Direct RESEARCH JOURNALS
Direct Research Journal of Social Science and Educational Studies
Vol. 6 (6), pp. 78-89, July 2019
ISSN 2449-0806
DOI: https://doi.org/10.5281/zenodo.3333830
Article Number: DRJSSES278337086
Copyright © 2019
Author(s) retain the copyright of this article
https://directresearchpublisher.org/drjsses/

Full Length Research Paper

The Contribution of Road Infrastructure and Maintenance to Economic Growth in Burundi

Jean Bosco Nsabumuremyi* and Emmanuel Kwizera

School of Business Administration, International Leadership University-Burundi.
Corresponding author E-mail: bosco_nsabumuremyi@yahoo.com

Received 12 June 2019; Accepted 8 July, 2019

The study evaluated how road infrastructure and maintenance influence growth in Burundi with a view of developing consumer spending, investment, imports vs exports, and government expenditure. This research employed descriptive and cross-sectional design and adopted mixed research approach where both qualitative and quantitative were combined. Self-administered questionnaires and interview guides were used to collect data from a sample size of 230 delivered from a study population of 540 using Slovin's (1960) formula. Simple random sampling and stratified sampling were used to select sample. From the findings, a significant positive relationship between Road infrastructure and Economic growth was found (r = 0.638, P-value<0.01). It indicated also a significant positive relationship between Maintenance and Economic growth (r = 0.609, P-value<0.01). The study variables explained 61% of the variance of Economic growth (R Square =.610). The most influential predictor of Economic growth was Road infrastructure (β=0.406, Sig 0.700) followed by Maintenance (β=0.100, Sig 0.734) which is less likely to influence Economic growth since it portrays a low value with a significance in the model. The study recommends that Road infrastructure development assigned to the Road Agency should map out areas with urgent need for roads while assessing the economic potential, that the Ministry of Public works should develop a road construction policy focusing on the standards and guidelines for new road construction.

Keywords: Road, road infrastructure, maintenance, and economic growth

INTRODUCTION

There has been a renewed concern with infrastructure by policy makers in both developed and developing countries which can be traced back to the mid-1980s. From the mid-1980s to mid-1990s a number of countries had undertaken the structural adjustment reforms sponsored by the IMF and the World Bank (Dailekh, 2011). As a consequence this led to the reduced dominance of public sector provision of infrastructure as a result of the increasing pressures of fiscal adjustment and consolidation. In many developed countries there was an increased pace of opening up of infrastructure industries to private participation as reflected in widespread privatization of public utilities and multiplication of concession and other form of public-private partnerships. However, in less developed countries this has been slow especially in many African countries; hence infrastructure development continues to lag behind (Raballand, 2003).

Infrastructure is the fundamental facilities and systems serving a country, city, or other area, including the services and facilities necessary for its economy to function thus road infrastructure is an open way, usually surfaced with tarmac or concrete, providing passage from one place to another (Kyobe, 2014). According to the Road Agency (2018), Burundi has over 11,000 Km divided in two categories: (i) the classified network

managed by the Road Agency and (ii) the unclassified network of over 60,000Km. The actual network that is interesting this study is the classified network. It is approximately 5,211 km made by 1,945 of National Roads; 2,522 of Provincial Roads, 282 of Communal Roads and 462 Urban Network. 3,625 km are unpaved whereas 1,586 kilometers are paved (Mugisha, 2016). These are contributing to connect area to another and the country to the neighboring countries and regions towards Burundi transport corridors namely Northern corridor: Mombasa-Kampala-Kigali-Bujumbura; Central corridor: Dar-es-Salaam-Isaka-Bujumbura; Southern corridor: Mpulungu-Kigoma-Bujumbura. The last one is not related to the road infrastructure since it is a maritime transport. However, that entire network is not regularly maintained because of lack of funds and the southern corridor is not well exploited. The current study therefore seeks to investigate the contribution of road infrastructure and maintenance in influencing the growth of the Burundian economy and to establish direction of causality if any.

Road infrastructure development is measured in aspects of coverage, usability, quality and connectivity (Ntanda, 2010). Maintenance refers to the activities required or undertaken to conserve as nearly, and as long as possible the original condition of an asset or resource while compensating for normal wear and tear. Maintenance of roads is undertaken to ensure the safety of traffic and to sustain the service ability and appearance of the road (Rostock, 2015). Thus, Economic growth is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. Economic growth is measured majorly by GDP which considers Consumer spending, Investment, Export Vs Imports and Government expenditure (Rafferty, 2013). In this study, particularly GDP was considered as a major indicator to justify the economic growth.

Given the significance of the sector in economic terms, both the level of transport investment together with the amount of expenditure on transport operations can have wider effects on the economy (Mugisha, 2016). However, in Burundi, the road infrastructure system is largely Government-funded, in the sense that the majority of the costs of system investment, operations and maintenance are paid directly by the Government while the other partial payment arrangement are paid by the road users.

On just about any measure of infrastructure coverage: road density, telephone density, power generation capacity, or service coverage, Burundi lags behind most other regional groupings in the world. Burundi also lags behind other EAC member countries in access to basic infrastructure services. About 90 percent of the population lives in rural areas. Despite the importance of agriculture, only a relatively small portion of the rural population has access to all-season roads. The road densities in areas of arable land are substantially lower in Burundi. According to the World Bank (2010), only 6.5 percent of the population in Burundi has access to electricity, compared with 16 percent for Sub-Sahara Africa and 41 percent for other low income developing countries. Burundi is also lagging in mainline and mobile telephone densities, as well as internet access. Tele-density remains poor at three percent of the population, with more than 90 percent of subscribers concentrated in urban areas. Access to safe water and sanitation in Burundi is roughly comparable to other low income countries.

Not only is access to infrastructure services limited, but the poor state of infrastructure leads to substantially higher costs. Prices for services can be two to three times than that of other countries, further undermining the competitiveness of Burundi business in regional and global markets. The cost and inadequacy of these services affects commercial opportunities for small farmers, entrepreneurs, and businesses - small and large. Business surveys in Burundi consistently identify the poor road network and the poor reliability of the service as the single most important obstacle to increased business investment. Road infrastructure development is measured in aspects of coverage, usability, quality and connectivity (Ntanda, 2010)

The contributions from private investors for the power program, civil aviation and, if it proceeds, the rail extension in Burundi, are predicated on the assumption that it will be possible to form public-private partnerships for each of these operations using BOT, BOOT or some comparable privatization techniques. A total of $1.4 billion of private funding would be needed for PPPs in these three sectors. This excludes the approximate $670 million that might be required for a rail link to the mines; it is assumed that the mining companies would fund and construct these spurs, if they were to go ahead. The bulk of the private funding for these programs is required in the first decade. These PPP-type arrangements typically involve substantial amounts of debt financing by the private sectors. Maintenance is measured in four dimensions including stakeholders, costs, policies and standards (Rostock, 2015).That infrastructure matters to growth is now relatively well recognized and widely understood among practitioners and policy makers. There is, indeed, a plethora of anecdotal and more technical evidence that better quantity and quality of infrastructure can directly raise the productivity of human and physical capital and hence growth (e.g. by providing access, roads can: (i) improve education and markets for farmers' outputs and others by cutting costs, (ii) facilitate private investment, (iii) improve jobs and income levels for many). While there is a reasonable agreement on how much infrastructure matters to growth, there is much less convergence on which infrastructure subsector matters the most under which circumstance. This can be seen in the differences in estimates of investment needs across regions and within regions. The challenge is thus to sort the drivers of these differences.

Various scholars found the relationship between road

infrastructure and economic growth. The findings of Ashipala and Haimbodi, (2003) showed that good transport linkages reduce transport costs, road congestion and promote industrial development throughout the country. It implies that the better the infrastructures are, the more successful the economic development policies. According to World Bank (1994), poor infrastructure facilities, especially in transport, communications and information technologies, are one of the major impediments for investment and growth in many African countries.

Aschauer, (1989) also found out a strong significant positive relationship between public investments in infrastructure and economic growth for the United States for the period 1949–1985. A later study by Aschauer, (2000) found that the stock of public infrastructure capital is a significant determinant of aggregate total factor of productivity and that investments in public sector not only improve quality of life but also increase economic growth and returns for private investments. Seethepalli et al. (2008) found that road infrastructures promote growth in East Asia. The study of Montolio and Solé-Ollé, (2009) shows the similar results in the Spanish economy and point out that productive public investment in road infrastructure positively affected relative provincial productivity performance in Spain.

The findings of the study conducted by Gould *et al.* (2013) showed that inadequate investment in highway maintenance results in deteriorating road conditions, which can increase costs for users and society. According to them, vehicles consume more fuel when travelling on poorly maintained roads and diversions because of failed infrastructure or emergency repair works because additional travel time costs. There may also be wider costs to society associated with poorer environmental management, safety and security controls, and even accessibility if parts of the network have to be permanently closed or restricted for travel. Delays to maintenance now can also lead to increased costs of maintenance later, when more significant interventions may be required.

Then, the performance of road maintenance systems can be assessed by a number of important indicators such as cost, safety, environmental impact, and level of complaints by users. A review of practice reveals that insufficient level of expenditure or poor management of the road network often has serious consequences for the economic and social life of a country in terms of vehicle operating costs, travel time costs, accident costs and environmental impact (Salih *et al*., 2016). Infrastructure could depend on the development stage of the countries covered by the sample analyzed, time period over which the impact is assessed, and the type of infrastructure. According to Garsous, (2012), there is evidence supporting the existence of a link between Road infrastructure, Maintenance and Economic growth of any country. There is enough literature on the relationship between road infrastructure and economic growth, maintenance and economic growth. However, most of those studies done have been in various sector and the researcher did not come across one study done on road infrastructure and economic growth in Burundi. Therefore, it is important to conduct such studies within the Burundian context to assess the kind of relationship that exists between those study variables. So, it will be the contribution of researcher's work.

METHODOLOGY

This study applied descriptive and cross-sectional research design and used mixed research approach in order to gather data from respondents. The study population consisted of Ministry of Public work's Administrators, Technical staff and some identified road users of the association of the transporters of Burundi. Simple random sampling was used to obtain a good representative sample of the area population of the Ministry administrators and Technical staff while stratified sampling was used to select road users. The sample size of 230 was computed from the study population of 540.

This study used survey and interview as data collection techniques while self-administered questionnaire was used as instrument to collect quantitative data and interview guide was used as instrument to collect qualitative data. In this study, both primary and secondary data were used. Statistical package for the social sciences (SPSS) version 20.0 was used to process and summarize information got from the questionnaire.

The data was sorted, coded, and fed into the SPSS to generate various results. The data was analyzed for descriptive statistics, that is, frequencies, percentages, mean and standard deviation. The data was then presented using Spearman's correlation, factors loadings, ANOVA (Analysis of Variance) and regression statistical techniques as extracted while multiple regression analysis was used to test the potential predictors of the dependent variables.

The qualitative data collected through interviews were analyzed manually. The data was then categorized, cleaned, interpreted and analyzed under their respective themes.

The items/questions selected for the study were deemed relevant to the study variables since all content validity indices for all experts and Alpha coefficients were above e 0.7 (Table 1) (Kankiriho, 2014).

RESULTS AND DISCUSSION

This section presents the respondents' view on whether road infrastructure and maintenance have a contribution on economic growth in Burundi.

Table 1. Validity and reliability of the instrument.

Variables	Anchor	Cronbach Alpha Coefficient	CVR (Content Validity Ratio)
Road infrastructure	5 points	0.8320	0.8146
Maintenance	5 points	0.8188	0.7963
Economic growth	5 points	0.8008	0.7591

Source: Primary data, 2018.

Relationship between study variables

Spearman correlation coefficient was used to determine the degree of relationship between the study variables as shown in the (Table 2).

Table 2. Spearman's zero order correlation matrixes.

	1	2	3
Road infrastructure (1)	1.000		
Maintenance (2)	0.331**	1.000	
Economic growth (3)	0.638**	0.609**	1.000

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

Road infrastructure and economic growth

Table 2 shows a positive relationship between Road infrastructure and Economic growth (r = 0.638, P-value<0.01) which implies that road infrastructure highly determines economic growth. The results in (Table 2) are in agreement with (Ntanda, 2010; Mugisha, 2016; and World Bank, 2010).

Road maintenance and economic growth

Table 2 shows also a positive relationship between Maintenance and Economic growth (r = 0.609, P-value<0.01) which implies that maintenance determines economic growth. The results in (Table 2) is in agreement with (Garsous, 2012; Rostock, 2015)

Regression analysis

Regression analysis was used to examine the road infrastructure, maintenance and economic growth. Table 3 shows the regression model for road infrastructure, maintenance, and economic growth.

Table 3 shows that (R= 0.707) in a combination of road infrastructure and maintenance in assessing the level to which they can predict economic growth in Burundi. These variables explained 61% of the variance of economic growth (R^2=0.610). The most influential predictor of economic growth was road infrastructure (β = 0.406, Sig. 0.700) followed by maintenance (β = 0.100, Sig 0.734) which is less likely to influence economic growth since it portrays a low value with a significance in the model.

The factor loadings of road infrastructure, maintenance and economic growth in Burundi

This research used factor loading in order to check how much a variable loads into its corresponding factor. The value of each item in factor loading should be at least 0.50 into its relative principal component. The result in (Table 4) shows the factor analysis results of road infrastructure variables, four factors were extracted, component one (coverage) explained 37.2%, followed by usability with 29.5%, then quality with 22.1% and lastly connectivity with 11.2% which least explained road infrastructure. The result in (Table 5) shows the factor analysis results of maintenance variables, four factors were extracted, component one (stakeholders) explained 40.7%, followed by costs with 29.6%, then policies with 15.5% and the last (standards) with 14.1% of the variance of maintenance. The result in (Table 6) shows the factor analysis results of economic growth variables, four factors were extracted, component one (consumer spending) explained 41.3%, followed by Investment with 28.5%, then imports Vs. exports with 19.2% and the last (government expenditure) with 11% of the variance of economic growth.

Analysis of variance

This research used analysis of variance in order to check for variations amongst groups/ categories of respondents' opinions. The Sigma value of each item in analysis of variance should be between 0.1 and 1.0 in its relative principal group for it to be deemed of significance (Negative or positive).

The result in (Table 7) indicates a statistically significant difference between Gender groups and how likely Road infrastructure would influence Economic growth as evidenced by the result (0.265); Age group of the respondents had a statistical significant difference on how likely Road infrastructure would influence economic growth at values (0.486). It also indicates a statistically significant difference between levels of education of the respondents and how likely Road infrastructure would influence Economic growth as evidenced by the result

Table 3. Regression model for road infrastructure, maintenance and economic growth.

Model	Un-standardized coefficients		Standardized coefficients		
	B	Std. Error	Beta	t	Sig.
Constant	-13.469	118.623		-0.114	0.913
Road infrastructure	0.632	0.504	0.406	1.191	0.700
Maintenance	0.200	0.493	0.100	0.212	0.734

$R = 0.707$, $R^2 = 0.610$, Adjusted $R^2 = 0.568$, $F = 2.766$, Sig = 0.054
[a]Dependent variable: Economic growth where is a, R, and R^2 in the table and what does B and F stand for?

Table 4. Factor analysis of road infrastructure.

Variables	Coverage	Usability	Quality	Connectivity
The Ministry through the Road Agency and the National Road Fund tries to ensure wide coverage of roads	0.938			
Roads reach every part of the Country	0.913			
Wide coverage of roads is an important asset for Citizens	0.890			
The existing roads are beneficial for human and goods transport		0.916		
The Ministry focuses on usability of existing roads		0.893		
Good passable roads facilitate trade and industry		0.860		
The existing roads are of high quality			0.903	
Good quality road networks facilitate economic growth			0.881	
The Ministry demands high quality roads from all constructors			0.854	
Road connectivity facilitates business development				0.861
Connectivity is crucial for a fully operational road infrastructure				0.837
Transport majorly relies on physical connectivity of places through road networks				0.822
Eigen Value	1.687	1.141	0.885	0.332
Variance %	37.163	29.535	22.120	11.182
Cumulative	37.163	66.698	88.818	100

Source: primary data computed.

(0.504). Lastly, it indicates a statistically significant difference between Working experience intervals of the respondents how likely Road infrastructure would influence Economic growth at values (0.372). The result in (Table 8) indicates a statistically significant difference between Gender groups and how likely maintenance would influence economic growth as evidenced by the result (0.354); Age Group of the respondents had a statistical significant difference on how likely maintenance would influence economic growth at values (0.170). It also indicates a statistically significant difference between Levels of education of the respondents on how likely maintenance would influence economic growth as evidenced by the result (0.498). Lastly, it indicates a statistically significant difference between working experience intervals of the respondents how likely Maintenance would influence economic growth at values (0.403). The result in (Table 9) indicates a statistically significant difference between Gender groups and how likely they would influence Economic growth as evidenced by the result (0.518); Age Group of the respondents had a statistical significant difference of (0.433). It further indicates a statistically significant difference between Levels of education of the respondents how likely they would influence Economic growth as evidenced by the result (0.573). Lastly, it indicates a statistically significant difference between Working experience intervals of the respondents how likely they would influence Economic growth at values (0.352).

Qualitative findings

Asked what strategies are put in place to ensure that there is full coverage of the road network, responses included various strategies but key of all were; "*data collection for road network, ensuring the proper planning of roads to be built and rehabilitated as well as capacity building for road safety actors*."

Regarding what the Ministry of public works has done to ensure that the existing roads are usable and in perfect shape, an official responded that "*We usually take the right steps to validate the annual program of road maintenance*" *through the board meeting. It is also endorsed by the ministry level before implementation."*

Table 5. Factor analysis of maintenance.

Variables	Stakeholders	Costs	Policies	Standards
Road maintenance is easier if key stakeholders are involved	0.924			
Stakeholders like the Citizens are willing to engage in road maintenance	0.900			
The Ministry freely shares road maintenance information with other stakeholders	0.877			
Roads are maintained through cost sharing		0.852		
Costs charged for road maintenance are fair		0.834		
New road maintenance costs are discussed with the road users before they are introduced		0.822		
There are clear policies in regard to road maintenance			0.841	
The Ministry and road contractors maintain roads in respect of existing policies			0.829	
Road users are aware of the existing road maintenance policies and they act in accordance			0.803	
The Ministry has a set standard for all roads to be constructed				0.816
Contractors adhere to these standards when they are constructing a road				0.795
All major roads in the Country are of high standard				0.762
Eigen Value	1.430	0.785	0.420	0.365
Variance %	40.747	29.613	15.506	14.134
Cumulative	40.747	70.360	85.866	100

Table 6. Factor analysis of economic growth.

Variables	Consumer spending	Investment	Imports Vs. Exports	Government expenditure
There are road infrastructures as a result of revenue from consumer spending	0.955			
Road users get the worth of their expenditure on road construction and maintenance	0.919			
There is economic growth as a result of consumer expenditure on road infrastructures	0.893			
There is heavy investment in road infrastructures from different funding sources		0.938		
Investment in road infrastructure facilitates economic growth		0.880		
The Ministry allows private investors to invest in road infrastructure construction and maintenance		0.850		
Good road infrastructure boosts export volumes			0.888	
Road construction materials and machinery are imported			0.838	
Good roads provide an environment for a better balance of payments position			0.807	
The Government spends heavily on road construction and maintenance				0.802
Government expenditure is low compared to its income				0.787
Government expenditure assessment is crucial in explaining economic growth levels				0.764
Eigen Value	2.567	1.812	1.370	0.951
Variance %	41.272	28.511	19.243	10.974
Cumulative	41.272	69.783	89.026	100

About the structures and guidelines that have been set to ensure construction of high quality new roads, one respondent was quoted saying "*There is the National Road Fund for financing technical studies in order to build new roads and their maintenance, The Road Agency « OdR » for planning and coordinating roads construction and maintenance and the involvement of reputable construction companies and design offices in construction and design*".

On approaches being used to assure meaningful connectivity of all people by the road network, 17 officials opined that "*construction of new roads and maintenance of the existing ones which is already being done is the ultimate assurance*."

Asked about how the ministry of public works involves all stakeholders in the maintenance of the road network, one respondent responds that "*We organize awareness workshops for local communities and also arrange for the return of the assessment report for the work done over a given time especially staff and companies*".

In regard to where road maintenance costs come from and how are they collected, a key Ministry official said that "*Road maintenance costs are obtained from domestic resources and at the same time Burundi*

Table 7. Analysis of variance for road infrastructure.

Road infrastructure		Sum of Squares	Df	Mean Square	F	Sig.
Gender	Between Groups	1895.900	7	270.843	3.104	0.265
	Within Groups	174.500	2	87.250		
	Total	2070.400	9			
Age Group	Between Groups	965.600	7	137.943	1.362	0.486
	Within Groups	202.500	2	101.250		
	Total	1168.100	9			
Level of Education	Between Groups	1238.400	7	176.914	1.289	0.504
	Within Groups	274.500	2	137.250		
	Total	1512.900	9			
Working Experience	Between Groups	520.400	7	74.343	0.250	0.372
	Within Groups	594.500	2	297.250		
	Total	1114.900	9			

Table 8. Analysis of variance for maintenance.

Maintenance		Sum of Squares	Df	Mean Square	F	Sig.
Gender	Between Groups	2037.900	7	291.129	17.916	0.354
	Within Groups	32.500	2	16.250		
	Total	2070.400	9			
Age Group	Between Groups	1107.600	7	158.229	5.231	0.170
	Within Groups	60.500	2	30.250		
	Total	1168.100	9			
Level of Education	Between Groups	1242.400	7	177.486	1.312	0.498
	Within Groups	270.500	2	135.250		
	Total	1512.900	9			
Working Experience	Between Groups	961.900	7	137.414	1.796	0.403
	Within Groups	153.000	2	76.500		
	Total	1114.900	9			

Table 9. Analysis of variance for economic growth.

Economic growth		Sum of Squares	Df	Mean Square	F	Sig.
Gender	Between Groups	1870.400	8	233.800	1.169	0.518
	Within Groups	200.000	1	200.000		
	Total	2070.400	9			
Age Group	Between Groups	1055.600	8	131.950	1.173	0.433
	Within Groups	112.500	1	112.500		
	Total	1168.100	9			
Level of Education	Between Groups	790.900	8	98.862	0.137	0.573
	Within Groups	722.000	1	722.000		
	Total	1512.900	9			
Working Experience	Between Groups	914.900	8	114.362	0.572	0.352
	Within Groups	200.000	1	200.000		
	Total	1114.900	9			

Revenue Authority collects the revenue and deposits it to the National Road Fund Account".

Asked how efficient the existing polices on road construction and maintenance are, responses were several but the most common were those re-echoed by one administrator who said "*Invitation for bids are advertised, Tenders are officially issued out and contracts are signed then the works are executed and the work receptions are pronounced*".

Asked how the ministry of public works ensures maximum standards in both road construction and maintenance, most emphasized that the ministry ensure

maximum standards through "*awarding tenders through standard official tender documents and official awarding of contracts to reputable service providers*."

On whether the existing road network facilitates consumer-centered economic growth, most responded that "*Indeed it does but very slowly and at a low volume*."

Asked if the existing road network creates a suitable environment for investment, responses were several but most "*negative as most responded directly with a 'Not really' answer*."

Regarding the impact that existing roads have on the export volume of the country, an official said that "*He would simply call it 'Very satisfying".*

Asked about the level of expenditure in road maintenance during these last five years, a financial officer said "*it was very high and actually backed it with an amount 'BIF 67,449,649,052'. The same figure represents the level of investments in road rehabilitation during those years*."

Conclusion

The study established that in general terms variables including road infrastructure and proper timely maintenance heavily contribute to faster Economic growth in Burundi. This trend shows that there is actually a need for more coverage in terms of road infrastructure as well as adequate regular maintenance as the best way to strengthen and improve economic growth in Burundi especially in the existing harsh economic times. The challenge however, is that road infrastructure quality has not been given a priority yet it heavily impact on economic growth in Burundi. High quality, long lasting roads facilitate easy movement of goods and services while at the same time requiring low costs in maintenance since durability is the core

Recommendations

Based on the findings and the conclusions, the researchers derived the following recommendations:

(i) Road infrastructure development that is assigned to road agency should map out areas with urgent need for roads while assessing the economic potential especially for roads in areas that have minerals or with a high concentration of agricultural or industrial activity. This will help in scaling infrastructural development to facilitate economic growth.

(ii) The ministry of public works should develop a road construction policy focusing on the standards and guidelines for new road construction and ensure that all contractors and engineers abide by the set rules in order to be assured of quality of new road network. This can also include material quality and labor quality such that only qualified professionals are involved in road construction.

(iii) The government through the ministry of public works should consider a strategy to promote local businesses in the achievement of major infrastructure projects with the aim of limiting the expatriation of currencies. Thus, the latter will be reinvested into the economic circuit of Burundi and will play an important role for job creation.

(iv) The ministry of public works ought to get all stakeholders on board such that they can collectively do a thorough assessment of the costs and key focus points that are vital for economic growth. This will help in creating a standard infrastructural profile sufficient for faster solid economic growth.

(v) There is need to formulate a road maintenance plan that outlines the scope, frequency and administrative authority because this will be the best way to attain efficiency and accountability for resources provided by all stakeholders especially the private sector which has high expectations in terms of financial accountability.

(vi) Road infrastructure setup projects should be implemented with consideration of prospective maintenance and also align the maintenance plans with the usage targets of the road such that high volume business roads are given maximum emphasis in order to reduce chances of early maintenance while the low volume roads can be meant for public transport activity and be restricted on traffic usage to eliminate the need for regular maintenance.

(vii) There is need to evaluate areas with key economic activities and assess their ability to influence export value and also improve the Country's balance of payments position then design an infrastructural development plan that favors the findings of the assessment. This will boost exports and reduce the volume of imports which will go a long way in improving the rate of economic growth in the country.

(viii) Therefore, the ministry of public works in Burundi should set and implement stringent Road infrastructure construction standards to ensure quality both in terms of construction plans and construction materials as this will create durability and cost efficiency which will ultimately lead to faster economic growth in Burundi.

(ix) There is also need to involve stakeholders like the Citizens to contribute in road maintenance in the following manners: (a) set up of road tolling at some of main roads. The money collected at the road of concern should be utilized to maintain the same road in order to stimulate the users to get profit from their contribution; (b) to sign the performance contracts between the Road Agency with the municipalities and the National Road Fund in order to maintain the sections of the roads that cross the respective entities.

Authors' declaration

We declare that this study is an original research by our

research team and we agree to publish it in the journal.

REFERENCES

Aschauer DA (1989). Is public expenditure productive? *Journal of Monetary Economics*, vol. 23(2): 177-200.

Aschauer DA (2000). Do states optimize? Public capital and economic growth. *The Journal of Regional Science*, 34(3): 343-363.

Ashipala J, Haimbodi N (2003). The impact of public investment on economic growth in Namibia. *NEPRU Working Paper* No. 88, 26(5): 277-282.

Dailekh P (2011). *Viewing Macro-Economics from a practical Angle.* New York, Edge Publications

Garsous G (2012). The impact of infrastructure on growth in developing countries. *International Economic Journal*: London.

Gould E, Parkman C, Buckland T. (2013). The Economics of Road Maintenance. *RAC Foundation and Association of Directors of Environment, Economy Planning and Transport,* 2(5): 89-91

Kankiriho H (2014). *Infrastructure investment and growth in Burundi.* Kampala, MacMillan

Kyobe A (2014). Keys costs in Infrastructure considerations. Nairobi: *Pauline Publication Africa.*

Montolio D, Solé-Ollé A (2009). Road investment and regional productivity growth: The effects of vehicle intensity and congestion. *Papers in Regional Science,* 88(1): 99-118.

Mugisha O (2016). *Introduction to modern Research.* Nairobi, Nyumba Publications.

Ntanda C (2010). *How relevant is infrastructure to growth in East Asia?* World Bank Policy Research Working Paper.

Raballand G (2003). Determinants of the Negative Impact of Being Landlocked on Trade: An Empirical Investigation Through the Central Asian Case, Comparative Economics Studies, *Palgrave Macmillan; Association for Comparative Economic Studies*, 45(4): 520-536.

Rafferty N (2013). *Measuring Economic growth: The right way*. World Bank Econ Rev 19(2): 311–333.

Road Agency (2018). Roads to prosperity? Assessing the link between public capital and productivity. *American Economic Review,* 89(3):619-638

Rostock B (2015). Road construction redefined. *Economic development culture change*, 57:685–722.

Salih J, Edum-Fotwe F, Price A (2016). Investigating the Road Maintenance Performance in Developing Countries. International Journal of Civil and Environmental Engineering, 10(4): 472

Seethepalli K, Bramati MC, Veredas D (2008). How relevant is infrastructure to growth in East Asia? *The World Bank Policy Research Working Paper* 4597.

World Bank (1994). Infrastructure for development. *World Development Report*, New York: Oxford University Press.

World Bank (2010). *Poverty reduction strategy paper medium term plan (2008-2012) for Kenya Vision 2030*.Washington DC: World Bank.

SELF-ADMINISTERED QUESTIONNAIRE

Please answer by ticking the appropriate answers where necessary.

SECTION A:

BACKGROUND INFORMATION:

A1. Gender:

Male ☐ Female ☐

A2. Age:

20-29 ☐ 30-39 ☐

40-49 ☐ 50 and above ☐

A.3 Educational level.

Masters Level ☐ Bachelors Level ☐

Diploma level ☐ Certificate level ☐

A.4 Number of Years in service:

Less than 1 Year ☐ 1 - 2 years ☐

3 - 4 years ☐ 5 years and above ☐

Instructions from question 1- tick the number that best indicates your opinion on the questions using the following scale.

Scale	**1**	**2**	**3**	**4**	**5**
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree

SECTION B: ROADS INFRASTRUCTURE

Coverage

	Statements	**1**	**2**	**3**	**4**	**5**
B1	The Ministry of Public works through the Road Agency and the National Road Fund tries to ensure wide coverage of roads					
B2	Coverage is a major concept in road infrastructure					
B3	Roads reach every part of the Country					
B4	Wide coverage of roads is an important asset for Citizens					

Usability

	Statements	**1**	**2**	**3**	**4**	**5**
B5	The existing roads are usable for human and goods transport					
B6	The Ministry focuses on usability of existing roads					
B7	Good passable roads facilitate trade and industry					
B8	Usability of a road is important in road infrastructure					

Quality

	Statements	**1**	**2**	**3**	**4**	**5**
B9	The existing roads are of high quality					
B10	Good quality road networks facilitate economic growth					
B11	Quality is essential in assessing road infrastructure					
B12	The Ministry demands high quality roads from all constructors					

Connectivity

	Statements	1	2	3	4	5
B13	Road infrastructure connects people from different parts of the country					
B14	Road connectivity facilitates business development					
B15	Connectivity is crucial for a fully operational road infrastructure					
B16	Transport majorly relies on physical connectivity of places through road networks					

SECTION C: Maintenance

Please check your feelings on governance by following the rating below and tick the appropriate choice: 5 - Strongly Agree (SA) 4 - Agree (A) 3 – Undecided (UD) 2 -Disagree (D) 1 - Strongly Disagree (SD).

	To what extent do you agree/disagree with the following statements? Tick the scale	*Strongly Disagree*	*Disagree*	*Not sure*	*Agree*	*Strongly Agree*
		1	2	3	4	5
	Stakeholders					
C1	Road maintenance is easier if key stakeholders are involved					
C2	Stakeholders like the Citizens are willing to engage in road maintenance					
C3	The Ministry freely shares road maintenance information with other stakeholders					
C4	Every stakeholder in the roads infrastructure sector has a defined role					
	Costs					
C5	Road maintenance costs are high					
C6	Roads are maintained through cost sharing					
C7	Costs charged for road maintenance are fair					
C8	New road maintenance costs are discussed with the road users before they are introduced					
	Policies					
C9	There are clear policies in regard to road maintenance					
C10	The Ministry and road contractors maintain roads in respect of existing policies					
C11	Policies and guidelines are important in road maintenance					
C12	Road users are aware of the existing road maintenance policies and they act in accordance					
	Standards					
C13	The Ministry has a set standard for all roads to be constructed					
C14	Contractors adhere to these standards when they are constructing a road					
C15	Harmonized standards make road construction and maintenance easier					
C16	All major roads in the Country are of high standard					

SECTION D: Economic growth

		No extent	*Small extent*	*Moderate extent*	*Great extent*	*Very great extent*
		1	2	3	4	5
	Consumer spending					
D1	Consumers spend less on road infrastructures					

D2	There are road infrastructures as a result of revenue from consumer spending	
D3	Road users get the worth of their expenditure on road construction and maintenance	
D4	There is economic growth as a result of consumer expenditure on road infrastructures	
	Investment	
D5	There is heavy investment in road infrastructures from different funding sources	
D6	Investment in road infrastructure facilitates economic growth	
D7	There are investors who cannot invest in an area without a good road	
D8	The Ministry allows private investors to invest in road infrastructure construction and maintenance	
	Imports Vs Exports	
D9	Good road infrastructure boosts export volumes	
D10	Road construction materials and machinery are imported	
D11	Good roads provide an environment for a better balance of payments position	
D12	The Ministry does its road supervision work with focus on economic growth	
	Government expenditure	
D13	The Government spends heavily on road construction and maintenance	
D14	Government expenditure is low compared to its income	
D15	The Government spends majorly on products and projects that contribute to the Country's economic growth	
D16	Government expenditure assessment is crucial in explaining economic growth levels	