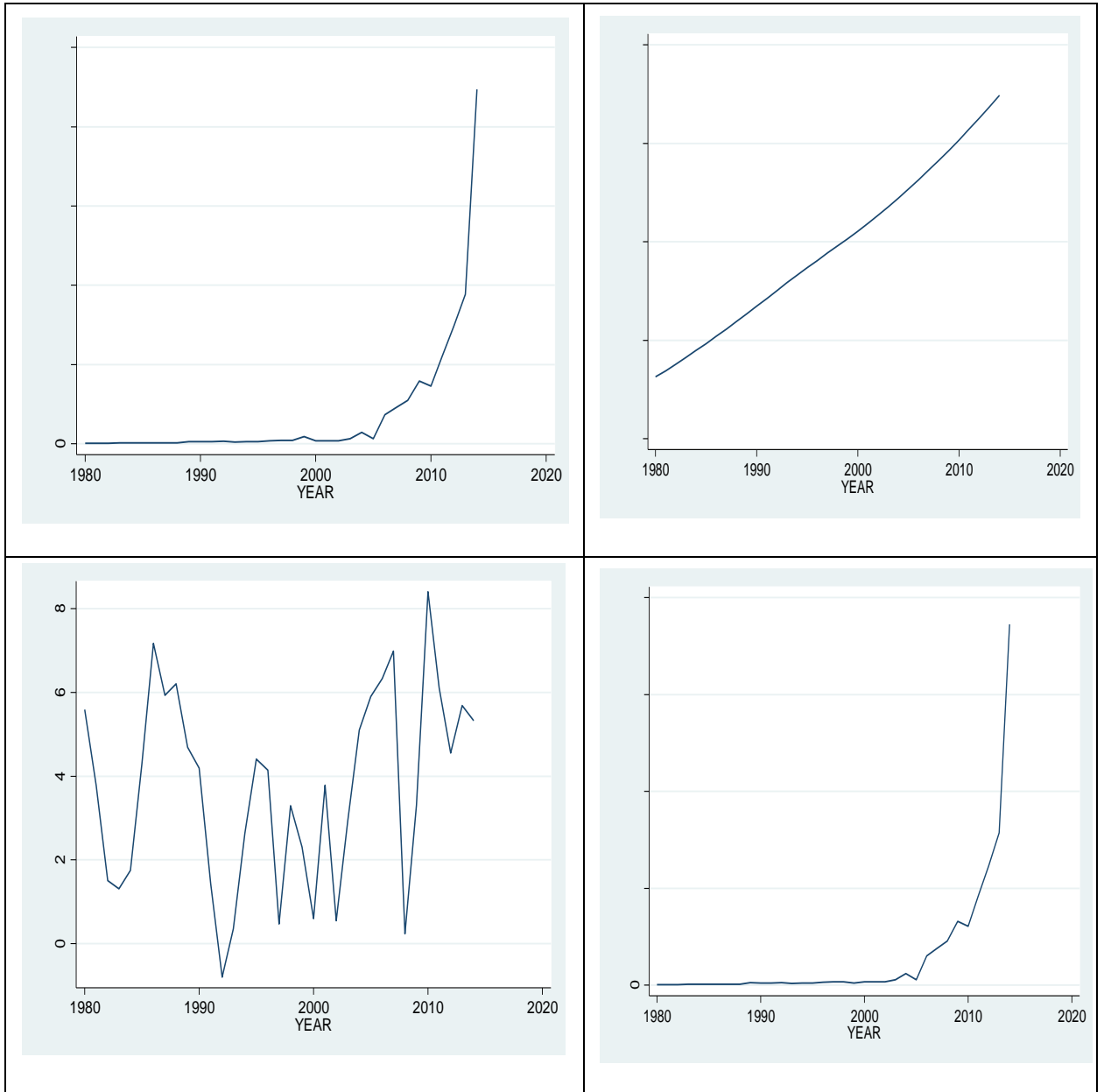
4.3 Pre- estimation tests

Unit Root test

This was fundamental in defining the order of integration between the variables prior to the estimation of the empirical model since the approximation of the empirical model without earlier knowledge on the order of integration of the variables would lead into spurious regression problem. In this case the Dickey – Fuller tests was applied in testing the presence or the absence of unit root among the variables. Prior to testing for the unit roots, the variables are plotted. The plot graphs point out that all the variables are non – stationary and have a trend. This therefore implies that when testing for the unit root, the

test is done taking into account the deterministic trend. The plot graph is given in graph 4 below.

Graph 4: Plot graphs of all variables



The findings of stationarity / unit root test for variables are as presented in table 11. From graph 4, It is observed that labour force variable has a deterministic trend while GDP

growth rate, public expenditure on road infrastructure and private investment on road infrastructure have random trends.

Table 11: Unit root test results

	t- statistics	At level			At First Difference			Order of Integration	
		Critical values			Critical values				
		1%	5%	10%	1%	5%	10%		
GDP Growth Rate	-3.662	-4.297	-3.564	-3.218	-6.304	-4.306	-3.568	-3.221	I(1)
Public expenditure	5.912	-4.297	-3.564	-3.218	-4.018	-4.306	-3.568	-3.221	I(1)
Private Investment	5.907	-4.297	-3.564	-3.218	-6.057	-4.306	-3.568	-3.221	I(1)
Labour force	7.279	-4.297	-3.564	-3.218	-5.591	-4.306	-3.568	-3.221	I(1)

From the observations in table 11 above, it is noted that at all significance levels, all the variables are non – stationary implying that they have unit roots. This is because, the t – statistics is higher than the critical values at all one percentage, five percentage and ten percentages significance levels. Therefore this called for the differencing of the variables. Upon differencing and thereafter testing for the unit root, it is noted that all the variables are now stationary implying that there is no unit root. This leads to the conclusion that the variables have one unit root meaning that they are integrated of order one.

Autocorrelation test

Given that the study deals with the time series data, this call for testing for autocorrelation among the variable in order to ensure that the estimators of the model are unbiased, linear and efficient. In this study two tests for autocorrelation are used to ensure robustness. These are the Durbin's alternative test for autocorrelation and Breusch-Godfrey LM test for autocorrelation

Table 12: Autocorrelation test results

Durbin's alternative test for autocorrelation		
Null hypothesis: no serial correlation		
chi2	df	Prob > chi2
4.826	1	0.2280
Breusch-Godfrey LM test for autocorrelation		
Null hypothesis: no serial correlation		
chi2	df	Prob > chi2
4.850	1	0.2276

From the results in table 12 above, it's evident that both test yields to the same conclusion with regard to presence of autocorrelation among the variables. For the Durbin's alternative test for autocorrelation the chi2 value is 4.826 with the corresponding probability of 22.80 percent. On the other hand, Breusch-Godfrey LM test yields a chi2 value of 4.850 with the corresponding probability of 22.76 percent. Since the probabilities of the chi2 are greater than the 5 percent significance level then the conclusion is that there is no serial correlation amongst the variables thus the null hypothesis is accepted.

Cointegration test

The Johansen test was used to check for Cointegration

Table 13: Johansen Cointegration test results

Cointegrating equation	Eigen value	Trace statistic	5% Critical value
0	.	68.7723	47.21
1	0.59136	39.2396	29.68
2	0.50423	16.0852	15.41
3	0.37423	0.6158*	3.76
4	0.01849		

Cointegrating equation	Eigen value	Max Eigen statistic	5% Critical value
0	.	29.5327	27.07
1	0.59136	23.1544	20.97
2	0.50423	15.4694	14.07
3	0.50423	0.6158	3.76
4	0.01849		

From table 13 above, the test reports both the trace statistics and the max Eigen statistic. Looking at the critical values at 5 percent significance level, it is noted that both the trace statistics and the max Eigen statistic conclude that there are three Cointegrating equations. This is because it is at the third Cointegrating equation where we have the

critical values being less than 5 percent since at the third Cointegrating equation the critical values are 3.76. Therefore implies that in the long run, all the variables move in the same direction. As such the estimated empirical model is the long run relationship model.

4.4 Regression analysis and hypothesis testing

Upon testing for the unit root among the variables, it is evident that all the variables have the same order of integration. This means that whether estimation of the model is done using variables at their level point or after first difference yields unbiased estimators and no spurious regression since all the variables have the same order of integration. Upon estimating the empirical model, the outcomes of the estimated model are reported on table 14 below.

Table 14: Regression results

	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
Public expenditure	4.46807	1.70537	2.62	0.014	7.94e-07	-9.88e-08
Private Investment	1.37506	0.49821	2.76	0.010	3.57e-07	2.38e-06
labour force	3.87508	6.35259	0.61	0.544	8.98e-08	1.67e-07
Constant	2.476745	1.723266	1.4	0.161	1.037879	5.991369

Number of obs	= 35	R-squared	= 0.6901
F(3, 31)	= 9.93	Root MSE	= 2.3361
Prob > F	= 0.0001		

The total sample size was 35 meaning that we are dealing with the z – statistics. From the empirical model specified in the methodology, the regression is on the GDP growth rate, public expenditure on road infrastructure, private investment on road infrastructure and population labour force. From the results looking at the p –values of all the variables, it can be deduced that public expenditure on road infrastructure and the private investment in road infrastructure positively and significantly impact on the overall annual GDP growth rate at 5 percent significance level. This is because their respective p – values are less than 5 percentage significance level. For the public expenditure on road

infrastructure the p- value 1.4 percent while for the private investment in road infrastructure the p – value is 1.0 percent. However, for the labour force its insignificant since its p – value is 54.4 percent which is greater than 1%, 5% and 10% significance levels.

In regard to the interpretations, it is noted that a one billion shilling expenditure on road infrastructure by the government increases GDP per capital by 4.5 percent holding other factors constant. Therefore, public investment in road infrastructure shocks economic growth positively. For the private investment in the road infrastructure, it is noted that a one billion shilling expenditure on road infrastructure increases GDP per capita by 1.4 percent *ceteris paribus*.

Looking at the joint test statistics we find that the F – statistics is equal to 9.93 with a p– value of 0.0001. This means that public expenditure on road infrastructure, private investment on road infrastructure and labour force all jointly determine economic growth rate. The coefficient of determination is equal to 69.01 percent implying that 69.01 percent of total changes in economic growth are accounted for by changes public expenditure on road infrastructure, private investment on infrastructure and labour force within the model with only 30.99 percent of total changes in economic growth being determined by the factors outside the model.

4.5 Heteroskedasticity test on residuals / Serial correlation test of residuals

Upon running the regression, the test for the presence of the serial correlation in the residuals of the model is done. This is core in determining whether the estimated model best fits the data. In this study the Breusch-Pagan test for serial correlation was used. The findings of the heteroskedasticity are displayed below in table 15.

Table 15: Testing for heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for Serial correlation for Residuals

Null hypothesis: Constant variance

chi2	df	Prob > chi2
0.04	1	0.8479

The test was applied using all the explanatory variables. This test is a chi – square test with a value of 0.04. In order to decide if to accept or reject the null hypothesis, p – value of the Chi – square is checked. Since the p value is greater than 0.05 the null hypothesis is accepted. In this case the probability value of the chi2 is 84.79 percent which is greater than 5 percent significance level. In other words, there is no heteroskedasticity implying that there is homoscedasticity among the residuals. This implies that the variance of the model residuals is constant across the residuals.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The study analyzed the role of private and public sectors in roads infrastructure financing in Kenya and its impact on the economic growth. The study reviewed the period from 1980 – 2014 using annual time series data. The study was motivated by the fact that proper road transportation systems are the key pillars for the developed economies. Investment in infrastructure determines the cost of production creates job opportunities and leads to increased trade volumes. This in return leads to increased economic development and reduction in the the levels of poverty. Further, the Kenyan economy has performed poorly since 1970s due to poor management, poor governance and non-adherence to the economic policies leading to poor standards of living, low economic growth, unemployment, high levels of crime and dilapidated infrastructure. Kenya is facing large infrastructure investment shortfalls which require to be addressed in order to achieve Vision 2030 and attain the sustainable development goals. According to the World Bank (2010) report, Kenya spends about \$1.6 billion (Sh134 billion) annually on infrastructure but it needs a sustained expenditure of \$4 billion (Sh336 billion) per year, which is about 20 per cent of the Gross Domestic Product, over the next decade. The need for additional infrastructure is further necessitated by the rising population which is growing at an average rate of 3% per annum and rapid urbanization. The level of infrastructure development determines the level of a country's economic growth by influencing the level of trade, production, poverty reduction, environmental sustainability and management of population growth.

5.2 Summary of findings

From the data analysis, the study found out that a one billion shilling expenditure on road infrastructure by the government, increases GDP growth by 4.5 percent holding other factors constant. Therefore public spending in road infrastructural development shocks economic growth positively. For the private investment in the road infrastructure, it is

noted that a one billion shilling expenditure on road infrastructure increases GDP growth by 1.4 percent *ceteris paribus*.

Looking at the joint test statistics we find that the F – statistics is equal to 9.93 with a p – value of 0.0001. This means that all the factors are jointly significant in explaining investment implying that public expenditure on road infrastructure, private investment on infrastructure and labour force all jointly determine economic growth rate. The coefficient of determination is equal to 69.01 percent implying that 69.01 percent of total change in economic growth is accounted for by changes public expenditure on road infrastructure, private investment on roads infrastructure and population labour force within the model with only 30.99 percent of total changes in economic growth being determined by the factors outside the model.

5.3 Conclusion

From the data analysis, it is evident that economic growth in Kenya is highly responsive to the government expenditure on the road infrastructure. This is evidenced by the fact that one shilling expenditure on road infrastructure by the government, increases GDP growth by 4.5 percent holding other factors constant. This therefore justifies the importance of road infrastructure as pointed out in the country's economic development blue print vision 2030 on physical infrastructure as well as the World Bank report. These findings therefore confirm the current ambitious plan by the government to build more physical economic infrastructure especially road infrastructure by increasing total number of tarmacked roads is founded on the belief that increased road connectivity has a positive multiplier on the overall economic development. Moreover, it is noteworthy that these efforts are not only geared towards construction of international trunk roads but also national, urban and the rural roads in efforts of increasing connectivity.

In addition, the private investment on road infrastructure was deduced to positively and significantly impact on the GDP growth rate. This is evidenced by the fact that one billion shilling expenditure on road infrastructure increases GDP per capita by 1.4 percent *ceteris paribus*. This emphasizes on the significance of the private sector entities

in investing in transformation of the road infrastructure. This proves the importance of private sector ventures through Public – Private – Partnership in the road projects.

5.4 Policy recommendation

From the results of the model, several crucial policy recommendations can be drawn. First is the importance to loop in the private sector financing of the road infrastructure in Kenya. This could be through a more sensitization of the PPP programme that has now a legal framework following the enactment of PPP act 2013. The government can leverage on this to mobilize more financial resources from the private sector which will be more cost effective thus avoiding high costs of loans that come from borrowing from the international lenders such as development financial institutions. By bringing the private sector on board, this will help bridge the huge infrastructural financing gap that the public sector faces in providing the public utilities such as roads.

In addition the annuity financing aspect in road infrastructure should be fast tracked by the state with the aim of realizing the dream of 10,000 kilometers of tarmacked roads by the government. Given that annuity financing calls for the participation of the private sector mainly through the banks from the onset of the project hence enhancing the timely completion of the project. In addition it fosters efficiency given that all the private stakeholders involved in the project are enjoined together as a consortium.

5.5 Limitations of the study

The data from secondary sources had limitations caused by discrepancies in data collection, definition of terms and statistical methods. Since the data is not clearly categorized in the national accounts data, the investments in the activity sectors were considered for the purpose of this study. The limited cases involving PPPs in the Kenyan roads sector also impeded on the data collection from secondary sources. Time was also a constraint because I had to balance between office work and working on this project during odd hours.

5.6 Suggestions for future research

This paper provides input to the understanding of the role of private and public sectors to roads infrastructure financing in Kenya and its impact to economic growth. The paper provides a tool to enable stakeholders to examine modern ways of infrastructure financing by bringing the private sector on board. The study has only concentrated on roads whereas there are many other forms of infrastructure such as railway line and air transport. The Government of Kenya has invested over 300 billion Kenya shillings in construction of the standard gauge railway. The main aim is to decongest our roads and increase efficiency on the cargo transit. Road transport is also facing increased cases of traffic accidents which result into fatalities and wanton destruction of property. Despite the establishment of the National Transport and Safety Authority (NTSA), the problem has not been contained. County governments are also adopting new low cost road building technology to help counties improve infrastructure. The technology known as probase and which has been adopted from Malaysia is currently being used by the Meru County Government. Other country governors have visited Meru County and have given an indication that they will adopt probase technology in their counties. Therefore, I suggest the following topics for future research:

1. Road safety in Kenya: Economic and social impact of road traffic accidents.
2. Impact of the standard gauge railway project on the Kenyan economy.
3. The impact of probase technology on roads infrastructure development in Kenya: A case study of Meru County.

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