Social Cost of Motorcycle Transport on Human Welfare in Kakamega Municipality, Kenya

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Abstract

Road transport is the centre nerve of movement of passengers, goods and services in urban centers globally. Conventionally, vehicles and handcarts adequately served Kenya"s towns before the advent of bicycle transport in 1990s that graduated to motorcycle transport (MT) in 2000. Currently, MT dominated intra-urban transport notwithstanding their associated social cost. Regrettably, no policy exists on MT in Kenya to optimize its utility. This paper examined the social cost of MT on human welfare in Kakamega municipality, Kenya. A questionnaire was randomly self-administered to sample of 200 households within the municipality"s four sub-locations proportionately to obtain primary data. Oral interview, ocular observation and focused group discussions provided additional data. Secondary sources of data were also consulted. Tables, Two Stage Least Squares (2SLS) regression, Pearson"s correlation coefficient and willingness to pay analysis were used to analyze data The study reveal that MT operated in an unstable, risky, more risky, and most risky environment that aggravated social cost. Two stages Least Square regression model revealed that the variables studied accounted for 64% of the social cost of MT. Consequently, out of the eleven examined factors eight were significant (at P<0.05 level). Human death, urban traffic congestion, overspending, Crime and overloading bore positive coefficients while contrary to the expected, ill health, over speeding and competition had negative coefficients. Finally, Pearson"s correlate coefficient established a moderate negative relationship between the social cost of MT and human welfare and thus, each household was willing to pay Kshs. 90.80 per month to streamline MT. The study concluded that MT harmed human welfare. It recommended collective responsibility in the management of MT as a strategy to minimize social cost, attain optimal urban MT and better human welfare in Kakamega municipality.

Key Words: *Motorcycle Transport, Social Cost, Human Welfare, Kakamega Municipality, Kenya*

INTRODUCTION

Background

Transport is a fundamental segment of development since without access to resources and markets, growth stagnates and poverty increases (World Bank, 1990 & 1996). Inappropriately designed road transport system, breed poverty, harm the environment and ignore the emerging community needs. Increased responsiveness to customer needs, adopting global trade patterns and coping with rapid motorization were the driving forces behind the mushrooming motorcycle transport (MT) in Kenya. Without extensive government reforms to regulate the sector and strengthen its institutional capacity, Kakamega Municipality might hardly achieve optimal MT.

Social cost comprises of private and external costs accruing from economic activities and born by the society (Perman *et al.,* 1999). Private cost of MT was incurred by the proprietor in terms of maintenance and recurrent expenditure. Alternatively, external cost includes externalities like pollution and congestion among others incurred by the residents of Kakamega municipality. Thus social cost was instrumental in cost benefit analysis used to justify any given economic activity. In this case, it was applied to motorcycle transport in Kakamega municipality, the headquarters of Kakamega County.

Motorcycles, popularly known as _bodaboda", in Kenya have become an important segment in Kenya's transport sector. The transformative nature of the MT boosted economic engagements of many Kenyans but were bedeviled with far reaching irreversible social cost. Road accidents cost many lives (Ikunda,

2013) and injured people. BITRE (2010) estimated the social cost of road crashes in Australia to be $17.85 billion in 2006. He further estimated human losses of $2.4 million per fatality, $214 000 per hospitalized injury, and $2100 per non-hospitalized injury. This amalgamation of all the road crash costs caused by automobiles overlooked the motorcycles. This project addressed the social cost of motorcycle transport as a precursor of human welfare in Kakamega Municipality.

Investment in motorcycle transport raised economic growth by increasing the social return. It embraced both subsistence and commercial uses, and generated employment opportunities especially for the youth. Consequently, an efficient motorcycle transport system helped to lower the production cost, widened market and diversified the economy. It also influenced the location of firms, refined the labor market and enabled equal access to opportunities (World Bank, 1996). These jointly made MT an indispensable arm of road transport that account for the rapid economic growth.

Traffic congestion was a serious problem in cities because it wasted time and disrupted commerce while idling vehicles intensified air and sound pollution (Christainsen, 2006). This lowered the quality of life in metropolitan areas and forced some countries like Singapore to price vehicle entry into her central business district in 1975 to regulate traffic volumes. In Kenya and Kakamega Municipality in particular, traffic congestion worsened with the advent of motorcycle public transport. Unfortunately, road pricing that would help mitigate this scenario had high transaction cost including queuing that rendered its application to the huge number of motorcycles remained infeasible.

Motorcycle transport perpetuated crime in Kakamega municipality. The mayor of Kakamega, Mr. Matias Sichere and Kakamega Police Chief Mr. Joseph Omijah echoed that most of the 3,000 motorcycles that operated as *bodaboda* in the municipality had been stolen from other towns (Otenyo, 2012). Also some people were managing motorcycles for other persons who brought them from other town especially Nairobi. Thus a total crackdown of *bodabodas* not registered with the Municipal council had been mounted in the region to counter this crime.

The legal system was the most appropriate way to distribute the social cost of motorcycle transport to the society. Criminal law helped to enforce social control by discouraging behaviour that harmed societal wellbeing and challenged government authority and legitimacy (Okidi *et al.,* 2008). This could raise the penalties for MT offences and encouraged compliance to traffic rules. For instance, the wearing of helmets that conform to Kenya Bureau of Standards was mandatory but was often ignored and accounted for numerous fatal accidents. This concurred with Kibogong' & Kisia's (2012) findings in Naivasha district that 36% of patients treated at the emergency department in Naivasha hospital because of road traffic crash were motorcyclists, of which 75% of these were not wearing helmets at the time of the crash. Helmet wearing among motorcycle passengers was hardly 3% as reported by Ikunda (2012) in Plate 1 where the cyclists did not wear the full riding gear and hanged the helmet on the motorcycle.
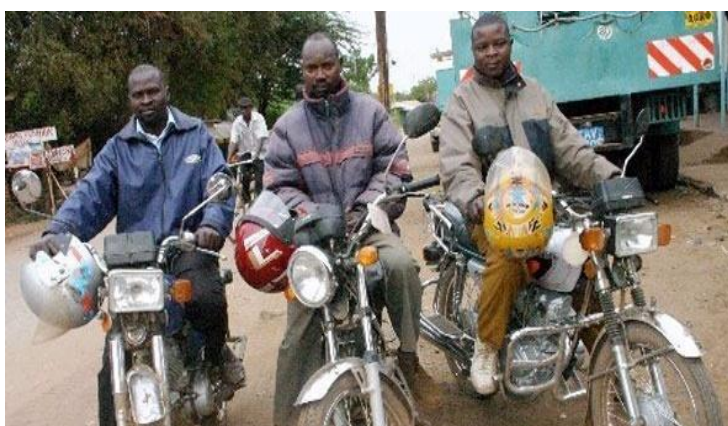

Plate 1. *Bodaboda* operators pose for a photograph in their working gear
Source: Ikunda, 2012

To regulate the growth of the motorcycle business in Kakamega municipality, the council had started taxing *bodaboda* operators in the town in a bid to raise revenue collection and streamline their operations.

Motorcycle operators were required to pay Kshs 600 monthly to be allowed to operate in the town (starreport.co.ke/news/article.../kakamega-municipal-levy-taxes-boda-boda). The monthly payment was preferred because it was not cost-effective for the Council to collect the daily fee of Kshs. 20 from over 3000 motorcycles.

Problem Statement

Detailed policy studies had been prepared for urban transport (World Bank, 1996) and on specific topics, such as road maintenance (World Bank, 1988) in the past twenty-five years. The period had witnessed rapid changes in the global economy like increased need for flexibility and reliability in transport services. Additionally, growing individual aspirations for more access and mobility has generated the need for a greater variety of transport services and strategies. In Kenya, MT has emerged to complement and supplement public service vehicles but harms the environment and mankind. Between 2005 and 2011, motorcycle registration increased by almost 40-fold and comprised 70% of all newly registered vehicles in 2011. Social cost of motorcycles increased proportionately overburdening families, communities, roads, health delivery systems and urban centers. In 2010, out of 3,055 road traffic deaths reported in Kenya, approximately 7% were motorcyclists (Republic of Kenya, 2012).

Urban transport has inadequate public service vehicles since private cars and heavy commercial vehicles dominated roads, making motorcycle transport indispensable in Kakamega municipality. Heavy traffic congestion during rush hours, and competition for limited road space among motorists, pedestrians and cyclists is common. Unfortunately, Kenya had no urban transport policy (Republic of Kenya, 2002) as the Metropolitan Growth Strategy for Nairobi formulated in 1973 with a plan period of 30 years, is yet to be fully implemented. Thus, this paper examined the social cost of motorcycle transport on human welfare in Kakamega municipality, Kenya. It specifically examined the working environment for motorcyclists; socio-economic determinants of social cost of MT; and established the relationship between social cost of motorcycle transport and human welfare in Kakamega Municipality.

Study Area

Kakamega municipality is located at the heart of Kakamega County and serves as its headquarters. Its altitude range from 1520m to 1680m above sea level with mean annual temperature ranges between 17.5^{o}C and 19°C. Rainfall is evenly distributed, and averages about 2000mm per year (Republic of Kenya, 2002) making seasonal roads impassable most of the year. Kakamega municipality covers an area of 49.9KM^2 with a total population 74,115 and the highest population density of 1,485 persons per square kilometer in the County. The 52% of people living below poverty line is above the national figure of 47% (Republic of Kenya, 2005) hence lure youth to the motorcycle transport industry. It had numerous hotels, banks, businesses enterprises and an open air market. The town has inadequate health and academic institutions that are often understaffed and ill-equipped (Republic of Kenya, 2002), to serve the ever increasing motorcycle transport oriented casualties. Common human ailments presented by motorcycle transport victims included wounds, buns, bruises, fractures, pneumonia and fever disorders.

MATERIALS AND METHODS

Kakamega municipality has 1905 effective households that are occupied throughout the year as ascertained with the help of village headmen. It is divided into four sub locations from which a random sample of 200 (10.5%) household was proportionately collected. Self face-to-face administered questionnaire and oral interview were used to obtain primary data on social cost of MT, complemented by secondary sources. This holistic social cost approach surpassed Widyastuti and Mulley's (2005) oriented motorcycle casualties that prioritized accidents. Thus willingness to pay and revealed preference approaches (Perman *et al.,* 1999) were applied to incorporate both the direct and indirect costs of MT as suggested by Silcock and TRL (2003). The environment under which MT operated was rated as risky, more risky and most risky while Two Stage Least Squares (2SLS) regression analysis was used to estimate the determinants of the social cost. Finally Pearson's correlation coefficient was use to establish the association between social cost of MT and human welfare of the residents of the municipality.

RESULTS AND DISCUSSIONS

Characteristics of the Sampled Households and State of Motorcycle Operators

Kakamega municipality households had varied features as displayed in Table 1. The sample was gender sensitive comprising 58.5% males and 41.5% females, of which 47.5% and 52.5% had attained basic and post-secondary education respectively. The modal age was 43 years, average household size 7 members and average monthly income of Kshs. 7, 450 and 67% of the respondent were married. Most of the respondents (66.5%) succumbed to disguised unemployment and catalysed the growth of motorcycle transport business as a source of livelihood irrespective of the high risks involved.

Table 1. Characteristics of the sampled households

Feature	Description	Count (%age)
Gender	Males	117 (58.5)
	Females	83 (41.5)
Education level	Basic	95 (47.5)
	Post-secondary	105 (52.5)
Marital status	Single	66 (33.0)
	Married	134 (67.0)
Modal age	43 Years	
Average household size	7 Members	
Average Income	Kshs. 745,0	
Occupation	Disguised unemployment	133 (66.5)
	Employed	67 (33.5)

Notes: Figures in brackets are percentages.

Kakamega Municipality Motorcycle Transport Environment

Motorcycle transport operated in unstable environment (Table 2) rated as risky (*), more risky (**), and most risky (***) that accounted for the high cost incurred by the society. First, failure to wear protective clothes (89.5%); none functional headlamps, indicators and reflectors (60.0%); tired and drunk riders (40%); unlicensed riders (52.5%) long working durations amounting to 24 hours (2.5%); overloading (85%); spontaneous parking, boarding/loading and alighting/offloading (63.5%); and the ruthless municipal council (48%) comprised the most risky environment. Secondly, partial gear dressing (10.5%), drunk riders (27.5), tired riders (22.5), riders possessing invalid licenses (33.5%); state of the motorcycle characterized by defective head lumps/indicators/reflectors (60%); working for approximately 18 hours (3.5%) and riders aged below 18 years and poor road conditions (50%), and corrupt traffic police (46.5%) were classified as more risky environments. Thirdly, commercial motorcycle practice (68.5), working for 12 hours (81%) youthful rider (80%), average road conditions (29.5%) and weak government policy on MT (4.5%)presented risky environment for the motorcycle users. However, given that male and females were the dominant riders and passengers respectively, it emerged that both gender risked being widowed and children orphaned as such escalating social cost of this transport mode.

The popular brands of motorcycles used for transport were king-bird (40%), Boxer (35%) and Bajaj (25%). Most of them were poorly maintained as they lacked full dressing gear (protective clothes and helmets for both the rider and the passenger (100%) headlamps and indicators, and the tires were worn out. Only 20% had valid insurance 65% bore expired insurance stickers while 15% had no insurance cover. Riders often under the influence of drugs (*Chang''aa*, cigarettes and *bang*') were about 85%. The motorcycles were owned by teachers (55%), other civil servants (25%) and business persons (20%), who either used the motorcycles to commute to duty or leased them to riders at an average rate of Kshs. 300 per day. Motorcycle riders were predominantly youth which 28% had authentic driving licenses. Unfortunately only 10% of the licenses were valid since 40% were expired and 50% percent borrowed. Worse still, most of them 90% had attended informal driving schools since they could hardly afford formal training. Full training hardly lasted one hour since the students graduated from bicycle riding.

Passengers included commuters (52%), students (25%), and the general public (23%). On average a motorcycle carried two passengers together with their luggage simultaneously. Common goods carried were groceries, maize, construction materials and timber. However, 40% of the respondents also reported

that the most lucrative business was carrying drugs including *chang''aa* and *bang''* as well as counterfeit goods for the dealers to evade police road-blocks. Poor Road conditions in the municipality (50%) hampered efficient movement especially on Wednesdays and Saturdays as the market days in Kakamega town. The tarmac roads that traversed Kakamega town were also narrow with heavy traffic that left minimal space for motorcycle riders. Feeder roads from Shinyalu, Ingotse and Maraba satellite towns were seasonal. There were no official parking and stages made it difficult to monitor and co-ordinate the activities in the MT industry.

Table 2. The environment of motorcycle transport in Kakamega municipality

Feature	Description	Counts (%age)
Motorcycle transport rating	Preferred	119 (59.5)
	Not Preferred	81 (40.5)
Protective clothes (rider and passengers)	Full dressing gear	0 (0.0)
	Partial dressing gear	21 (10.5)**
	No dressing gear	179(89.5)***
State of the motorcycle: Head lumps/Indicators/Reflectors	Adequate	5 (2.5)
	Defective	120 (60.0)**
	None functional	75(37.5)***
Motorcycle operation modes	Commercial	137(68.5)*
	Subsistence	63(31.5)
State of motorcycle riders	Sober	20 (10.0)
	Drunk	55(27.5)**
	Tired	45(22.5)**
	Tired and drunk	80(40.0)***
Working duration of the motorcycle riders	6 Hours	31(15.5)*
	12 Hours	162(81.0)*
	18 Hours	7(3.5)**
	24 hours	5(2.5)***
Age of the of motorcycle riders in years	Below 18	13 (6.5)***
	18-36	160 (80.0)*
	Above 36	27 (13.5)
Gender of motorcycle riders	Males	199 (99.5)
	Female	1 (00.5)
Gender of motorcycle passengers	Males	60 (33.3)
	Female	120 (66.7)
Training of riders	Licensed (Valid)	28(14.0)
	licensed (Invalid)	67(33.5)**
	Unlicensed	105(52.5)***
Insurance of the motorcycles	Insured (valid)	53(26.5)
	Not Insured	147(73.5)**
Road condition: tarmac and feeder	Good	41(20.5)
	Average	59(29.5)*
	Poor	100(50)**
Loading: No. of passengers/amount of luggage	Adequate load	30(15)
	Overloaded	170(85)***
Parking lots and stage	Designated	73(36.5)
	Spontaneous	127(63.5)***
Regulation framework	Corrupt traffic police	93(46.5)**
	Ruthless municipal council	98(48.0)***
	Weak government policy	9(4.5)*

Notes: *Risky environment   **More risky environment   ***Most risky environment

Determinants of the Social Cost of Motorcycle Transport

Two stages Least Square regression model revealed that variables studied accounted for 64% of the social cost of motorcycle transport (Table 3). Consequently, out of the eleven examined factors, four were significant (at P<0.01 level) and seven were significant (at P<0.05 level). Human death, traffic congestion, road conditions, crime and overloading bore the anticipated positive coefficients, but contrary

to the expected, ill human health and competition (inter and intra) in terms of over-speeding had negative coefficients.

The number of motorcycle oriented death (0002[**]) increased with the social cost of the motorcycle transport mode. Unfortunately, it was difficult to accurately determine the exact number of death reported because some died in the long ran. Victims included the riders, passengers, pedestrians and occupants of other units of carriage involved in the accidents. This concurred with Wasonga's (2013) revelation that in the first two weeks of June 2013, 142 and 364 had been killed and injured respectively by motorcycles.

Social costs of motorcycle transport increased with urban traffic congestion (0194[*]). Motorcycles scrambled for space among themselves and with vehicles for tarmac and other motorable routes as well as for foot-paths shop-corridors with bicycles, pedestrian and handcarts. This led to congestion cost and increased the probability of accidents that inflicted harm (physical and mental) and death. To minimize accidents, traffic flow slowed resulting to congestion that culminated to waste of time, disruption of the supply chains and increased pollution as observed by Christainsen (2006) in Singapore.

The social cost increased with the worsening state of the roads (.0008[**]) in the municipality. Tarmac roads were narrow with heavy traffic flow that motorcycles access to the roads particularly during rush hours and on Wednesdays and Saturdays being market days. Seasonal feeder roads and foot paths converging at Kakamega town were muddy and dusty during rain and dry seasons respectively rendering them impassable for motorcyclists most of the year. There being limited parking space and stages, motorcycles transacted their business spontaneously, endangering the lives of other road users as reported by word Bank (1988).

Rising crime including robbery, rape, kidnapping and even murdered (.0095[**]) also accelerated social cost. At the same time using motorcycles to execute robberies as well as kidnapping children and women was a common practice. Riders also fell victim of this vice because they were often duped by teaser passenger to remote destinations like Shitaho and Kakamega forest. On arrival, the riders were snatched the motorcycles then beaten and left for the dead. Stolen motorcycles were then dissembled to provide spare parts or to other towns. This was in conformity with Otenyo's (2012) observation that most of the motorcycles in Kakamega municipality were stolen.

Overloading (.0000) enhanced social cost of motorcycle transport. During the peak period especially at end month or whenever *Matatus* were on strike, motorcycles carried a maximum of five passengers and luggage. In such instances, three adults sat at the back and two children in the front of the rider with huge luggage on the carrier and hanging on the next to the head lamps. They also transported large quantities of heavy and bulky goods like cement, Irion sheets and maize that often obstructed other road users. These extreme forms of overloading destabilized the motorcyclists resulting into fatal accidents that led to loss of life and property as reported by Risbey *et al* (2010) in Australia.

Alternatively, social cost of MT reduced with increased chance of ill health (.0082[**]). Motorcycle transport saved many lives especially in remote areas where motorable roads were impassable or absent. They offered door to door services for the patients, especially those who could not walk to the hospital or to the nearest bus station to board a vehicle. In a nutshell, motorcycle transport was faster, affordable, accessible, readily available and demand driven. Similarly, inter and intra motorcycle competition characterized by over speeding (0.0002[**]) varied inversely with social cost. Respondents noted that most motorcycle operators had formed self help groups that prioritized the queuing criteria to moderated competition. Alternatively, the speed used expedited movement and saved time as intended by most passengers including commuter, students and patients.

Table 3. Determinants of the social cost of motorcycle transport: 2SLS regression analysis

Social costs	B	SE B	Beta	T	Sig T
Death: Loose of human life	.173474	.045342	.255969	3.826	.0002 *
Ill human health	-.118331	.044116	-.180313	-2.682	.0082 **
Urban traffic congestion	.076182	.032220	.157824	2.364	.0194 *
Cost price and recurrent expenditure	-.092232	.089451	-.069090	-1.031	.3042
Road conditions	.150622	.043724	.226127	3.445	.0008 **
Illicit trade	-.028279	.023233	-.083957	-1.217	.2255
Competition and over-speeding	-.028905	.007658	-.250564	-3.775	.0002 **
Crime: Robbery, rape, kidnapping	.041250	.015689	.172796	2.629	.0095 **
Loss of amenity: pollution	-.001759	.019236	-.006289	-.091	.9273
Unroad-worthy motorcycles	.010029	.051446	.013270	.195	.8457
Overloading/crowding effect,	.272681	.060390	.324260	4.515	.0000 **
(Constant)	.646719	.172998		3.738	.0003 **

Notes: R^2= 0.64342,   Adjusted R^2 =0.41399   F = 9.18377   Sig.F = .0000, df=10
Sig. * 0.01   Sig. ** 0.01

Social Cost of Motorcycle Transport and Human Welfare Model

Pearson correlation was used to investigate the relationship between the social cost of motorcycle transport and human welfare. A significant, moderate, negative correlation (-0.460 *, at 2-tailed test), was reported (Table 4). The inverse relationship meant that continued use of motorcycle transport under the prevailing environment escalated human, property, urban and air related social cost. The scenario caused pain, suffering and loss of property and time that culminated to the deteriorating human welfare as reported earlier by Ruta (2002),Otenyo (2012), Kalama (2013) and Muiruri (2013). Consequently, 85% of the respondents would pay an average of Kshs. 90 per month as a donation towards sanitising motorcycle transport to help internalise external costs that could help minimise the overall social cost.

Table 4. Correlation between social cost of motorcycle transport and human welfare of Kakamega Municipality

Description	Correlation tests	Social cost of motorcycle transport	Human welfare of Kakamega Municipality
Social cost of motorcycle transport	Pearson correlation	1	-0.460 *
	Significant(2tailed)	.	0.021
	N	189	177
Human welfare of Kakamega Municipality	Pearson correlation	-0.460 *	1
	Significant (2tailed)	0.021	.
	N	167	188

Notes *Correlation significant at the 0.05 level (2-tailed)

CONCLUSION

Summary

Motorcycle transport is a preferred but risky activity in Kakamega municipality. It is characterized by irresponsible riders who neglect road safety measures. This is worsened by the poor road network, long working hours, crime and numerous traffic/municipal offences. Death, ill human health, elicit trade and crime, among others were the most common social cost of motorcycle transport that enhanced human suffering. This culminated to vicious cycle of poverty and deteriorating human welfare. Residents opted to donate something to improve the transport mode as a strategy towards mitigate this worrying trend.

Recommendations

In order to better human welfare as intended, it is everyone's duty and responsibility to oversee sanity in motorcycle transport business. This is because both motorcycle owners and riders on one side and traffic police and municipal council *askaris* on the other side colluded to escalate its social cost that worsen human welfare.

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