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## **Road Tolling in Zambia: A Literature Review**

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### **Abstract**

Zambia is a land-locked country with desire to develop infrastructure to link it with its neighbors. Zambia is reasonably a vast country with a land area of about 752,000km<sup>2</sup> and a classified road network totaling about 67,670km most of which is in a poor state. The country is further constrained by high costs of transport estimated to add up to 40% of the cost of the final product. Therefore, the government of Zambia enacted an Act of Parliament to authorize the Road Development Agency collect tolls on selected highways. The first gates are located at Kafulafuta on the Ndola-Kapiri road with the second set located at Manyumbi on the Kapiri-Kabwe road while the rest are under construction. Consequently, the researcher undertook to assess the action by government in relation to theoretical constructs of road tolling.

**Keywords:** road; toll; act; public; private.

### **1. Introduction and Overview of Road Tolling**

Transport infrastructure investment is projected to increase at an average annual rate of about 5% worldwide over the period 2014 to 2025. Sub-Saharan Africa leads the pack with the fastest average annual growth rate of over 11%. Meanwhile, Asia-Pacific remains by far the largest transport infrastructure market, with investments increasing from \$557bn per year to nearly \$900bn per year in 2025. On the downside, transport infrastructure investment levels in Western Europe are expected to take a long time to recover due to continual fiscal austerity – returning only to 2008 levels in 2022 [1].

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Further, Sub-Saharan Africa is the fastest growing regional infrastructure market, with a projected average increase in transport spending of over 11% per year from 2015 to 2025. Most of this growth is expected in roads and ports [1]. Development and maintenance of physical infrastructure are key to rapid economic growth and poverty reduction. Production costs, employment creation, access to markets and investment depend on the quality of the infrastructure, especially transport. Road transport is the most widely used means of transportation in Africa. The authors in [2] argued that failure to maintain roads is tantamount to an act of disinvestment. The author in [3] writing on the topic “The Analysis of Road Infrastructure Development Financing in Lithuania” declared that “Well – run and effective transport is not only the service creating high value but also the necessary preconditions of the successful development of other fields of the economy and of the quality of human well – being”. Road infrastructure is one of the fundamental factors predetermining the efficiency of transport activities. This statement amplifies the fact that an efficient road infrastructure is a necessary requirement for an accelerated development of any economy. The availability of an efficient transport system is essential to foster economic development [4]. Tolls on highways and bridges could increase funds for construction and maintenance of transportation infrastructure, and reduce congestion and air pollution by giving residents incentives to use the highway system more efficiently. Tolls generally take two forms. Flat rate tolls remain constant throughout the day (though they may vary by type of vehicle). Time-varying (congestion) tolls impose higher rates when traffic is heavy, and lower rates during off-peak times. Time-varying tolls may change on a well-defined schedule-for example, a constant high rate during 6:00-9:00 a.m. and 4:00-7:00 p.m. on weekdays and a constant lower rate at all other times [5].

### ***1.2 The Current Road Tolling Situation in Zambia***

In Zambia, road transport is the dominant mode and represents the biggest share in terms of freight and passenger traffic. Roads are important for their contribution to economic growth by facilitating trade and increasing productivity in agriculture/industrial activities, and for improving living standards [6]. Rationally in most African countries road building has been given a higher priority than road maintenance with scant attention to the imperatives of recurrent costs of road management once the road has been constructed. The authors in [2] estimated the annual maintenance expenditure required to prevent road deterioration to increase from 0.2% to 1.6% of GDP in East Asia and the Pacific to 3.5% in South Asia. Developing nations like Zambia should not only build roads infrastructure projects but also operate and maintain them successfully. However, experience has shown that the general absence of a periodic or routine maintenance policy due to inadequate resource allocations has resulted in the continuous deterioration of roads hence the need for rehabilitation and construction at much higher costs [7]. Zambia has a gazetted road network of approximately 37,000 km of which 6,476 km are bituminous and surfaced to Class 1 standard. Gravel and earth roads account for 8,478 km and 21,967 km respectively. In addition there is about 30,000 km of ungazetted community roads comprising tracks, trails and footpaths. A large part of the main road network was constructed between 1964 and 1975 and was not designed to take advantage of the strategic location of Zambia in the sub-region, particularly with regard to regional transportation and the need to tap and harness the country’s resources for economic development. The geography of Zambia is such that to access many parts of the country and neighboring countries involves crossing of rivers. In many areas where bridges have not been constructed, pontoons and ferries are used. Most pontoons in Zambia are more than 50 years old and their carrying capacity ranges from 12

to 100 tones Further, the country’s investment in road infrastructure has been eroded through lack of proper maintenance. The main problems have been institutional and financial which relate to inadequacy of the institutional framework within which roads are managed; inadequate and erratic flow of funding; Lack of managerial accountability; lack of clearly defined responsibilities among road management actors and poor terms and conditions of service for those who are charged with road management. Consequently, in March 2011, the Toll Act No.14 of 2011 was enacted to provide for the establishment and operation of Toll roads in Zambia. The Government through the Toll Act No.14 of 2011 appointed the Road Development Agency (RDA) as the Tolls Authority. The principal objective of RDA was to introduce the road user pay principle as an innovative and self – financing mechanism for sustainable road rehabilitation and maintenance. Other functions under this law are to operate toll points, appoint toll collectors and enter into concessions on selected roads with the private sector through appropriate public – private partnership (PPP) models. “An example is every tone of copper transported on Zambian roads would now be levied to contribute to the road maintenance. Government would issue a road bond as a way of pre-financing the maintenance or construction of new roads whose maturity and repayment is far off in the future. Given the foregoing government decided on road tolling as the most effective avenue for raising additional finance for road maintenance and rehabilitation. Consider the exhibits below showing toll gates located at Kafulafuta on the Copperbelt Province.



**Figure 1:** Toll structure from the lowest to the highest toll fee

Figure 1 above shows the tariff structure throughout the country where tariffs range from K10 [\$1] for saloon cars to a maximum of K250 (\$25) for heavy trucks.

### **1.3 Problem Analysis**

In Zambia, the transport sector in the country is guided by the Transport Policy of 2002. The GRZ Medium Term Expenditure Framework (MTEF 2014-2016) recognizes that inadequate infrastructure is an impediment to growth and enhancement of competitiveness of the economy and poverty reduction. The MTEF explicitly recognizes the role transport infrastructure plays as a catalyst to economic development, this point further underpinned by the Revised Sixth National Development Plan (RSNDP 2013-2016) and the National Long Term Vision 2030 (NLTV 2030) whose objective is to increase economic growth with a view to Zambia becoming a middle income country by the year 2030. In this context, GRZ embarked on new transport development programmes designed to among others transform the country from a landlocked to a land linked country. The main objective of road infrastructure development is to increase access and reduce the cost of travelling and doing business for the communities as well as reduce travel time [8] Consequently, in November, 2013, Zambia introduced a national tolling programme whose objective was to keep the core road network in maintainable condition at all times through self-financing and self-sustaining mechanisms; to broaden the financing options for road infrastructure development, renewal and maintenance; and to encourage public-private partnership arrangement in road infrastructure financing and development, thus empowering Zambians by developing them into small to medium entrepreneurs. This development follows the enactment of the Toll Act No. 14 of 2011 that authorizes the Road Development Agency (RDA) to operate toll points, and to erect and maintain such structures necessary for operating toll points on any road, border post, bridges, pontoon or any other place. The agency would be responsible for collecting toll fees at weighbridges and ports of entry. The weighbridges would be situated at Kafue, Kafulafuta, KapiriMposhi, Kazungula, Livingstone, Mpika, Chipata's Mwami border post and Solwezi. Traditionally, in Zambia, the main source of funding for road infrastructure has comprised of direct government allocation through Public Sector Investment Programmes (PSIP); vehicle licenses; registration and examination fees; fuel levies; international transit fees; weighbridge charges and overloading fines. However, budgetary constraints are recognizing government's inability to provide infrastructure services timely and efficiently. The second concern is that in Zambia, it has been assumed that roads, as a public good should be constructed and maintained by public sector and be free of charge. The author in [9] argues that roads can be classified as a public good because they satisfy the condition of public goods, which are non-excludability and non-rival consumption. However, roads also have characteristics of private goods and it is therefore possible to set a user charge for them.

## **2. Literature Review and Theoretical Perspective of Road Tolling**

### **2.1 An Overview of Road Funding and Tolling**

Traditionally, transport funding in developing countries has been the responsibility of government. The author in [10] further observed that experience across the world has proven that the capacity of most governments to adequately fund transport infrastructure construction and maintenance is limited. Most governments have therefore tried to respond to this challenge by developing new alternative sources of road finance and road tolling has been one such option. Further, road financing using toll fees has had challenges equal to other similar infrastructure projects. Some of these challenges includes finance risk, user rejection, political risk, currency

risk and force majeure [11]. Therefore, tolling of roads faces similar challenges and this has resulted in inadequate and slow development of road infrastructure. Most governments around the world are experiencing diminishing general budgetary resources and this has been prompting the search for alternative sources of financing for infrastructure projects and road tolling is one of them. The author in [12] observed that the primary economic benefit of tolling are the user – based funds generated to support road development and the ability to influence road use and traffic patterns through road pricing. The author in [12] added that in particular, public acceptance is one of the overriding issues in toll road development and may be the greatest impediments to private than to public toll road development. After taking these important noneconomic issues into consideration, policy makers may make different decisions than those indicated by a purely economic assessment. The author in [13] observed that public tolling may be preferable if noneconomic policy considerations make private tolling unattractive. Public tolling is preferable to general government funding in these cases because of the additional funds generated from direct beneficiaries of the project and the ability to use tolls to manage traffic. Additionally, road tolling provides readily available source of revenue since all motorists are subjected to the fee before crossing to the other side. In the case of Zambia, motorists pay cash and this adds to enhanced liquidity position of the government. Toll gates are necessary as the money raised from this would be used to maintain the roads and assist us in meeting the demands of social services, which are important for the growth of our country. Toll roads therefore will reduce the total net cost to the economy, ensuring greater opportunities for prosperity and growth. The authors in [14] observed that road tolling is an equitable method for a motorist to pay only for the section of road used which is referred to as the “User Pay” principal. Tolling is important because it enables the government to provide roads sooner than the traditional tax-based revenue which would traditionally fund these roads. Tolling delivers the much needed infrastructure sooner than later and ensures dedicated funding for maintenance of the road. The benefits of tolling are to ensure a high quality road net-work. In addition to contributing to improved road safety, toll roads generally increase conscious driving that allows the motorist to be alert looking out for the next toll gate during the drive time. The “Use Pay” principal represents a fair and precise way of paying for transportation facilities.

## **2.2 Roads as Public Goods**

The author in [15] argued that roads have been financed from government allocations for a while now and the public have had to accept such models so much that any more fundraising for roads is seen as a burden on motorists. Usually the funding for Zambia has been through Public Sector Investment Programmes (PSIP), vehicle licenses and fuel levies. However, due to the inadequacy of funds generated from these sources, governments from most developing countries as well as other countries have considered road tolling as a way to generate additional funds. However, the author in [15] added that this situation would be ideal if road users had alternative routes so that they would take the tolled road by preference. Roads which are infrequently utilized possess the characteristic of non-rival consumption among users and are traditional examples of public goods. Joint consumption means that roads yield services that are simultaneously enjoyed by more than one user, without substantial detriment to the satisfaction of others. If roads are totally non-rivalrous, then neoclassical economic principles dictate that roads ought to be provided for by the public sector and financed from general revenue taxation [and perhaps land value taxation], fully taking into account the social opportunity cost of public funds. On the other hand, roads which are heavily utilized have the nature of rival consumption among

users and are called congested public goods. Thus the standard public finance text (see, for example, author 14) argues that both the non-rival consumption characteristic of public goods and the non-excludability or rather, costly excludability of congested public goods are causes of market failure, calling for government intervention. Hence, roads which possess the attribute of congested public goods, and thus have a partially rival consumption characteristic, ought to be treated by the relevant governmental authorities as mixed or impure public goods, if not private or club goods [16].

### **2.3 Methods of Tolling Roads**

The authors in [17] wrote that in the past, road tolls were levied traditionally for a specific purpose such as city construction financing or road and bridge construction and maintenance. The evolution in technology made it possible to implement road tolling policies based on different ideas. The different charging ideas are designed to suit different requirements regarding purpose of charging, charging policy, the network to the charge, tariff class differentiation and a few others. On this note there are three types of Road Tolling ideas according to the author in [18] are explained below:

- a) Distance or Area Charging: This method allows toll collectors to collect tolls per distance covered by the motorist or area the motorist is driving by.
- b) Time Based Charges and Access Fees: Here, the motorist pays in relation to time of the day. However, the access toll is premised on tolling motorists as a way of allowing them to access the other side of the toll gate.
- c) Motorway and Other Infrastructure Tolling: This type tolls costly infrastructures, like a bridge, a tunnel, a mountain pass, a motorway concession or the whole motorway networks of a country.

### **2.4 Challenges Associated with Toll Roads**

Toll road schemes cause an increase in investment spending, which could have an inflationary effect. This effect could however be compensated for by exploiting other forms of investment. The high serviceability of a well maintained toll road could have a greater cost-lowering effect on the price of consumer items than the cost-increase caused by the toll tariff. A net deflationary impact could even be achieved if producers shifted the costs and benefits forward to the consumer [19]. The introduction of tolls along corridors can cause significant traffic diversions. When tolls were implemented on the N1 between Pretoria and Bela-Bela in South Africa, a traffic diversion of 30-40% to the non-tolled alternative was experienced [20]. This traffic diversion can have serious impacts on regular users of the alternative route. Examples of these problems include increased vehicle operating cost, congestion, environmental hazards, increased number of accidents, premature failure of pavement. Indirect effects may also be experienced along the alternative route, such as reduced pedestrian safety, decreased land value, impact on prices of goods and services [20]. Further, inequity occurs when road users are forced to have additional cash expenses. The author in [21] adds that Toll roads are a step in the wrong direction if policies and strategies strive to promote the use of public transport. The revenue from a toll scheme is expended in the road itself and not available to upgrade public transport. The demand for public transport is also reduced if the capacity of roads is increased. The toll tariff gives the user a direct cost and the user can then

make a decision on whether he will benefit sufficiently from “buying” the road or if using an alternative would be more favourable [22]. However, the economic benefit of tolling is that Toll financing allows for national road construction to start sooner than when relying on general tax revenue for instance, in Zambia, collecting monies from road user fees only takes place at the end of the financial year meaning that no maintenance or service would be done on the roads for a full year. Subsequently, users can enjoy the benefits of the road earlier. The availability of funds when maintenance is required is another issue when roads are financed through tax. Tolloed roads can be maintained when necessary, which prolongs the serviceable life of the pavement structure. A study by the authors in [22] revealed experiences of eight road toll projects in developing and industrialized countries which concluded that the success of toll projects is dependent on an efficient allocation of responsibilities between the public and private sectors. Out of the eight countries, Chile, Colombia, Hungary, United Kingdom, and the United States scored high in terms of concession environment. On the other hand China, Mexico and Malaysia were considered to have less favorable environments and, therefore, recorded lower service levels in their projects. The authors in [23] observed that private capital has a tendency of increasing the opportunity for road development. The findings from his study were that an improved road network was critical in facilitating the development of industry, creating and expanding residential areas, and implementing environmental improvements therefore road tolling resulted in increased private investment and stimulation of socioeconomic and regional development. Conversely, the authors in [24] cautioned that toll facility operation needed the removal of government exclusive rights of operations so that pricing is balanced by competition rather than the monopoly of influence exhibited by the government.

## ***2.5 Review of Similar Projects and Studies***

### ***2.5.1 A case of Mexico:***

The authors in [25] examined toll facilities in Mexico through a mathematical model of traffic forecasting where they noted that usage, and therefore toll revenues from passenger cars, was considerably more elastic than for trucks, which had generally lower diversion rates than cars and buses. Although the study was based on a limited sample of Mexican toll roads, the principles and mathematical relationships developed were useful principle inputs to this study.

### ***2.5.2 South Africa and Mozambique***

In South Africa, the government went into an agreement with the government of Mozambique in 1996 to build the N4 toll road between South Africa and Mozambique that would be operated by the Trans African Concessions (TRAC). The author in [13] revealed that the 30year concession for a private consortium, Trans African Concessions (TRAC), to build and operate the N4 toll road from Witbank, South Africa to Maputo, Mozambique would be handed to the state after the concession period. This deal was the biggest project finance deal in Southern Africa but faced demand risk whereby motorists preferred free alternative routes.

### ***2.5.3 A Case of Forth Road Bridge***

In a study by the Transport Analytical Services in 2007 on the Forth Bridge in the United Kingdom (UK), all the

respondents found the costs to be manageable and affordable. However, there was a view among some respondents that the toll collection causes congestion and the fact that the toll at the Forth Bridge is a round sum (£1 compared to 80p on the Tay Bridge at that time) was considered to be a benefit, because it is a more convenient amount to pay and therefore collection is faster than it would be with an amount such as 80p. This finding is helpful for the current study because it guides in terms of motorists feelings about the denomination that would facilitate quick transaction. In addition most respondents thought that the toll would need to increase by a minimum of 300% (to £4 or more) before it would begin to have a significant impact on travel behavior, and therefore on traffic volumes. The understanding is that road tolling would result into restricted movements by motorists. Other considerations that the study participants mentioned were that the piece of infrastructure was significant for trade in the region and traffic congestion was expected to reduce if motorist opted to use public transport in order to avoid paying the tolls.

#### **2.5.4 A Case of Switzerland**

The author in [26] noted that the Swiss toll was after change induction on motorists so that most of them would prefer travelling by train rather than take the road in an effort to avoid paying for a toll. Additionally, it was expected to reduce the constantly increasing number of foreign heavy goods vehicles travelling along alpine routes. A change in the modal share would improve conditions for local traffic and reduce the burden on communities and the environment hence the toll would be a catalyst to the reduction in traffic congestion. The author in [26] further observed that immediately after the introduction of the kilometer charge in 2001, the vehicle kilometers of heavy goods vehicles on Swiss roads dropped; this trend continued in 2002. The reduction in vehicle kilometers from 2000 to 2002 was approximately 7–8%.

#### **2.6 Theoretical Perspective of Road Tolling**

A theoretical perspective of tolling was presented by the author in [19] that suggests that tolls be charged on roads where congestion is common. Such a toll system is referred to as a congestion toll. The reason for this is that the user does not pay the entire cost of the journey. The users pay for their own vehicle cost and travelling delays, but they also create delays and costs on other road users and the environment. Tolls can be used to discourage users from making unnecessary trips and this is one circumstance in which tolling could lead to decongestion on the roads. On the contrary, the author in [19] discourages the tolling of rural roads where congestion is a rare occurrence. He argues that rural roads should be viewed as “pure public goods”, because the road users do not influence each other significantly. However, the rural areas in Zambia records limited number of vehicles most of which are farm trucks whose movements are limited thereby contributing to traffic congestion insignificantly. Further, road tolling should be based on the principle of traffic volume. For instance, Zimbabwe’s busiest regional trunk road (Harare–Beit Bridge) recorded a traffic flow of just over 4000 vehicles per day the remaining sections recorded an average traffic flow of only around 2,000 vehicles per day. Therefore, the level of vehicle flow is not equivalent to the required threshold of not less than 5000 vehicles per day. On the contrary, Zambia, records a far below daily average traffic of vehicles per 24hrs on the tolled sections. This result works against the theory behind tolling. The central London congestion charge introduced in February 2003 had a very quick and significant impact on traffic volumes within the charging zone [27]. The



number of passenger cars and minicabs entering central London during the charging hours (Monday to Friday 0700–1830) fell by 30%. There was also a drop in the number of vans. Conversely, the number of taxis, buses, coaches, and bicycles rose, indicating a change in the transport mode supported by an increase in the supply of bus services. The number of lorries and other goods vehicles remained almost unchanged. Conversely, the cordon toll trial in Stockholm started in August 2005 and ended in July 2006 and was introduced on a permanent basis. The purpose of the trial was to cut the number of car trips during morning and evening rush hour traffic in the inner-city segment by 10–15%. The actual reduction was even higher, namely 22% or almost 100,000 fewer trips over the cordon border every day [28]. When measured in vehicle kilometers, inner-city traffic fell by 15%.

### **3. Conclusion and Suggestions**

The introduction of road tolls was long overdue in Zambia. The debate started in late 2008 and protracted to 2010. This debate was spearheaded by the central government as the major stakeholder. However, the tolling of roads in Zambia where traffic volume is insignificant and that there is no congestion on highways simply means that tolling in Zambia is a fundraising venture. What remains to be ascertained is whether the revenue collected will be used for the intended purpose. Further, what compels motorists to pay is that it is law and defaulting is breaking the law. Considering that road tolling has an effect on motorists cost increase, making the toll-fees affordable would be easy to pay and prevent motorists from taking alternative actions. The National Road Fund Agency in Zambia should decentralize pay-points for road tolls in order to avoid time loss during payments at toll points. The toll gate should involve toll ticket inspection only. Additionally, there is need to improve and make available social and trading services along tolled sections in order to allow the public to trade and access vital services such as banking facilities in form of Automated Teller Machines. This move would allow motorists without cash to access cash for the toll ticket. Other alternatives needed include prepaid toll tickets as well as electronic toll tickets. Furthermore, increases in road user charges and tolling of more roads may not necessarily lead to improvements in road infrastructure financing if measures are not put in place to reduce incidents of revenue leakages. One measure that can be used to do this is to automate the revenue collection process as is being done in South Africa. This reduces the number of contacts between the collector and the one paying. Apart from having the potential of reducing corrupt practices, it can also lead to a reduction in the cost of collection. Furthermore, to deter people from indulging in corrupt practices, stringent punishment should be meted out to people who engage in such practices.

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