INFLUENCE OF TRAFFIC MANAGEMENT STRATEGIES ON MITIGATING TRAFFIC CONGESTION IN NAIROBI COUNTY, KENYA

Muriuki, H., & Omwenga, J.

The Strategic JOURNAL of Business & Change MANAGEMENT
ISSN: 2312-9492 www.strategicjournals.com
Vol. 9, Iss. 4, pp 155 – 165. October 8, 2022. www.strategicjournals.com, ©Strategic Journals

INFLUENCE OF TRAFFIC MANAGEMENT STRATEGIES ON MITIGATING TRAFFIC CONGESTION IN NAIROBI COUNTY, KENYA

[1] Muriuki, H., & [2] Omwenga, J.

[1] Master Candidate, Jomo Kenyatta University of Agriculture & Technology [JKUAT], Kenya
[2] Doctor, Lecturer, Jomo Kenyatta University of Agriculture & Technology [JKUAT], Kenya

Accepted: September 25, 2022

ABSTRACT

The main purpose of the study was to assess the influence of traffic management strategies on mitigating traffic congestion in Nairobi County in Kenya with specific objective being: infrastructure expansion. The study adopted both descriptive and correlational research designs. The target population greater than 10,000 residents operating within the Central Business District, samples size of 384. Questionnaire was the main instrument for data collection. The data collected was summarized, classified, report tabulated, analysed and discussion done qualitatively. The findings were that parking management strategies strategy, infrastructure expansion strategy and use of public transport strategy contributes to mitigation of traffic congestion and recommended that strict traffic enforcement by the police in the Nairobi Central Business District. Mobility management programmes that will promote use of alternative modes of transport should be put in place, likewise higher capacity vehicles operating within the CBD should be encourage in all the designated stage and bus stops. Integrated and coordinated inter and multi-modal transport system involving road and rail be done to reduces traffic congestion in the city. private transporters and stakeholders in public transportation in transport sector policy formulations should totally involve for a better and invention of more innovative ways of dealing with congestion of traffic in the city. Finally, the study suggested that further studies be conducted on influence of traffic management strategies on mitigating traffic congestion in Major towns in Africa. This would help give a holistic idea on the how to mitigate traffic congestion including working in the house and subsequent productivity of employees when working in the house in curbing movement within bigger cities in Africa.

Key Words: *Parking Management, Infrastructure Expansion, Public Transport*

CITATION: Muriuki, H., & Omwenga, J. (2022). Influence of traffic management strategies on mitigating traffic congestion in Nairobi County, Kenya. *The Strategic Journal of Business & Change Management,* 9 (4), 155 - 165.

INTRODUCTION

Transport constitutes a vital component in terms of creating a competitive business environment as well as way upon which numerous environmental objectives as well as socio-economic is achieved (Nairobi Metro vision 2030). Traffic congestion has frustrated the realization of such objectives in many cities across the world. Traffic jam prevents people from moving freely, slows, disrupts and delays business operations within urban setup. The city transportation system forms the engine upon which economic operations engaging all communities all over the world operates, and consequently improves livelihood of residence within the city (Adams, 2017). City transportation is not limited to private cars but also includes railways, waterways in some countries, airways and road networks. Though, the big proportion is roads where majority of people operating within the city uses roads as a means of transport. Reasonably, planning, co-ordinations and research efforts focuses on the road transport since it is majorly get affected by the traffic congestion. In other words, road transportation system is the main player in the economic activities of most cities in the world. Recently, most cities have experience a great increase in road traffic and transport demand since the demand for cars keeps on shooting up, leading to worsening of jam in the city, manifested in road traffic congestion (Kolowksky & Moshe, 2013).

Congestion has a series of ancillary impacts not limited to political, environmental and resource impacts of the jam, this contributes negatively to quality of life, increased stress, reduction of safety as well as impacts negatively on non-vehicular space in the roads by the users such as the users of sidewalks and road frontage properties among others (Transport Canada, 2006). In 83 cities across USA the costs of wasted time and fuel due to traffic congestion was estimated (2005) at $60 billion, (Jonathan and Levy, 2007). It has been foreseen by researchers that yearly economic loss of money due to traffic congestion will be at $16 billion by 2030 in Canada, (Clear Air Commute, 2014). Sanders (2015) found in the study that the cost of traffic jam in the United States of America is about 97,676 vehicles crashes in work zones, 1,340 deaths witnessed in the roads, 56,465 injuries in fatal accidents, more than 484 million hours lost in roads due to delays by motor vehicles being in Jam and $6.534 billion lost time most so in the city. Sanders (2015) stressed that costs relating to congestion is too expensive and includes property and medication since most of the road users normally faces the dangers of accident and the user delays costs are often considered the largest cost. Delay from increased accidents normally causes congestion of traffic and delay from reduced lanes are considered enormous. In addition, when congestion costs are increased fuel consumption also increases leading to air pollution.

Nairobi has an estimate of vehicles population which stood at above 600,000 in the year 2019 and has been increasing at 8,000 motor vehicles per month, (GoK, 2019). Traffic congestions is a major problem in Nairobi CBD and has a bad effect on the residence livelihood within Nairobi (Irung'u, 2016). This study therefore seeks to investigate the development of traffic management strategies in Nairobi that can reduce the negative impacts of traffic jams. Normally the discussion on cost of traffic jam in cities contributes to the estimated value of time lost by people stuck in jam and this comes with other broader costs of traffic jam that should be searched on (Dachis, 2013). Most of the studies that have been conducted window dress costs of traffic jam and ignores how the problem of traffic jam contributes to negative organizational performance. The urbanization encourages people since they strongly believe that there are ready jobs in the city accompanied by better match of their skills, capability, sharing knowledge, face-to-face interaction, and creation of positive competition among one another, there is shared entertainment and cultural exchange thus benefit other people this leads to congestion of individual in the city (Dachis, 2013). Though congestion makes urban interactions too costly to pursue, the mention

above benefits are foregone, (Dachis, 2013). Hence, the need to look for alternatives way of controlling the traffic jam will be of benefit to many people migrating to the City.

Statement of the problem

The congestion of human persons in the central business district saw the county come up with more commercial centres for business hubs and lowering human traffic to the market and busy places in efforts to decongest the place (KNBS, 2018. Many offices moved out of CBD to areas like Upperhill, Westlands and Hurlingam. Nairobi city has been experiencing a growth rate of 4.1% against the national and worldwide average growth rate of 3.51% and 2.27%, respectively according to census report 2019, leading to a need of expanding infrastructure and other services capacities since there will be an increase in demand the utility of this kind of services by the continuous growing population not only in Nairobi County but also other part of the world. Nairobi compared to other Counties has the highest population density at 6,577 people per Square Kilo-meters and growing at 7.1% p.a, followed by Kiambu County with a density of 918 people per Square Kilo-meter and growing at 5.8% p.a, in line with Kenya National Bureau of Statistics (KNBS, 2019).

A recurrent of the traffic congestion is also clearly seen in the evening peak hours when most of the people have to make their return journey to their respective homes and other residential areas. The government reported that traffic jams cost over 50 million Kenya shillings ($578,000) a day in lost productivity due to delays in traffic jam. There is a problem in the city, a cry by many people on delays, narrow roads, increased population in the city, shortage of resources caused by delays, increase in theft and corruption affecting people working in CBD and a need for proper strategy is lacking that might mitigate this kind of problem hence a proper study needs to be conducted to curb this problem and from the researcher was prompted to conduct a study on the influence of traffic management strategies on mitigating traffic congestion in Nairobi County in Kenya to come up with a long lasting solution to the traffic congestion in the city.

Objectives of the Study

The general objective of this study was to assess the influence of traffic management strategies on mitigating traffic congestion in Nairobi County in Kenya. The study's specific objective was to determine the extent to which infrastructure expansion influences mitigation of traffic congestion in Nairobi County.

LITERATURE REVIEW

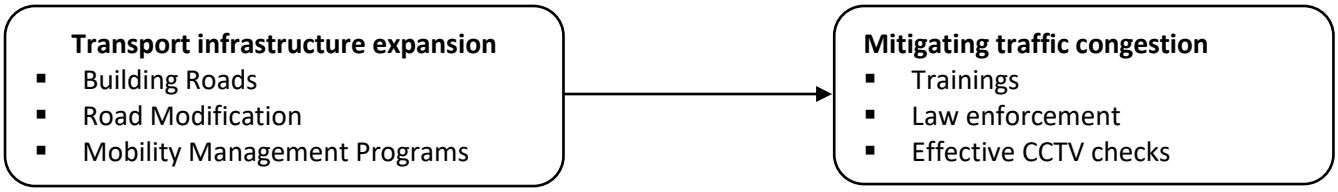
Economic theory

The theory was developed and improved by Hook in 2005 and the theory asserts that all businesses are created to make profit and improve the economic livelihood of the people in the society and the project to be invested should be efficient enough to yield more profit and boost economy. The theory is relevant to the study since it tends to discourage congestion in the roads and stress that congested roads are deemed to be one of the most tragedy happening to people commuting from one place to the other. Since roads in most areas within the city are free to be used by everyone, they yield very little financial benefits and is recommended that the users should not over-utilize them for the sake of the upcoming generation, to that effect traffic collapses into a jam need to be discouraged (Hook, 2005). And for the road to yield more revenue there is a need to Privatize highways let individuals to manage them and this will reduce congestion through economic incentives and disincentives imposed by the private owners for the users that cannot hither to the adherence to policies of the highway. Theory also is applicable when the roads are treated as the cash cows and Congestion be properly managed and non-recurring highway incidents, like a crash or roadwork, leading to reduction of the road's capacity less than the normal levels.

According to Anthony (2004), rush hour traffic congestion is unavoidable since majority of the employees tend to utilize the roads and being the

time when they are returning back home. Capitalist economy normally enjoys, trends existing in acquisition of goods and services and the demand factor (ability to pay) or by wait in line (first-come first-serve); leading to congestion. Calling for the traditional solution of making the "pipe" large enough to accommodate congestion in the line, widening roadways or expanding "flow pressure" via automated highway systems, to get access to services offered in a given locality. There is a greater need to reduce congestion (a demand-side solution, effectively rationing demand), since it will ensure efficient flow of revenues generated through, from and into public transportation businesses (Beck 1999).

Conceptual framework



Independent variable **Dependent Variable**

Figure 1: Conceptual Framework

Transport Infrastructure Expansion

Infrastructure expansion is the process of building new road, rail way lines, internet modification among others. Most countries though are in need of expanding their infrastructure they are perturbed by in adequate supplies of resources in terms of lack of space, lack of enough money supplies, impromptu pandemics affecting country budgets in dense urban set up and is this has proved to be very expensive and this covers larger proposition outlying boundaries of urban areas. Many countries take infrastructure expansion as the only as a last resort in combating the problem of traffic congestion. The usefulness of providing much broader and new road capacity as a traffic congestion mitigation strategy is on circulation and the jam related problem is being managed. Though, there are many occasions where the creation of new and modern infrastructure is not effective especially where there is a subsequent demand for more automobiles, the infrastructure expansion will not necessarily help in managing congestion and traffic problem issues since many people will tend to buy as many cars as possible flooding the roads. Though from the previous studies it is recommended that the decision to capitalise in new road capacity and parking capacity needs to be encouraged and people needs to be motivated whenever they make an attempt of adhering to the policies in place on curbing the traffic congestion and these are not limited to thorough cost-benefit exercise that takes into consideration a wider range of traffic jam problem in the city. (Thomson, 2012).

Several ways have been developed to squeeze more capacity out of the already existing infrastructure to accommodate more users including creation of adding lanes, separation of lanes for heavy and light duty vehicles, re-allocation of more road space, modifying the existing roads, amending the geometric design of roads, developing more fly overs, creating one-way streets among others since the strategies are deemed to be of benefit either to car users or public transport in eradicating the problem of traffic congestion; nevertheless operational management policies also serves as additional mitigating strategy that road users ought to adopt and these involvements ought to bring efficient traffic flows and accommodate maximum utilization of capacity available in the roadway to curb the possibility of sudden traffic breakdowns.

Provision of alternative routes by for example construction of new road links and by-pass roads also helps to reduce traffic congestion because the additional routes increase the redundancy of the transport system and distribute traffic that would

otherwise be congested on fewer routes (Gonzales et al., 2014). However, it is observed that road users will switch their normal daily routes to avoid congestion, and by so doing congestion will be shifted to the new roads that were previously un-congested (Vanderbilt, 2012).

Improving traffic operations management is a strategy with much potential to mitigate traffic congestion. Instruments under this strategy include road traffic information systems (intelligent transport systems), pre-trip guidance, coordinated traffic signal systems and dynamic speed and incident management policies. According to OECD/ECMT (2007), traffic operation management strategies are cost-effective and help to improve travel and should be used to manage traffic so that flows are held below the limit of the physical facility. Duranton and Turner (2015) conducted study on the relationship between federal highways and the kilometres covered by the highway vehicle (VKT) in US cities the findings were that the driving speed on the highway to increase since there is a less traffic jam compared to other in-town roads thus the highways should be built in most cities to reduce the traffic congestion problems.

Empirical Review

Brueckner (2017) assessed the efficacy of urban growth boundary (UGB) as a second best substitute for a first-best toll regime in a congested city. The results of the evaluation showed that the utility gain generated by the UGB was very small and could not support the management of traffic congestion. It was suggested that a UGB be advance to make it useful instrument for dealing with the falsifications caused by traffic congestion.

Rich and Nielsen (2016) undertook a study on socio-economic analysis on proposed road pricing schemes for Copenhagen area and the finding was to be assessed and used in cost reduction. It was observed that socio-economic surplus from the projects be made crucially on the level of traffic jam management. The finding indicates that there is magnitude of demand in introducing road pricing, and had significant contribution to project surplus, degree to which benefits outweighed costs was also established through checking use of revenue realized from congestion management.

Creutzig and He (2015) studied the external costs and potential impacts of travel demand management with the overall aim of providing help in defining policy instruments that mitigate the adverse impacts of transportation. They analysed different externalities of car transportation in Beijing and found that a road charge could address traffic congestion. Upon further investigation on the role of demand elasticity in transportation, they demonstrated that joint demand and supply-side policies provided considerable synergies to mitigate adverse impacts.

Salomon and Mokhtarian (2016) undertook research on policies designed to curb congestion and found that policies on traffic had little effect. They attribute the ineffectiveness to what they refer to as a “gap” between policy assumptions and users perception on policy measures and further stressed that there is a gap that need attention and that there should be a set of alternative responses to traffic congestion which is wider and differ to one recognized by the existing policies by the congestion policy makers, and further stressed that costs and benefits should be left to the users creating barriers to the adoption of the congestion of vehicles in the city.

METHODOLOGY

To achieve the objectives of the study, both descriptive and correlational research designs were adopted. Descriptive research was used to give details concerning the state of affairs factually while correlational design was used to assess the degree of relationship that exist between the variables through the use of linear regression model. The population for this study was drawn from general public, policy makers, professionals, developers and employers. In this study, stratified random sampling was employed in selection of a sample. The stratums included Nairobi residents and motorists, Nairobi County employees, Ministry of transport,

roads and infrastructure, Ministry of Nairobi Metropolitan development employees residing in Nairobi. In each strata random sampling was used to select individual respondents to fill the questionnaires as indicated in table 1 below;

Table 1: Sample Matrix

Category	Sample Size	Sample Size percent
Residents and motorists	52	14%
City Council employees	58	15%
Ministry of roads	57	15%
County Traffic Management Officers	50	12%
Traffic Police Officers	52	14%
Nairobi Metropolitan	58	15%
Ministry of transport	57	15%
Total	**384**	**100%**

The research data was analyzed using SPSS version 22.0 and generated both inferential and descriptive statistics which was further used to derived deductions and overviews of the population. Descriptive analysis used frequencies, trends and percentages, while inferential statistics used Pearson's correlation to show the relationship among the variables and the regression analysis to show the magnitude of independent variables on the dependent variable. The data then were presented using data tables and charts.

RESULTS AND DISCUSSIONS

The number of questionnaires administered were 384 out of which 343 questionnaires were returned whereas 41 were not returned. This represented 89% return rate and conformed with the recommendations of Babbie (2004) that a return rate of 50% is considered appropriate for analysis, 60% is better and 70% is best and information achieved from it is of less errors. Based on Babbie (2004), 89% response rate was therefore adequate for the study.

Infrastructure Expansion Strategy

Table 2: Infrastructure Expansion Strategy

Statement	1	2	3	4	5
There is a proper plan of developing new infrastructure by building new roads within Nairobi CBD	24%	25%	4%	28%	19%
County government of Nairobi has been modifying existing infrastructure so as to increase its capacity	26%	29%	10%	18%	17%
There is a complete separation of vehicles and separate lanes for Freight/Goods transport within the CBD	24%	38%	2%	11%	25%
When the government converts two way to one way then the traffic congestion is reduced	12%	13%	2%	32%	41%
There is mobility management programmes that will promote use of alternative modes of transport, like the higher capacity vehicles operating within the CBD	34%	24%	8%	18%	16%

To explore more on infrastructure expansion strategy several statement were made and different reactions were observed and on the statement of there is a proper plan of developing new infrastructure by building new roads within Nairobi CBD, 24% of the respondents strongly disagreed, 25% disagreed with the statement leading to a sum of 49% being in a contrary opinion stressing that there is no plan in place for developing new infrastructure in Nairobi, 4% are not aware of the plan hence neither agreed nor disagreed with the statement, while 28% agreed and 19% strongly agreed with the statement asserting that the plan is underway of developing and building more roads to

reduce traffic congestion in the Nairobi CBD. On the statement of County government of Nairobi has been modifying existing infrastructure so as to increase its capacity, 26% of the respondents strongly disagreed, 29% disagreed hence majority of the respondents disagreed with the statement that there exist strategy of modifying infrastructure leading to increase in capacity. 10% of the respondents had no idea of such a strategy hence neither agreed nor disagreed with the statement though some of the respondents summing up 35% agreed that they are away of such a strategy and County government are continuously modifying the infrastructure and increasing capacity of the roads in Nairobi CBD.

On the statement of there is a complete separation of vehicles and separate lanes for Freight/Goods transport within the CBD, 28% of the respondents strongly disagreed, 38% disagreed leading to up to 62% of the respondents disagreeing with the statement and asserting that within the CBD there is no separation of the lanes and all vehicles uses the same lane, 2% of the respondents neither agreed nor disagreed with the statement stating that they are visitor in Nairobi and have o idea of the existing lanes, 36% of the respondents agreed with the statement that the county government have separated lanes and demarcation done using the red lines most so in the super highway. On the statement that when the government converts two way to one way then the traffic congestion is reduced majority of the respondents summing up to 73% agreed with the statement and further stressing that to reduce jam in the city, heavy track should have the own lane, the matatus own lane and the private cars, 2% neither agreed nor disagreed with the statement, remaining 25% disagreed asserting that even if the government converts two way to one way and no proper check the road users will still misbehave by overlapping and congestion will still be realized.

On the statement of there is mobility management programmes that will promote use of alternative modes of transport, like the higher capacity vehicles operating within the CBD 34% of the respondents strongly disagreed with the statement, 24% disagreed claiming that there is no management programmes in place on alternative mode of transport, 8% of the respondents had no idea hence neither agreed nor disagreed with the statement while the remaining 34% agreed that there is alternative ways like the use of NYS buses to ferry people in and out of the town.

Mitigating Traffic Congestion

Table 3: Mitigating traffic Congestion

Statement	1	2	3	4	5
Increasing the capacity of roads, construction of bypass roads and missing link roads should be implemented and the use of (motor cycle) transport be encouraged	14%	28%	4%	22%	32%
The public transport system should be re-engineered to achieve enhanced levels of service by focusing on sustainable urban transport principles such as bus rapid transit.	13%	21%	7%	23%	36%
Constant surveillance of the road system and prompt response to incidents that interfere with traffic flow should be implemented	18%	18%	6%	20%	38%
Intelligent Transport Systems that combine information and communication technology with transport infrastructure should be adopted to avail travel-related data to help in travel planning	17%	11%	4%	40%	28%
Public transport should be managed effectively to encourage their use	9%	20%	6%	28%	37%
The parking management strategies policy should be strict and priced highly to discourage use of private vehicles in CBD	18%	15%	4%	32%	31%
High fines should be charged for public and private cars found parking on the roads or on non-designated areas	14%	10%	4%	32%	40%

Mitigating traffic congestion has been viewed as a vital element to deal with in any town and exploring the management strategies several statements were made and the respondents reacted on the statement differently.

On the statement of increasing the capacity of roads, construction of bypass roads and missing link roads should be implemented and the use of (motor cycle) transport be encouraged were agreed upon by majority of the respondents summing up to 54 stressing that for congestion of traffic in CBD to reduce more ways to be expanded and the use of motor cycles be encouraged since they don't normally create jam, 4% neither agreed nor disagreed while the remaining 42% were in contrary opinion asserting that, for the decongestion to happen the government should discourage urbanization and create more industry in rural area since this will reduce the city population and reduce the traffic congestion in the city.

On the statement of the public transport system should be re-engineered to achieve enhanced levels of service by focusing on sustainable urban transport principles such as bus rapid transit, majority of the respondents adding up to 59% were in agreement, 7% neither agreed nor disagreed since they were visiting the city for the first time and have no idea of the traffic congestion in the city while the remaining 34% were in contrary opinion stressing that bus rapid transit will not solve the problem since not convenience for many people working in offices those who uses the small car like the Ubber cars hence will not be effective.

On the statement of Constant surveillance of the road system and prompt response to incidents that interfere with traffic flow should be implemented, majority of the respondents summing up to 58% were in agreement even suggest installation of the CCTV system everywhere in the city and any driver or road user found on the wrong side of the law are dealt with ruthlessly, 6% of the respondents neither agreed nor disagreed to the statement while the remaining few respondents summing up to 34% were in disagreement claiming that when such a system are in place then matatu owners will over exploit the passengers by increasing the bus fare in and out of the town.

On the statement of intelligent Transport Systems that combine information and communication technology with transport infrastructure should be adopted to avail travel-related data to help in travel planning, the statement was supported by 68% of the respondents and stressing that the system should be effective as soon as possible since they have been suffering for the problem caused by the traffic jam in the CBD, 4% of the respondents neither agreed nor disagreed with the statement and the remaining 28% disagreed with the statement claiming that even the system are installed in the city how effective will it be to the users, unless training done that changes the user perception and views is when the congestion will be managed.

On the statement of Public transport should be managed effectively to encourage use of public transport, the statement was supported by the majority of the respondents adding up to 65% claiming that if public transport system is well managed the a lot of people will tend to use public transport and not their private cars, 6% neither agreed nor disagreed with the statement while the remaining 29% were in contrary opinion asserting that they cannot use public whatsoever since their personal cars are much convenient than that of public transport.

On the statement of the parking management strategies policy should be strict and priced highly to discourage use of private vehicles in CBD was supported by majority of the respondents adding up to 63% of the respondents asserting that when parking management strategies policy are properly enforced them it will deter most people from parking where there is no parking like the road side leading to unnecessary jam, 4% of the respondents neither agreed nor disagreed to the statement while the remaining 33% of the respondents were of contrary opinion claiming that the more the policy on road the more people will ignore hence

leading to corruption on the road. Last on the statement of high fines should be charged for public and private cars found parking on the roads or on non-designated areas were supported by 72% of the total respondents, 4% neither agreed nor disagreed on the fines while the remaining few of the respondents were against the high fine since by breaking the law they work extra trips and generate more revenues.

Regression Results

Table 4: Regression Coefficients for all the Variable

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.852	.990	.236	1.256	.000
Parking management strategies	.302	.198	.452	1.443	.000
Infrastructure expansion	.289	.479	.475	1.387	.001
Use of public transport	.348	.569	.987	1.546	.000

Based on the linear regression model, $Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + u$, the model therefore becomes; $Y = 0.852 + 0.302\ X_1 + 0.289X_2 + 0.348X_3 + u$

Where Y = dependent variable (mitigating traffic congestion)

α = constant

β_1, β_2 and β_3 are coefficients of independent variables

X_1, X_2 and X_3 = are independent variables (parking management strategies, infrastructure expansion and use of public transport respectively)

Testing at 5% significant level, the regression analysis in table 4 was significant since all the p-values (Sig. $p<0.025$) testing at 2 tail test. The findings indicate that holding infrastructure expansion and use of public transport constant, every one-unit increase in parking management strategies increase mitigation of traffic congestion by 30.2%, Holding Parking management strategies and use of public transport constant, every one-unit increase in infrastructure expansion increases mitigation of traffic congestion by 28.9%. Holding Parking management strategies, infrastructure expansion, every one-unit increase in use of public transport increases mitigation of traffic congestion by 34.8% From multiple regression analysis, R2 = 0.752 meaning that 75.2% of traffic congestion can be mitigated through traffic management strategy and that the high degree means the regression model fits the data very well.

Summary of findings

On infrastructure expansion strategy several statement was made and different reactions were observed and on the statement that there is a proper plan of developing new infrastructure by building new roads within Nairobi CBD, majority were in a contrary opinion stressing that there is no plan in place for developing new infrastructure in Nairobi. On the statement of County government of Nairobi has been modifying existing infrastructure so as to increase its capacity, majority of the respondents disagreed stressing that there does not exist strategy of modifying infrastructure leading to increase in capacity. On the statement that there is a complete separation of vehicles and separate lanes for Freight/Goods transport within the CBD, majority of the respondents disagreed with the statement and asserting that within the CBD there is no separation of the lanes and all vehicles uses the same lane.

On the statement that when the government converts two-way to one way then the traffic congestion is reduced majority of the respondents agreed with the statement and further stressing that to reduce jam in the city, heavy track should have their own lane, the matatus own lane and the private cars too. On the statement that there are mobility management programmes that will promote use of alternative modes of transport, like the higher capacity vehicles operating within the CBD majority of the respondents disagreed claiming that there are no management programmes in place on alternative mode of transport.

CONCLUSIONS AND RECOMMENDATIONS

On infrastructure expansion strategy more still need to be done, a proper plan of developing new infrastructure by building new roads within Nairobi CBD is not known to many government should put plan in place for developing new infrastructure in Nairobi, modification of existing infrastructure so as to increase its capacity has not been done by both the County and National government, no complete separation of vehicles and separate lanes for Freight/Goods transport within the CBD, and all vehicles uses the same lane. When government converts two-way to one way then the traffic congestion is reduced and to reduce jam in the city, heavy track should have their own lane, the matatus own lane and the private cars too. Mobility management programmes that will promote use of alternative modes of transport, like the higher capacity vehicles operating within the CBD has not been think of in Nairobi according to majority of the respondents.

Infrastructure expansion strategy is one of the best way of reducing traffic congestion in Nairobi CBD and more still need to be done, a proper plan of developing new infrastructure by building new roads within Nairobi CBD should be developed, modification of existing infrastructure so as to increase capacity of the users should be put in place by the Nairobi city planning committee, there should be complete separation of vehicles and separate lanes for Freight/Goods transport within the CBD, government should also converts two way to one way to reduce jam in the city, heavy track should have their own lane, the matatus have their own lane and the private cars too. Mobility management programmes that will promote use of alternative modes of transport should be put in place, likewise higher capacity vehicles operating within the CBD should be encourage in all the designated stage and bus stops.

Suggestions for further Research

Finally, the study recommended for further studies on influence of traffic management strategies on mitigating traffic congestion in Major towns in Africa. This will help give a holistic idea on the how to address traffic congestion including working in the house and subsequent productivity of employees when working in the house in curbing movement within bigger cities in Africa.

REFERENCES

Adams, J. (2017). Evaluating the effectiveness of road safety measures Town and Country Planning 344-52.

Anthony, D. (2004). Stuck in Traffic, 2nd edition, McGraw Hill, London.

Dachis, B. (2013). *Cars, Costs and Congestion: A New Approach to Evaluating Government Infrastructure Investment*. Commentary 385. Toronto: C.D. Howe Institute. July.

Davis, R. (2013). Death on the Streets. Hawes, N. Yorkshire: Leading Edge. Government of Republic of Kenya, 2007: Kenya Vision 2030 – The Popular Version

Hook, W. (2005). Urban congestion, the motorization crisis in the world transport, Sterling publishers, London.

Irungu, Z. K. (2016) Decongesting Nairobi – Urban Transportation Challenges. Ministry of Roads and Public Works, Roads Department, Nairobi, Kenya.

Kenya: Traffic Management Authority: Institute of Transportation Engineers Journal March 2005.

Kolowksky, M. and Moshe, K. (2013). On the relationship between commuting, stress symptoms, and altitudinal measures, *Journal of Applied Behavioural Science*, 485 – 92.

Saunders, J. (2015). Congestion charging in Edinburgh: some lessons in acceptability, paper presented at European Transport Conference,

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students.* Italy; Prentice-Hall.

Syverson, J. (2010). Harley-Davidson Corporation cooperation efforts in traffic policing, paper presented at the 7th International Police Executive Symposium, Evanston, IL,

Thomson, J.M. (2012), Modern Transport Economics, Penguin, London,

Traffic clogs emerging economies 2011 commuter pain index finds technology might help alleviate the problem. (2011, September 27). States News Service. Retrieved September 12, 2018, from http://www.highbeam.com/doc/1G1-268195989.html

Walters, A.A. (1961). The theory and measurement of private and social cost of highway congestion, *Econometrica*, Vol. 29 pp.676-99.

Wards (2014). Automotive Industry News, Data and Statistics. (n.d.). Retrieved September 13, 2014.